K.L.E. SOCIETY's

S. NIJALINGAPPA COLLEGE

II Block, Rajajinagara, Bengaluru-560010

Re-accredited by NAAC at 'A+' grade with 3.53 CGPA

College with UGC-STRIDE Component –I

IQAC Initiated UGC STRIDE Sponsored Two day 4th International Conference On

"Sustainable Growth through Nano-science and Artificial Intelligence for Safeguard of Environment"

(SGNASE-2021)

Organized by
Science Departments

29th & 30th October 2021

Time: 9.30 IST

Website: https://www.klesnc.org

Email: sgnase2021@klesnc.org

About the KLE Society

The KLE Society, Belagavi, since its inception 1916, has been a role model in imparting quality education and upliftment of socioeconomic status. The KLE Society disseminates the knowledge in all spheres of education from KG to PG, for overall personality development of the students. It promotes and encourages the students' community to opt for programmes like Medicine, Dentistry, Pharmacy, Nursing, Agriculture, Law, Business Management, Hotel management, Engineering & Technology, Arts, Science, Commerce and Education. Under the leadership of visionary chairman Dr. Prabhakar B. Kore, Ex.M.P., the number of institutions has been elevated up to 280 in various fields of education including research in India & Abroad. The visionary chairman of our Society taking the entire organization towards the global level by building the team spirit, digitalized teaching, learning and research among the faculty and student community for the welfare of the society at large.

About the College

K.L.E Society's S. Nijalingappa College, established in the year 1963, is one of the premier institution under KLE Society, and has been included under 2(f) and 12(b) of UGC. The college has seen phenomenal growth in terms of courses offered, quality enhancement, student and staff strength besides development in infrastructure. The College offers higher education to 3,685 students from all sections of the society.

Over its glorious service of more than a half century to the community, the college has earned many significant laurels. The college has been re-accredited at A grade in the previous two cycles, in third cycle A^+ grade with CGPA 3.53 in 2016. College has received the status of 'College with Potential for Excellence' Phase-II and UGC-STRIDE Component-I by UGC in 2019. The college conducts a range of UG courses in B.A, B.Sc., B.Com., BCA, BBA, BHM and PG Courses in M.Sc., M.Com., MCA, MTTM and Ph.D. in Commerce to cater to the diverse needs of the evolving higher education scenario at the national as well as Global level. The college is also recognised as research centre in commerce by Bengaluru City University, Bengaluru.

About the Science Departments

Undergraduate (Physics, Chemistry, Mathematics, Comp. Science, Botany, Zoology & Biotechnology) and PG (Physics, Chemistry, Mathematics & Commerce) departments of the college are actively involved to build the research capacity among the faculty and students. The college upholds research culture through Dr. Prabhakar B. Kore Basic Science Research Centre with state-of-art laboratories and Botany & Zoology museum. The college encourages faculty & research scholars by providing a platform to share recent research findings for human resource development through various conferences, seminars, symposia, workshops, FDPs & SDPs.

About the Bengaluru

Bengaluru is globally recognised silicon city attracts academicians, industrialists, researchers, corporates, event organizers, cine and sports celebrities and tourists, for its hospitality, diverse culture, lush green comfortable & clean environment. Bangalore is interspersed wildlife sanctuaries, hilly brooks and rivers. It has gained a reputation for being the 'Garden City of India'. A demographically diverse city, Bangalore is a major economic and cultural hub and the fast growing major metropolitan city of India.

Familiar tourist places in and around Bengaluru are Cubbon Park, Lalbagh Botanical Garden, Bannerghatta National Park, Visvesvaraya Industrial and Technological Museum, Planetorium, ISKCON Temple, IISc, historical monuments, Vidhana Soudha, Ramadevarabetta, Wonderla Amusement Park, Bangalore palace, Mysore Palace, Ranganathittu Bird sanctury, Krishna Raja Sagara Dam, Shivanasamudra, Trekking or hiking places like Nandi Hills, Savandurga and Chamundi Bettta.

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BY AIR – Bengaluru is accessible by air, road, and rail. Bengaluru Airport is 13km east of the City Station. Bengaluru has direct international flights and stopover for many other flights.

BY ROAD – Bengaluru has large bus terminus, which is near the railway station. There are two railway stations in Bengaluru. The main station is well connected to all major Indian cities. There are number of daily express trains from Bengaluru to other cities of India.

About the Conference

SGNASE-2021 with the theme "Nano-science & AI technology for sustainable environment" is focusing on the trending areas of research in nano-science & technology and its advancements in the trans-disciplinary areas such as Nano-electronics, Nano biotechnology, Nano robots, , Material science, Diagnostic devices. The conference provides global platform for scientific exchange among Artificial Intelligence researchers, academicians, scientists, analysts, engineers in the related disciplines. The conference deliberations will include keynote session & invited talks led by eminent scientists, research findings by young scientists, researchers & students through oral & poster presentations. This conference is place for all the experts across globe for new trans-disciplinary scientific collaborations and networking. With its scientific sessions delegates are provided assurance to explore the latest technologies and breakthroughs that are specific to the broad area research.

Sub-themes

- **Nano-materials & Technology 2D-materials**
- **Biomaterials and bio-devices**
- **Green materials for clean environment**
- **Renewable energies**
- **Drug delivery & Nano-carriers**
- **Smart Agriculture& Agro based industry**
- **Quantum Information and Processing**
- **Signal & Image Processing**
- **Nano-bionics & Artificial intelligence**
- **Artificial Neural Network**
- **Artificial Intelligence for Biodiversity conservation**
- **Global warming and climate change using AI**
- **e- commerce**
- **Crypto-currency**
- **Robotics & Vision**

❖**Call for papers:**

- **Full length research papers and posters invited from academicians, Industrialists, Research Scholars, UG & PG Students**
- **Authors are requested to send their original/ unpublished submissions (Abstract / Full length papers) in .doc / .docx format to sgnase2021@klesnc.org**

Guidelines for the Submission of full length paper

Guidelines for the Submission of Abstract

Accepted papers will be published in proceedings with ISSN/ ISBN

Note:

❖**Article should not exceed 15 pages, declaration of originality must be included at the end of the paper**

❖**Guidelines for Oral presentation: Time Limit of 5+2 minutes is allotted for each participant**

❖**Guidelines for Poster presentation: Poster Dimensions 3X4 feet with standard poster template**

Click Here to Conference Registration

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❖**Student & Research Scholars : Free**
❖**Faculty : ₹ 500**
❖**NRI, Administrators & Industrialists : ₹ 1000**
❖**Overseas Delegates :$15**

Publication fee extra

Important Dates

❖**Last Date for Registration : 28-10-2021**
❖**Abstract or Full paper Submission : 25-10-2021**
❖**Abstract Acceptance & Confirmation : 28-10-2021**
❖**Conference Dates**
Day – 1- Inauguration & Technical Sessions : 29-10-2021
Day – 2- Technical Sessions & Valedictory : 30-10-2021

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Indian Institute of Science, Bengaluru

Invited Technical Speaker

Prof. S.A. Shivashankar
Emeritus Professor,
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Indian Institute of Science, Bengaluru

Invited Technical Speaker

Prof. S M Shivaprasad
Director,
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Invited Technical Speaker

Dr. S. N. Omkar
Chief Research Scientist,
Department of Aerospace Engineering
Indian Institute of Science, Bengaluru

Invited Technical Speaker

Prof. Vinod V. T. Padil
Professor, Centre for Nanomaterials,
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"SUSTAINABLE GROWTH THROUGH NANO-SCIENCE AND ARTIFICIAL INTELLIGENCE FOR SAFEGUARD OF ENVIRONMENT"

(SGNASE-2021)

On 29th & 30th October 2021

Inauguration

@ 10 a.m (IST), 29th October 2021, Friday

Chief Guest
Prof. A.S. Kiran Kumar
Former Chairman, ISRO, Bengaluru
Visiting professor, Vikram Sarabhai Space Centre
Trivandrum, Kerala, India

Keynote addressee
Prof. K. J. Rao
Emeritus Professor
Solid & Structural Chemistry Unit
Indian Institute of Science, Bengaluru

President
Dr. Arunkumar B. Sonappanavar
Principal,
K.L.E. Society's S. Nijalingappa College

All are Cordially invited

Registration Link:
https://forms.gle/g4thzEPtmQMvAhsU6

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Email: sgnase2021@klesnc.org

SCHEDULE OF THE CONFERENCE

Day 1 : 29th October 2021, Friday

9a.m. -10a.m. : Registration and Breakfast		
Time	**Topics**	**Recourse person**
10:00a.m. - 10:30a.m.	Inauguration	**Prof. A.S. Kiran Kumar** Former Chairman, ISRO, Bengaluru Visiting professor, Vikram Sarabhai Space Centre, Trivandrum, Kerala, India
10:30a.m. - 11:30a.m.	Keynote Address	**Prof. K. J. Rao** Emeritus Professor, Solid & Structural Chemistry Unit Indian Institute of Science, Bengaluru
11:30 a.m. to 11:45 a.m. : Tea Break		
11:45a.m. - 12:45p.m.	Technical session 1 Some potential applications of Nanotechnology aimed at sustainability and Health care	**Prof. S.A. Shivashankar** Emeritus Professor, Centre for Nano-science and Engineering, Indian Institute of Science, Bengaluru
12:45p.m. - 01:45p.m.	Technical session 2 Drone Computing	**Dr. S. N. Omkar** Chief Research Scientist, Department of Aerospace Engineering Indian Institute of Science, Bengaluru
01:45p.m. - 02:45p.m. – Lunch Break		
02:45p.m. - 03:45p.m.	Technical session 3 Artificial Neural Network	**Prof. Mustafa Basthikodi** Department of Computer Science Sahyadri College of Engineering and Management Mangalore, Karnataka
03:45p.m. - 04:00p.m. Tea break		
04:00p.m. - 05:30p.m.	Poster presentation	**Jury members** **Dr. K. Fakruddin** Prof & HOD of Physics, Ghousia college of Engineering, Ramanagar, Karnataka Chairman, Board of studies Basic Science, VTU, Belagavi, Karnataka **Dr. B. Lakshmeesha Rao** Assistant Professor, Dept. of Physics Poornaprajna College Udupi. Karnataka,

SCHEDULE OF THE CONFERENCE

Day 2 : 30th October 2021, Saturday

Time	Topics	Recourse person
9a.m.-10p.m. : Breakfast		
10:00a.m. -11a.m.	**Technical session 4** **Tree Gum Based 'Green' and Sustainable Materials for Environmental Applications.**	**Prof. Vinod V. T. Padil** Professor, Centre for Nanomaterials, Advanced Technologies and Innovation, Technical University of Liberec, Czech Republic
11:00a.m. -12:00p.m.	**Technical session 5** **Artificial Intelligence and future of Humanity**	**Dr. Hanumanthappa M** Professor, Department of Computer Science & Applications, Bangalore University, Bengaluru, Karnataka
12p.m. - 12:15p.m. - Tea break		
12:15a.m. – 1:15a.m.	**Oral presentations**	**Session Chairpersons** **Dr. Hanumanthappa M** Professor & Chairman, Department of Computer Science & Applications, Bangalore University, Bengaluru, Karnataka **Dr. B.M. Nagabhushana** Professor & HoD of Chemistry, Vice president of LSIKC M.S. Ramaiah Institute of Technology, Bengaluru
01:15p.m. - 02:15p.m. -Lunch Break		
02:15p.m. -03:15p.m.	**Technical session 6** **The Ubiquitous nano-wall network**	**Prof. S M Shivaprasad** Director, Karnataka State Higher Education Academy,Dharwad Jawaharlal Nehru Centre for Advanced Scientific Research (JNCASR), Bengaluru
03:15 p.m. - 03:30 p.m. Tea Break		
03:30 p.m.-04:30 p.m.	**Valedictory**	**Chief Guest** **Prof. S M Shivaprasad** Director, Karnataka State Higher Education Academy,Dharwad Jawaharlal Nehru Centre for Advanced Scientific Research (JNCASR), Bengaluru

Best Paper Presentation : Certificate with Rs. 2,500/- Cash Prize
Best Poster Presentation : Certificate with Rs. 1,000/- Cash Prize

VALEDICTORY

30th October 2021, Saturday @ 03:15p.m.

Chief Guest

Prof. S. M. Shivaprasad

Director, Karnataka State Higher Education Academy, Dharwad
Jawaharlal Nehru Centre for Advanced
Scientific Research (JNCASR), Bengaluru

President

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Review of Ecological impactof increased hand soap utilization during COVID-19 pandemic

Smt. M.R. Chaya

Dept. Of Chemistry, KLES S. Nijalingappa College

Abstract:

A novel coronavirus was identified as the cause of a cluster of pneumonia cases in Wuhan, a city in the Hubei Province of China. Covid rapidly spread throughout China, resulting in a global pandemic. This Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) pandemic was partially prevented by frequent hand washing with soap as it was recommended by World Health Organisation (WHO). This made extraordinary surge in demand for hand washing products has led to environmental concerns. Therefore, the review aims to highlight the health and environmental concerns associated with the frequent use of hand washing products amid COVID-19. Synthetic petrochemical soaps are threat to the environment. Therefore the need for eco-friendly alternative hand washing productsare emphasised in this paper.In this article, several natural hand washing soaps eco-friendly alternatives to petrochemical-based soaps for hand hygiene are presented. The market for hand washing soaps is expected to grow significantly in the coming years, and hence, future research should be geared towards developing the right products.

Keywords: Coronavirus disease 2019, Biodegradable eco-friendly hand washing soap, Environmental pollution, Packaging waste, Water pollution, Sustainable solution

1. Introduction:

The epidemic coronavirus disease 2019 (COVID-19) poses severe global health challenges and adversely impacts human life quality.The World Health Organization (WHO) also declared COVID-19 as a global pandemic. This pandemic has already resulted in extreme societal, economic and political disruption worldwide[1].

Encouraging hand hygiene was one of the most cost-effective means of reducing the global burden of disease. Simple soap is one of most effective weapons against the coronavirus. Hand washing was demonstrated to reduce transmission by 45–55%[2].

The primary method of preventing infection spread in communities and healthcare facilities is washing hands with s oap and hand disinfectants..These products are most effective and affordable way to stop viruses. Hand washing with water and soap has been the "gold standard" method of eliminating most transient and resident microorganisms[3].

Synthetic soaps are also called as Syndets are substituents are natural soaps. Today Syndets dominate the market and have taken over ordinary soaps.Theyare manufactured synthetically and composed of non- biodegradable ingredients

and cause the environmental contamination. They are threat to aquatic species and pollute the water of ponds and rivers to the extent that it becomes non-usable.As soaps are complex mixtures of toxic and persistent ingredients, it is prudent to promote eco-friendly replacements.This forces us to find alternative eco sustainable hand hygiene products. Solid waste associated with these products in packaging and managing the waste is also other changeling task.

2. Chemistry of Hand washes:

Mankind has been using soap for thousands of years. Soaps are sodium or potassium salt of fatty acids, which is formed via neutralization reaction.Soaps are the products of hydrolysis of oils and fats with sodium hydroxide, or lye. This process is known as saponification. The oils or fats are hydrolysed by the lye, yielding fatty acids and glycerol. The fats and oils used to make soap are made up of triglycerides. Triglycerides are esters of glycerol with three fatty acid molecules. The other major component of soap is lye, an alkali or a base. There are two major types of lye: sodium hydroxide (NaOH, caustic soda), and potassium hydroxide (KOH, or caustic potash). Sodium hydroxide is used for making solid soap bars. Whereas potassium hydroxide utilized for making liquid soaps.

A soap molecule has a tadpole shaped structure, whose ends have different polarities. The long hydrocarbon chain is non-polar and hydrophobic, i.e., insoluble in water but oil soluble at one end. By contrast, the short polar carboxylate ion is hydrophilic, i.e., soluble in water but insoluble in oil and grease. When soap is shook with water, it becomes a colloidal soap solution.The action of agitating the solution causes foaming. This allows the soap molecules to develop a unimolecular film on the surface of water and to penetrate the skin. The hydrophobic nonpolar end of the soap molecule attracts and adheres to the surface of the water [4].

Water repellent hydrophobic tails wedge themselves into the lipid envelops of microbes and viruses In trying to avoid water, the hydrophobic tails wedge themselves into the lipid envelopes of the microbes and viruses, disrupting them and destroying them.As soap molecules cluster together, they enclose microbes and viruses, forming micelles that enclose such particles and dissolve them. Mechanical action, like rubbing or tumbling, dislodges the microbes and viruses.Excess water removes these and leaves the skin clean. Soap also disrupts the chemical bonds that allow bacteria and viruses to stick to surfaces, making them easier to wash away[5].

3. Active ingredients of hand washes:

Hand sanitizers are not so activate to remove viruses that stick to surfaces compared to hand soaps. As well as its cleaning properties, an excellent soap should offer other features, such as good lathering performance, low skin irritation, physical and chemical stability, easy risibility from skin and bathtub, homogeneous and uniform structure, and reasonable erosion rates and good resistance to cracking[6].

Hand washes are formulated from fats, petroleum, and oil-based products using a mixture of sulfonation, ethoxylation, and esterification processes[7]. A wide range of ingredients may be used to design hand wash with different characteristics of quality, odour, colour, shape, and packaging design. The three major components of hand soaps are Surfactants, Builders, and Additives. The major component of hand wash is surfactants which reduces the surface tension of the water, increases the wettability, and increases the emulsification property. Dodecyl Benzene sulphate (DDBS), Linear Alkyl Benzene Sulphate (LABS), Alcohol Ethoxylate (AE), Alkyl (or Alcohol) Ethoxy Sulphate (AES), Alkyl Sulphate (AS) and Amine Oxide are used as surfactants. Builders are used to treat the water to improve surfactant performance. Sodium Lauryl Sulfate(SLS) and Sodium Tri poly phosphate(STPP**)** are used as foam

booster.Liquid soaps require five times more energy to produce as they require bleaches, bleach activators, antistatic agents, fabric softeners, optical brighteners, anti-desorption agents, and fillers

.**4. Comparison of natural and synthetic hand washes:**

Based on the ingredients, chemical composition, hand washes are categorized into two broad groupings: natural and synthetic. Natural hand wash does not cause pollution as it can be digested by certain bacteria present in the sewage water.Natural hand wash primarily contains oils and fats which were originating from plants or animals without any additional components.Most natural hand wash are more ecofriendly and they do not produce toxic waste and byproducts, and they use less energy during production; therefore, they are more environmentally friendly.Synthetic soaps containsynthetic surfactants, plasticizers, binders, dyestuffs, fragrances, and other additives. Bacteria present in the sewage water are not able to degrade synthetic components and hence cause pollution. This is due to surfactants used in the production of Synthetic soaps.

5. Threat to Environment:

Hand washing habits increased significantly since the COVID-19 outbreak since nodrugs or vaccines available, non-pharmaceutical intervention like handwashing was recommended as the first line of protection against COVID-19[8,9].For preventing Coronavirus spread, hand washing is a vital public health measure recommended by WHO. The coronavirus outbreak has led to an unprecedented impact on hand soap markets globally. Significant increase in consumption of hand washes as cleaning products during the COVID-19.Google searches for “washing hands” have increased indicating the need for public information and guidelines related to hand hygiene[10]. The pandemic has also spurred people to stockpile and panic buy hand soaps.

Synthetic soaps containsynthetic surfactants, plasticizers, binders, dyestuffs, fragrances, and other additives. Bacteria present in the sewage water are not able to degrade synthetic components and hence cause pollution. This is due to surfactants used in the production of Synthetic soaps. Most of the residual surfactants are eliminated through sewage systems or directly into surface waters after use, and they end up dispersed in different environmental compartments such as soil, water and sediment.Chemical soaps are resistant to biological action and their elimination from sewage waste water by usual treatment presents a problem. They tend to produce stable foams in rivers, which may pose a threat to aquatic life.Theyforms an enclosing effect around organic substances present in waste water, inhibiting their oxidation.

Synthetic soapcontains approximately 35% to 75% phosphate salts. Phosphates are used as builders as they easily removed the hard water ions present in water. Phosphates can cause a variety of water pollution problems. Phosphate tends to inhibit the biodegradation of organic substances. Algae love to eat phosphates. High concentration of phosphate resulting from nitrification can lead to Eutrophication. During eutrophication is the growth of algae in the lake increases. Algae consume all the nutrients in the water and choke off the pond or stream so that no light can reach the bottom. This kills all the plants and fish in the pond or stream.

According to WHO, each person should wash hands at least five times per day, each time for almost 20–30s. If the tap is closed, a single hand washing with rubbing soap consumes almost 2 litres of water, and this amount can reach 4 litres when the tap is kept open. During use of liquid soaps the entire amount (100%) of product chemical ingredients are disposed down the drain with the wastewater. The substantial water consumption can lead to an increase in

wastewater generation by 15-18%, which reduces water quality because the wastewater is contaminated with soap surfactants.

When water is discharged directly into freshwater bodies without treatment, it might contaminate the environment and harm human health. This situation poses problems during wastewater treatment.[11]. Emission of loads chemical ingredients to the aquatic environment leads to Eco toxicological impacts. Waste water purification plants operating primary and secondary treatment with subsequent phosphate elimination and sludge incineration by applying chemical-specific elimination to the freshwater environment. Waste water parameters, such as total organic carbon (TOC), total nitrogen, total phosphorous, and total sulphur also impact on environment.

The additional ingredients such as antibacterial and antifungal agents, such as triclosan (TCS), triclocarban (TCC), fragrances, and preservatives, used in hand wash products result in severe health concerns for humans and the ecosystem. Disposal of these chemical elements contaminates the aquatic environment.

Packaging disposal is another major threat to the environment.Packaging is necessary to avoid product leakage, to ensure safe use, to protect products during transport. The Central Pollution Control Board reported in 2013 that approximately eight million tonnes of plastic are consumed annually. Furthermore, nearly 70 percent of plastic packaging is transformed into waste.As a result, it becomes part of the annual plastic waste production of 5.6 million tonnes.The environmental impact of liquid soaps and their associated packaging includes carbon footprint, Eco toxicity, ozone depletion potential, and eutrophication potential. Primary packaging used for hand washes consists of PET bottles, LDPE plastic bags and bottles. Secondary and tertiary packaging materials such as corrugated board and polyethylene film required for product handling and distribution were additionally considered. The liquid soaps are additionally offered as refill products. Refill packages of liquid soap consist of plastic stand-up pouches produced from PET (15%) and LDPE (85%).From raw material production to packaging production, liquid soaps use five times more energy than bar soaps.All packaging materials, including the total amount of plastic, paper and cardboard packaging were assumed to be combusted in a solid waste plant which will incinerate or remain as landfilling. Packaging needs to be collected and disposed of properly in order to be recycled properly and to avoid adverse environmental impacts.As the COVID-19 pandemic has drastically alter waste recycling activities, eco-friendly management and handling of packaging waste can help address the challenge faced by the waste management industry[12].

Life-cycle impact assessment of these products influences on energy consumption. Cumulative fossil energy demand (CED fossil) is the total amount of power used in extracting, manufacturing, using, and disposing fossil fuels. Thus, this primary energy indicator encompasses fossil feedstock, all process energy needed within the entire production chain, and packaging supply chain, as well as grey energy embodied in plant infrastructure.

6. A sustainable solution: Biodegradable hand soap:

Soap is the most widely used surfactant during the covid-19. Increased synthetic hand washing has led to the release and accumulation of potentially toxic components into the environment. These soaps are categorized into two broad groupings: Natural and Synthetic. The difference between them is not in their washing ability but in their production either from natural oils and fats or from petrochemical[13]. Natural soap is considered to have a natural origin if its

formulas comprise vegetable oils and animal fats. Synthetic soap is mainly petroleum-based hardly biodegradable, and has a high aquatic toxicity potential[14].

Considering all the above facts about synthetic soap based products there isnecessary to find alternatives for producing more sustainable and safer soaps that are made from natural materials and can decompose over time. Since biodegradable soaps are made of natural materials, they will naturally decompose over time. need to find alternative solutions for producing more sustainable and safer soaps that entail a minimum environmental impact and can be formulated with biodegradable materials. Since biodegradable soaps are made of natural materials, they will naturally decompose over time. Therefore, these soaps are an optimal alternative to synthetic soaps for their selectivity, structural diversity, good performance in extreme conditions, mass production potential via fermentation, environmentally-friendly nature[15]. Bio surfactants are safe and obtained from plant resources, spices, vegetables, culinary herbs, and agro-industry by-products of oil seeds and fruits, containing high levels of phenolics and other active ingredients. This makes them a good option in pharmaceutical and biomedical domains[16].

7. Conclusion:

Industries should gradually move toward developing sustainable hygiene products with the focus on natural and non-synthetic chemicals, biodegradable and non-toxic ingredients, natural compounds for antimicrobial purposes, and reusable and recyclable packaging materials. For the production of soaps and soap packaging, industry and research organizations need to find eco- and economically sustainable materials that significantly reduce the environmental impacts and decrease the risk of hazardous waste entering the wastewater system.

References:

1. Zambrano-Monserrate M.A., Ruano M.A., Sanchez-Alcalde L. Indirect effects of COVID-19 on the environment. Sci. Total Environ. 2020;728
2. Teymourian T., Teymoorian T., Kowsari E., Ramakrishna S. Challenges, strategies, and recommendations for the huge surge in plastic and medical waste during the global COVID-19 pandemic with circular economy approach. Mater. Circ. Econ. 2021;3(1):1–14.
3. Jefferson T., Del Mar C., Dooley L., Ferroni E., Al-Ansary L.A., Bawazeer G.A., Van Driel M.L., Foxlee R., Rivetti A. Physical interventions to interrupt or reduce the spread of respiratory viruses: systematic review. Bmj. 2009;339
4. Foddai A.C., Grant I.R., Dean M. Efficacy of instant hand sanitizers against foodborne pathogens compared with hand washing with soap and water in food preparation settings: a systematic review. J. Food Prot. 2016;79(6):1040–1054.
5. Schmidt C.W. Lack of Handwashing access: a widespread deficiency in the age of COVID-19. Environ. Health Perspect. 2020;128(6)
6. Chemistry, formulation, and performance of Syndet and combo bars Soap Manufacturing Technology, Elsevier (2016), pp. 73-106
7. Personal cleanser technology and clinical performance Dermatol. Ther., 17 (2004), pp. 35-42
8. WHO (World Health Organization) (2020b) Basic protective measures against the new coronavirus. https://www.who.int/emergencies/diseases/novel-coronavirus-2019/advice-for-public. Accessed 14 Sep 2020.
9. WHO (World Health Organization) & UNICEF (United Nations Children's Fund) (2020) Water, sanitation, hygiene and waste management for the COVID-19 virus: interim guidance, 19 March 2020. World Health Organization. https://apps.who.int/iris/handle/10665/331499 License: CC BY-NC-SA 3.0 IGO. Accessed 20 Sep 2020

10. Lin Y-H, Liu C-H, Chiu Y-C (2020) Google searches for the keywords of "wash hands" predicts the speed of national spread of COVID-19 outbreak among 21 countries. Brain BehavImmun 87:30–32. https://doi.org/10.1016/j.bbi.2020.04.020
11. D.M. JuelaQuintuña Estimated Impact of COVID-19 on Water Needs and Volume and Quality of Wastewater Available at SSRN 3651551(2020)Google Scholar
12. M. Ragazzi, E.C. Rada, M. Schiavon Municipal solid waste management during the SARS-COVID-2 outbreak and lockdown ease: lessons from ItalySci. Total Environ., 745 (2020), Article 141159
13. R. Tesser, R. Vitiello, V. Russo, R. Turco, M. Di Serio, L. Lin, C. Li Oleochemistry products, Industrial Oil Plant, Springer (2020), pp. 201-268
14. M. Deleu, M. Paquot From renewable vegetables resources to microorganisms: new trends in surfactants ComptesRendusChimie, 7 (6–7) (2004), pp. 641-646
15. K.V. Sajna, R. Höfer, R.K. Sukumaran, L.D. Gottumukkala, A. PandeyWhite biotechnology in biosurfactants Industrial Biorefineries& White Biotechnology, Elsevier (2015), pp. 499-521
16. O. Adigun, C. Manful, N. Prieto
Vidal, A. Mumtaz, T.H. Pham, P. Stewart, M. Nadeem, D. Keough, R. Thomas Use of natural antioxidants from newfoundland wild berries to improve the shelf life of natural herbal soaps
Antioxidants, 8 (11) (2019), p. 536

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Renewable Energies

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Abstract: *As a result of ongoing concerns about climate change, renewable energy sources have become an important part of the global energy consumption portfolio. By replacing fossil fuels in the power generating and transportation sectors, renewable energy solutions could cut CO2 emissions. Because conventional energy production has some negative and irreversible externalities, it is vital to develop and promote renewable energy supply technologies and demand. To reduce the unit cost of generation, power generation from renewable energy sources should be enhanced. Economic progress, population, energy pricing, weather, and technology are all elements that influence energy usage.*

Keywords: *Renewable Energy, Smart Energy, Marine Energy, Biofuels.*

I. Introduction

Renewable energy is useful energy that is replenished spontaneously but has a limited flow. They have an almost limitless lifespan. Natural phenomena such as sunshine, wind, tides, plant growth, and geothermal heat are all examples of renewable energy flows. While harnessing nature's power is typically considered of as a novel technology, it has long been used for heating, transportation, lighting, and other purposes. Wind has propelled ships across the oceans and mills that process grain. The sun has provided warmth throughout the day and has assisted in the lighting of fires that have lasted well into the evening. However, during the last 500 years or more, mankind have increasingly turned to dirtier, cheaper energy sources like coal and fracking gas. Renewables are becoming a more important power source, accounting for more than one-eighth of US generation now that we have more imaginative and less expensive ways to catch and keep wind and solar energy. The expansion in renewables is also happening at scales large and small, from rooftop solar panels on homes that can sell power back to the grid to giant offshore wind farms.

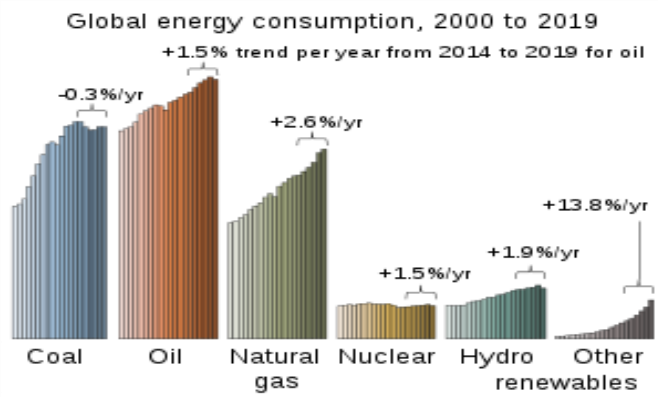
II. Renewable Energy

Renewable energy is energy produced from natural processes that is perpetually replenished. It comes straight from the sun or from heat generated deep within the earth in numerous sources. Solar, wind, ocean, hydropower, biomass, geothermal resources, biofuels, and hydrogen derived from renewable resources all contribute to the generation of energy and heat.

Rapid implementation of renewable energy and energy efficiency, as well as technological diversification of energy sources, would provide major energy security and economic benefits. It also plays an important role in reducing environmental pollution, such as air pollution caused by the burning of fossil fuels, as well as improving public health, reducing premature mortality as a result of pollution, and reducing associated health costs, which total several hundred billion dollars annually in the United States alone. According to the International Renewable Energy Agency, renewables' overall share of the energy mix (which includes power,

heat, and transportation) must grow six times faster by 2019 to keep global average temperatures "well below" 2.0 °C (3.6 °F) during the current century, compared to pre-industrial levels.

The graph below shows the level of global energy consumption from 2000 to 2019

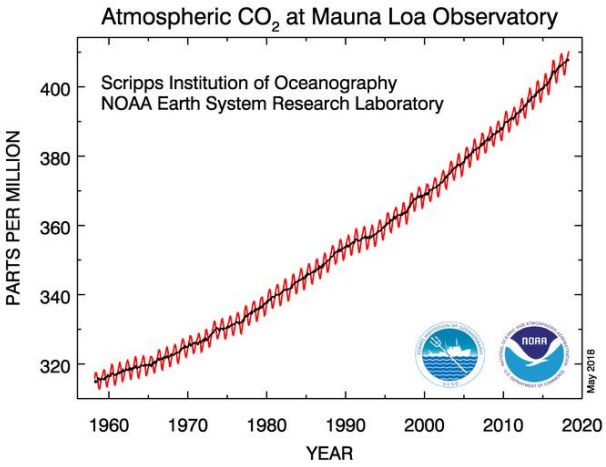


Coal, oil, and natural gas remain the primary global energy sources even as renewables have begun rapidly increasing.

Renewable energy often displaces conventional fuels in four areas namely,

1. Electricity generation.
2. Hot water/space heating.
3. Transportation.
4. Rural (off-grid) energy services.

WHY DO WE NEED RENEWABLE ENERGY
CO2 is at 407ppm (Oct 2018) increased by 90ppm in the last 70 years
Global warming ~1.1°C in the past 200 years
Ocean acidification
Rising sea level ~3.2mm each year
Decreasing ice sheet mass
Retreating glaciers
Decreasing Arctic ice at a rate of 13% each decade

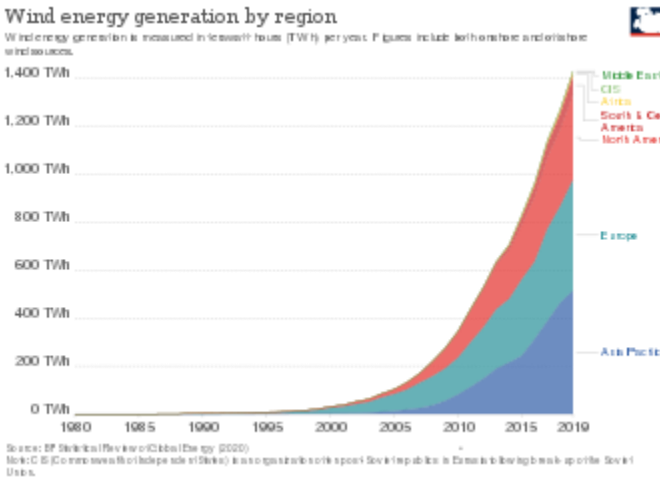


III. Types of Renewable Energy

The most popular renewable energy sources currently are:

1. Solar energy: For thousands of years, humans have used sun energy to raise crops, remain warm, and dry foods. "More energy from the sun falls on the earth in one hour than is used by everyone on the planet in a year," according to the National Renewable Energy Laboratory. The sun's rays are now used in a variety of ways, including to heat houses and businesses, to warm water, and to power electronics. Depending on how they capture, convert, and distribute solar energy, solar technologies are classified as either passive or active solar.

2. Wind energy: Wind turbines can be powered by air flow. The rated power of modern utility-scale wind turbines ranges from 600 kW to 9 MW. Wind farms are best built in areas with stronger and more consistent winds, such as offshore and high-altitude sites.



3. Hydro energy: Hydropower is the largest renewable energy source for electricity in the United States, though wind energy is soon expected to take over the lead. Hydropower relies on water typically fast-moving water in a large river or rapidly descending water from a high point and converts the force of that water into electricity by spinning a generator's turbine blades.

4. Geothermal energy: Thermal energy is generated and stored in the Earth to produce high-temperature geothermal energy. The energy that determines the temperature of matter is known as thermal energy. Earth's geothermal energy comes from both the planet's creation and the radioactive decay of minerals. The geothermal gradient, which is the temperature differential between the planet's core and its surface, drives a continual flow of thermal energy from the core to the surface in the form of heat.

5. Biomass energy: Biological material derived from living or recently living organisms is referred to as biomass. It usually refers to lignocellulosic biomass, which is made up of plants or plant-derived compounds. Biomass can be used as an energy source either directly, by burning it to produce heat, or indirectly, by converting it to various forms of biofuel. The conversion of biomass to biofuel can be accomplished using a variety of processes, which can be divided into three categories: thermal, chemical, and biochemical.

IV. Emerging Technologies

Smart energy

Smart energy means intelligent technology in energy related areas such as energy generation, storage of energy, distribution of energy and energy consumption. These seek to maximize the efficiency of the energy sector by focusing on renewable energy sources that are eco-friendly and drives down costs.

Marine energy

The energy conveyed by ocean waves, tides, salinity, and temperature changes is referred to as marine energy (also called ocean energy).

The kinetic energy, or energy in motion, created by the movement of water in the world's oceans is enormous. This energy may be used to generate electricity, which can be used to power homes, transportation, and industry.

Wave power (power generated by surface waves) and tidal power are both included in the term "marine energy" (obtained from the kinetic energy of large bodies of moving water).

V. Key Takeaways

- Using the renewable resources offers many opportunities to make our planet a better place.
- To face challenges such as combat climate change, we need renewable energy system to make energy distribution, storage and management more efficient.

- Renewable energy offers great flexibility to balance energy supply and demand.
- They are less reliant on foreign energy sources and inflates economic development and has high growth market also resulting in creating new jobs.

VI. Downsides

- Renewables are not accessible always, which is sometimes difficult to match supply and the demand.
- Requires large sum of initial capital investment.
- Rare metals such as tellurium are important for renewable energy technologies such as solar panels.
- Disrupted energy supply due to intermittency.

VII. Conclusion

Over the last fifteen years, the renewable energy sector has undergone extraordinary growth. The role of renewable energy in guaranteeing supply security, addressing climate change, meeting rising energy demand responsibly, encouraging economic growth, and industrial policy challenges are among the reasons for this.

Wind, solar, geothermal, hydroelectric, and biofuels are all important renewable energy sources. No energy resource is ideal; each has its own set of advantages and disadvantages. Renewable energy resources are essential for reducing CO2 emissions and ensuring a safe energy future. Climate change mitigation requires the use of renewable energy.

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E-COMMERCE USING DRONES

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Abstract

E-commerce companies have become very popular in India and the industry is growing at a good rate. E-commerce has many issues like delay in product deliveries, were due to this many customers are stepping back from using e-commerce. The e-commerce companies are finding different ways in solving this issue using many technologies. One such technology is using drones for delivering products. This involves delivering packages with a UAV (unmanned aerial vehicle) that is remotely controlled. Drones give online retailers a fast, affordable and simple delivery solution that also benefits customers. This article includes definition of e-commerce, problems of e-commerce, e-commerce using UAV, and their advantages and disadvantages.

I.Introduction

The impact of E-commerce is phenomenal, the number of consumers purchasing online has increased gradually with the increased use of internet. Customers are busy now-a-days to go to market and purchase goods. E-commerce has made their life more easy and convenient. Companies have a powerful search engine that shows hundreds of product matching the customer needs. The need for e-commerce has become more than essential now. E-commerce has become a part of our daily lives, more and more people now order food, clothes, groceries, home appliances and much more in online using e-commerce. Moreover the use of net banking, credit cards, UPI payments and other online transactions is increasing day by day.

Consumer behavior is changing rapidly as they are empowered, connected and expect an unprecedented level of service and convenience. Many enterprises have been making incredible efforts to reach customer's expectation and willing to make proper engagement with the great customer's

satisfaction. More than half of the world's population that is 4.5 billion people have access to internet. The era of internet and technology has made a huge evolution in E-Commerce market. In the early years, drone technology was mainly used in the fields of security, research, photography and communication. As this technology advances, more uses come to light. Perhaps the most important new use is in retail delivery. For online retailers drone package delivery has become far easier and faster to deliver orders in right time to the customers.

II. What is E - Commerce?

E-Commerce is also known as electronic commerce. It refers to the purchase and sale of goods online or via the internet or the transmitting of funds or data, over an electric network, predominantly the internet. E-Commerce is a paradigm shift influencing both markets and customers.

III. Types of E – Commerce

1) Business to Business (B2B)

In a B2B business model, e – commerce encompasses all electronic transactions of goods or services conducted between companies. Companies doing business with each other such that the manufactures sell the goods to distributors and wholesalers selling it to the retailers. Pricing is based on the number of orders and negotiable.

2) Business to Consumer (B2C)

In B2C model is the most common business model. Businesses selling their products to the consumers typically through catalogs utilizing shopping cart software in which a business sells products directly to the consumer over the internet. The decision making process for a B2C purchase is much shorter than a B2B.

3) Consumer to Business (C2B)

In Consumer to Business involves consumer selling products to business. A consumer posts his project with a set budget online and within hours companies review the customer's requirements and bid on the project. There is a complete reversal of the traditional sense of exchanging goods. This type of e – commerce is very common in crowd sourcing based projects.

4) Consumer to Consumer (C2C)

In Consumer to Consumer type e – commerce encompasses all electronic transaction of goods or services conducted between consumers (one consumer sells goods and services to other consumer). Generally these transactions are conducted through a third party, which provides the online platform where the transactions are actually carried.

IV. Characteristics of E – Commerce

- It establish the relationship between Business to Business
- All the payment process are done using electronic devices and service of payment are done in electronic devices such as Paypal.
- Distribution of product and services are done to customers through electronic way by using database.
- E – Commerce is a process in which it automatically responds to the customer and the process will run automatically to database.

V. Existing System

The main goal of e-commerce is earning profits. E-commerce implies a virtual store where visitors come to the store, pick the products of their choice, and become customers by purchasing them. The online e-commerce business has opened businesses of all kinds. All businesses can now sell online with the right use of resources. Consumers can purchase online from anywhere at any time using your e-commerce. People have stopped using e-commerce because of some issues. The biggest problem in e-commerce is that product deliveries are often delayed when there's a surge in e-commerce shopping.

For instance, the COVID-19 pandemic has been both a blessing and a curse to e-commerce retailers. On one hand, e-commerce increases sales and returns on revenue for retailers. On the other hand, however, it met a huge growth in orders for many online retailers, causing massive order processing and shipping delays. According to digital commerce, retailers are taking about 1.5 days longer than average to fulfill orders because they are not well equipped to scale the massive delivery volumes that come with the pandemic-induced peak season. The other reason for the delay in delivery of the product is products must be transported from one place to another place. This process takes time. The other issue is that delivery of wrong product, which means the product is shown on its web sometimes differs from the original product, due to which next that customer goes to buy the product through the traditional type of stores.

Disadvantages of existing system

- Product Deliveries are delayed.
- Wrong product delivery.

Ⅵ. Proposed system

We can use the current technology to overcome the problems of an existing system. E-commerce companies can use flying drones operated by a pilot. This involves delivering packages with UAV (unmanned aerial vehicle) that is remotely controlled. And retailers must be responsible in delivering the accurate product to the customers without any confusions. Drones would take service to an all-new High Level with faster and Hassle-free deliveries. Drones will be owned and operated by the retailers themselves and will not be dependent on third-party carriers to deliver products. Thus, customers will have their products delivered to their doorstep faster which will help improve customer experience. Delivering products using drones is surely a big deal for companies. Delivery drones are Quadcopters that are capable of delivering packages. It features a two-propeller system that allows for vertical takeoff as well as horizontal travel. They are currently being tested against the strict regulations governing the use of drones against populated areas. This delivery method is especially useful for small packages. Things like books, documents, medicine, and food items can be delivered with no problem. Currently small packages being delivered within a small area can be delivered faster, quicker and at lower costs by using drones instead of trucks. The packages between 0.5kgs to 8kgs that are being delivered within a 5km radius. The working of drones for delivering packages has been implemented by several companies such as Amazon, Wal-Mart, and Google. “Sense and avoid technology “, this technology will automatically allow the drones to fly safely around obstacles and other aircraft on their own. Using these commercial drones will be cheaper and faster than using any other traditional delivery method. Although there are a lot of challenges to be worked out, being able to deliver the parcel within 30 minutes. Drones will have limitations when it comes to complicated addresses as they cannot enter into corridors or narrow lanes as they are configured to follow pre-defined paths. So this affects the doorstep delivery strategy significantly and retailers will have to think of strategies to tackle this complex issue to ensure even customer service levels. Demonstration of experiments has already been at major e-commerce delivery such as Amazon. The future of drones flying overhead for delivering packages should not belong. There are several issues to be solved, but it is expected that it will solve the shortage of drivers. Drones can be safer when you consider that most accidents occur due to human factors. Automation of production and supply chains is the main goal of using drones. Drones is the most effective method of delivery. I believe that drones are going to revolutionize the e-commerce industry.

Advantages of using drones in e-commerce

- They can deliver the packages quickly and correctly to any location.
- It improves time management.
- Delivery drones are safer for delivery system.

Disadvantages of using drones in e-commerce

- The biggest drawback of drones is their weight and distance limitations.
- Drones are expensive devices
- Flying drones are prohibited in red zone areas.
- Using of drones can also affect the birds while delivering the package.
- The battery (lithium ion) used in common drones cannot last a half an hour trip when carrying packages.
- It requires skilled person to create a technology where programming can replace a human operator because the cost of purchasing automatic delivery drones is cheaper than training pilots.
- It creates a risk of damage during deliveries. There is a risk that the drones can be stolen.
- This would decrease job opportunities for uneducated workers.

The conclusion

Drones are destined to change the future of logistics and e-commerce. Drones give online retailers a fast, affordable and simple delivery solution that also benefits customers. In fact, drones are expected to increase e-commerce revenue by almost 25% over the next decade with deliveries costing less amount and being received in 30 minutes. It's clear that drones will have a huge impact on e-commerce delivery. Buyers can feel confident in placing higher-value orders while retailers can take advantage of cheaper delivery rates. As a result, drones can increase impulse purchases. Buyers will love being able to order an item and receive it in less than one hour.

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Artificial Intelligence for Bio-diversity Conservation

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Abstract: *With the growing public interest in artificial intelligence (AI), there is a growing need to learn more about the societal benefits that AI may provide. This study focuses on AI breakthroughs that aid animal detection and counting, detecting poachers in order to conserve animals, identifying waste materials in the ocean, annotation for animal recognition, annotation for animal counting, and annotation for animal poachers detection.*

I. Introduction

AI has the potential to play a critical role in identifying, recognising, and tracking wild animals moving in their natural habitats or in wildlife sanctuaries. Most importantly, AI has the potential to help save endangered plants and animals from extinction. With cameras traps and other passive sensors, we know have technology that collect information, no matter what. It is too late.

Wildlife insights is a response to there barriers that AI cloud based enabled platforms.

The application of AI which is used to detect and classify chunks of audio recordings where this could be used to classify a certain animal or to listen for gunshots.

- There have been six times in the history of life on earth where there have been extension.
- If you walk through forest you will essentially miss 90% of the animals that are there.

II. What role does AI play in animal conservation?

We don't know how many African elephants are there and how fast are they lost to poaching? How far do the whales go and how turtles survive to adulthood? Existing animal monitoring systems are either unable to expand internationally or fine-scale data is frequently unavailable to authorities. Traditional researchers, for example, labour arduously to do manual chores such as identifying specific animals from video traps for population studies. These camera photographs are also carefully categorised with more work and time. Artificial Intelligence (AI) and Machine Learning (ML), for example, operated more efficiently and produced better outcomes. The full integration of AI and machine learning-based solutions in wildlife conservation can aid in the preservation of the planet's biodiversity. Animal conservation is progressing in its efforts to preserve the planet's biodiversity. AI has the potential to help save endangered flora and animals from extinction. AI also plays a critical part in identifying or recognising wild animals straying into their green forest or being conserved in wildlife sanctuaries, as well as keeping track of them. Importantly, endangered

animals can be spared from natural calamities like forest fires, floods, and illegal activities like poaching if they are maintained in AI traps or watched by forest rangers.

III. Animal Detection & Counting with AI

Endangered creatures on the verge of extinction are cared for in a specific way. Machine learning is used in conjunction with an AI machine database or a drone image dataset to keep track of animals, assisting wildlife conservation agencies in maintaining their population under surveillance.

AI can count anything it has been taught to recognise, from elephants to icebergs. People are confined to boxes. From drones to satellites, microscopes to security cameras, AI can interpret data from any camera.

With the AI platform, AI can now be swiftly trained and deployed to count anything. The AI model accurately detected an elephant and a horse and was able to detect a zebra pigeon as a bird, a deer as a dog, and occasionally as a horse. The model correctly spotted an elephant and a horse, however the leavens was detected as a dog. Given that the model had never been trained to defect a deer and a lioness, I would think that the model came quite close by labelling them as dog. It's similar to how AI works with children because they have never seen a deer or a lioness. AI can now assist in the management of such tasks.

IV. Detecting Poachers to Save Animals

Another illegal activity that reduces the population of endangered species is intensively murdering the animals. Poachers kill elephants, rhinos, and other creatures and sell them for a high price in the market. These illicit actions are monitored by a system that does not require human intervention. Humans with guns and other illicit items can be easily detected using AI-enabled cameras with quick alert systems. There is also a terrific possibility for wildlife species with intelligent visibility from the sky.

Thousands of animals are poached each year, and their parts are sold for jewellery, medicine decorations, and meal. So animals, particularly elephants, require round-the-clock security. The most important thing we can do is to be aware of where various items originate.

High-quality training datasets are needed to train the machine learning algorithms so that drones can recognise a variety of species.

V. Identifying the Waste Materials in the Ocean

From space, our ocean appears pristine clean, but this is not due to people enjoying the beach, but rather to litter, waste material near the ocean's banks, poorly controlled waste sites, illegal damping, and mishandled waste from population centres, tourism, industrial, and agricultural activities, which account for an estimated 8 million metric tonnes of ocean. However, artificial intelligence algorithms can quickly detect and eliminate plastics from natural areas before they affect species. Drones detect floating or drowning objects in the sea, allowing the marine animal protection organisation to collect and remove such garbage. Plastic is toxic to living things and harbours invasive species, putting biodiversity and ecosystems at risk. To calculate the risk associated with plastic pollution, a better understanding of littering sources, distribution, and decomposition of plastic in seas is required. The ocean is in serious jeopardy. According to a credible projection, by the year 2050, there will be as much plastic as there is today. However, identifying and removing plastics from the water is a difficult task. However, thanks to enhanced AI-enabled cameras and drones, getting data on marine waste has gotten much easier. The AI model has been specifically trained to distinguish the many types of waste items that end up in the ocean. Hereby, people must use cloth bags instead of plastic bags.

VI. Annotation for Animal Recognition

Annotation technique is a semantic segmentation of an image that aids in the recognition of animals belonging to a single class. AI Drones can recognise such species caught in a single frame, making it easier for the forest wildlife conservation agency to identify them.

Cogito develops and produces high-quality training data sets for machine learning to train AI models.

VII. Annotation for Animal Counting

Comprehending wild animals is another difficult undertaking, especially when they are in their native habitat. Without any human interaction, AI can readily discover such animals and count them in order to maintain track of their number.

VIII. Annotation for Poachers Detection

Animals on the verge of extinction can be saved if the wildlife conservation department can discover illicit killings using AI-enabled security surveillance mounted at suspect sites. Night vision detection is also possible with AI security cameras.

IX. Conclusion

If AI can be fully and effectively applied to animal conservation, it can aid in the preservation of the planet's biodiversity. AI models can only be taught with the correct machine learning datasets. "Animal detection dataset for AI" was created to produce such a fully functional model.

The application of artificial intelligence (AI) to biodiversity conservation, which aids in the prevention of biodiversity extinction and hence the maintenance of a balanced biodiversity. With the help of technology such as

*Animal detection and counting.

* detecting poachers to save animals.

*Annotation for animal recognition

* Use of footprint identification.

The ideal data labelling procedure for generating datasets for computer vision-based AI models is image annotation. As more data is fed into the algorithms, the model will be able to learn from a variety of scenarios and recognise various unlawful weapons or objects, allowing it to make accurate predictions in real life.

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A Secure Hashing Approach using CBC Mode

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Abstract: *This study focuses on the importance of cryptography in the information security system and discusses some of the cryptography approaches. Previously, encryption was primarily employed to secure military information, diplomatic correspondence, and national security. However, the number of users is restricted. In today's world, cryptography is frequently discussed in terms of communication, e-commerce security, and so on. Cryptography is used to send messages in a secure manner, ensuring that no errors occur between transmissions.*

Keywords: *Security, Hashing, Encryption, Cryptography, CBC.*

I. Introduction

The art and science of keeping messages secure is known as cryptography. Cryptography is the study of the methods for communicating and storing data in a secure and private manner without being intercepted by third parties. Cryptography is a set of secure communication techniques that restrict access to a message's contents to only the sender and intended receiver. The name "cryptography" comes from the Greek word "kryptos," which meaning "hidden." People nowadays utilise cryptography to safeguard and defend their privacy on a daily basis without even realising it (for example, bank transactions, internet logins, e-commerce transactions, and so on). There are a variety of cryptography algorithms to choose from. However, this is based on the number of keys needed for encryption and decryption. The process of changing plain text (readable form) to cyphertext is known as encryption (unreadable form). Encryption is the process of encrypting data so that only those with the ability to restore it to its original condition can read it. It is an essential feature of a secure and reliable internet. It contributes to the protection of sensitive data.

Encryption [5-6] is a technique for securing data kept on computers and data exchanged through computer networks, such as the internet. Encryption is frequently used to increase the security of financial transactions and private messaging chats. The process of turning cypher text back to plain text is known as decryption. Decryption is the process of restoring the unencrypted state of data that has been rendered unreadable by encryption. The system extracts and converts the uncleared data into sentences and visuals that are intelligible not only by the reader but also by the system during decryption.

Components of Cryptography

- Plaintext - This is the data that needs to be protected.
- Encryption algorithm - This is mathematical algorithm that takes plaintext as the input and returns ciphertext.
- Ciphertext - This is the encrypted or unreadable version of the plaintext.

Goals and Services

Cryptography's main purpose is to protect sensitive data on a hard drive or as it travels across a media that may or may not be secure. The most common media is a computer network. The following services can be provided via cryptography:

- Confidentiality
- Integrity
- Authentication
- Non-repudiation

II. Existing System

The secure hash algorithm refers to a set of cryptographic hash functions issued by the National Institute of Standards and Technology (NIST) as a federal information processing standard in the United States (FIPS).

The Secure Hash Algorithm (SHA) is a series of cryptographic functions that are used to keep data secure. It operates by altering data using a hash function, which is a bitwise operations, modular additions, and compression functions-based method. The hash function then generates a fixed-length string that bears no resemblance to the original. These algorithms are one-way functions, which means that it's nearly impossible to change them back into their original data once they've been transformed into their hash values. SHA-1, SHA-2, and SHA-3 are three algorithms of interest, each of which was built with increasingly stronger encryption in response to hacker attempts.

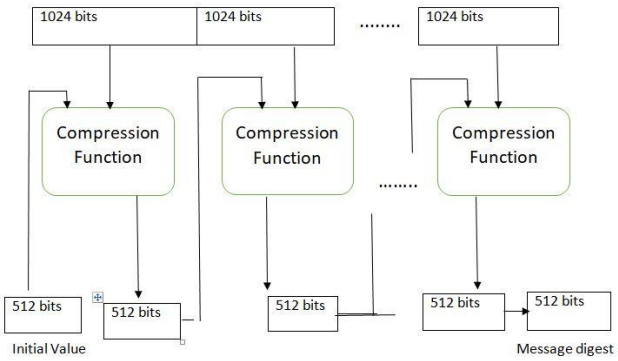

Fig-1 : SHA-512

SHA-512 is a variation of SHA with a message digest of 512 bits. From a multiple block message, SHA-512 generates a 512-bit digest. Each block has a length of 1024 bits. The digest is set to a value of 512 bits at the start. The algorithm creates the first intermediate message digests of 512 bits by combining this initial value with the first block of the message. To make the second intermediate digest, the digest is blended with the second block. Finally, the nth digest is created by combining the (N-1st digest with the nth block. Each block of the message consists of 64 bits words. Message digest has 8 words each of 64 bits.

III. Proposed System

For additional security and energy efficiency, the enhanced suggested solution uses the CBC mode of operation [1-4], in which plaintext is divided and XORed with the initialization vector (IV) before being submitted to the encryption process with a key. We get cypher text blocks after all the plaintext blocks have been executed. These blocks of ciphertext will be concatenated and delivered to the SHA function as input.

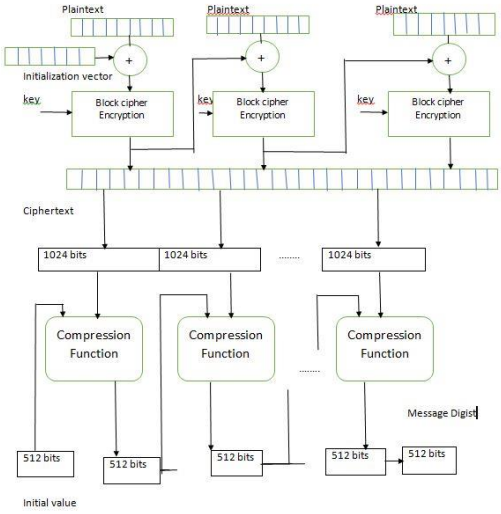

Fig-2 : Enhanced SHA-512

Each input block should be fewer than 1024 bits and is broken into 512-bit blocks. It is initialised for each cypher that generates the ciphertext and is used to encrypt the first block. After being compressed with the previous cypher key and the plaintext block, the resulting ciphertext becomes the cypher key for the following block. After the last compression operation, the message Digest is the final 512-bit ciphertext.

IV. Conclusion

This paper provides how Cryptography is used to achieve few goals like Confidentiality, Data integrity, Authentication etc, of the sent data. Now, in order to achieve these goals various cryptographic algorithms are developed by various people. For a very minimal amount of data those are not designed for small amount of

data. A single algorithm is used for both encryption and decryption i.e. it is fallen under secret key cryptography algorithm. But as public key cryptography is more secured then secret key algorithm. It is hard to say that any one is better than the others; it depends upon your application. One of the biggest and fastest growing applications of cryptography today is electronic commerce (e-commerce).

V. REFERENCES

[1] "Recommendation for block cipher modes of Operation methods and techniques" Evans DL, Bond PJ, Bement AL, Dworkin M. USA: NIST Special Publication; 2001. pp. 800–83.

[2]"Block Cipher Chaining Modes of Operation" Knudsen LR. 2000 Oct.

[3] "Counter Chain: A New Block Cipher Mode of Operation, Journal of Information Processing Systems" El-Semary AM, Azim MMA. Information Journal of Process Systems. 2015; 11(2):266–79.

[4]"Cipher Block Chaining Mode Using AES" Pavan A. C, Shweta. S. Magadum - International Journal of Innovative Science and Research Technology, Volume 5, Issue 3, March – 2020, ISSN No:-2456-2165

[5] "Implementation of Advanced Encryption Standard" by M. Pitchaiah, Philemon Daniel, Praveen, — in International Journal of Scientific & Engineering Research Volume 3, Issue 3, March - 2012

[6]"Encryption Process With Block Cipher & Mac", Pavan A. C - Journal of Emerging Technologies and Innovative Research (JETIR), January 2020, Volume 7, Issue 1, (ISSN-2349-5162)

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An International Open Access, Peer-reviewed, Refereed Journal

Artificial Intelligence and E-Commerce

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Abstract: *Today's world is so fast that every work is done at the tip of our fingerprint. This is because of the evolving technology and the research in science. The science and technology written a new chapter of human life in recent years. One among them is Artificial intelligence. This emerging field is now elaborating its wings to most of the grounds. And most using and promising in e-commerce. E-commerce is also outcome of the evolution of science and now it is more and more developing with AI technology. Hence, we come up with this wonderful topic that "Artificial Intelligence and E-Commerce".*

I. Introduction

Along with the development of science and technology, Artificial intelligence technology is becoming more and more mature and dramatically changing the way people work and live, especially in the field of electronic commerce, artificial intelligence technology has gradually developed into a powerful tool to boost sales growth and optimize e-commerce operations. At present, the application of artificial intelligence in the field of e-commerce is mainly reflected in the several aspects. Man-made reasoning has been created from over 60 years, and its examination results have entered each part of our economy and society, and numerous exceptional accomplishments have been finished. In 1997, IBM's PC beat the human world chess champion, denoting the authority appearance of the AI time. In 2016, Google Alpha G additionally ventured into AI field, making man-made consciousness practically inseparable from what's to come. Artificial intelligence which has as of now shown its worth in ventures like showcasing, medical services, money, and training, is currently making its essence in online business which is the thriving area of new age.

In past certain years, internet business has made surprising accomplishments. While partaking in the comfort brought by this online business area, individuals additionally set forward progressively high necessities for it. The rise of man-made consciousness innovation opens up groundbreaking thoughts and examples for the advancement of internet business. Alibaba, Rakuten, Amazon, Flipkart and different organizations are utilizing man-made consciousness innovation to direct remark mining, create chatbots, make item suggestions and interaction enormous information.

With the fast improvement of science, innovation and in monetary society, the use of fake intelligence(AI) is an ever increasing number of normal, its advancement significantly affects our work and way of life. In the field of web based business, Artificial Intelligence innovation has additionally been all around applied and accomplished great outcomes. Man-made brainpower has turned into a significant main

thrust for the improvement of web based business. This paper basically portrayed the internet business improvement circumstance and possibilities of AI innovation, investigations the current circumstance of the utilization of Artificial Intelligence innovation in the field of web based business, principally study and talk about exhaustively from the part of right hand of AI, canny coordinations, proposal motor and the ideal valuing application through the examination of internet business keen activity occurrence - Baidu remove, tests into the significant effect and extraordinary importance on the online business advancement of man-made brainpower. Man-made reasoning isn't only a clever innovation executed for its cool variable. Executing AI can possibly affect quite a few business capacities across your association. To see what it could mean for your business, it assists with understanding the parts of man-made reasoning. The meaning of AI is wide, and envelops information mining, normal language handling, and AI.

- Information mining alludes to the social occasion of both current and chronicled information to illuminate forecasts.
- Normal language handling centersaround human-PC association and how PCs decipher regular human language.
- AI concerns utilizing an assortment of calculations to apply insight or give guides to take care of an issue. Profound learning "includes layering calculations with an end goal to acquire more prominent comprehension of the information."

Over the recent years, AI innovation has developed and turn into an amazing asset to support deals and upgrade tasks. Indeed, even numerous little online business organizations are utilizing innovation with AI capacity.

II. How AI works in E-Commerce Sector

Artificialintelligenceis the intelligence which works upon the data which we shared to machines. This includes several steps, as follows.

- ✓ Collection of the data from all the available sources.
- ✓ Arranging the collected data with respect to different domains, i.e., in e-commerce sector the domains will be like clothes, electronics, home appliances etc.
- ✓ Feeding the data into machine.
- ✓ Machine will study the data and makes decision.
- ✓ After successful study of the data, when a customer enters any e-commers portal it will start working.
- ✓ Repetitively collects search history data from every user and compare with already existed data.
- ✓ Next time when customers logins , it will show up suggestions, recommendations

III. What exactly AI doing present in e-commerce?

Man-made brainpower Assistant: A man-made consciousness right hand (chatbot) whose essential capacity is to consequently react to client questions, react to basic voice orders, and give item proposals utilizing a characteristic language handling framework. Visit exchanges on internet business locales and portable pages depend on AI calculations customized to speak with clients in a customized way. Chatbots can assist customers with tracking down reasonable items, actually take a look at the stockpile circumstance of items, think about different items lastly assist purchasers with paying. In the event that there are any grievances or questions, the chatbot can likewise assist clients with reaching the relating administration staff. Purchasers can converse with the robots through text, voice and even pictures.

Suggestion: a total proposal framework dependent on AI calculation structure. Utilizing AI calculation can understand profound learning, measurable programming, expectation and investigation of client conduct, of monstrous informational collections, and foresee which items are probably going to draw in clients. To start with, in light of ongoing quests by likely clients, the AI calculation in the proposal motor can record key subtleties of the looked through

item dependent on the estimation results, The suggestion motor then, at that point, creates suitable Suggestions for the program and records them on an individual page, eventually assisting shoppers with finding the item rapidly.

Following the request: The request affirmed by the client is additionally tended to into conveyance mode. When the conveyance cycle begins then the Artificial knowledge gets into work. That is; checking of shipment subtleties, out for conveyance status, in the middle of calculated cycles. By every one of these information the machine will perceive the assessed season of conveyance and method of conveyance.

Estimating of the item: Currently online business industry is blasting field of this age.Particularly little retail retailers or little retailers find online business as the eventual fate of trade area. So here the opposition is extremely high due huge number of merchants, and it is hard to set a cost for a thing is exceptionally enormous test for human. By information examination AI itself sets or suggests a value esteem that could bear the costs of all assembling cost and with the benefit for vender too.

Request estimating: Every season and consistently don't have same sort of requests. Particularly in India, consistently the pattern will change. Thus, for high turn-over its vital to have request anticipating framework in trade area. Man-made brainpower does the task to keep up with market worth and supply process with deference of interest.

IV. Challenges in E-Commerce

Each and every sector has its own challenges. If we broke down one, another one will arise and come up; therefore continuous dedication is more important. The artificial intelligence is also facing challenges every day. Some of them are listed below:

- Scalability: Artificial intelligence using large amount data during its early faces , although in some time it will not be enough. In India the e-commerce data is very large that the machine needs time to understand it. Because south Indian mindset and likings are different from North Indian people. North India differs from East or west part of India. So total Indian recommendations are subdivided. This will challenge AI to perform masterly.
- Data acquisition: Acquiring the large amount of data from millions of users is not so easy. The person who comes for e-commerce sites is not only searches what he wants but also looks for other things also. Here AI have to collect and study that data also. So, data acquisition is a big challenge.
- Whether: The requirements or the market demand is directly proportional to the whether change in the environment. Sudden change in environment will affect the object and price demand. Talk about India, normally tsunamis and cyclones will definitely affect demand forecasting. So, knowing whether of future is not possible, this will cent percent a huge challenge for Artificial intelligence.

Advantages Of Artificial Intelligence in E-Commerce:

1. Minimum human errors
2. Available 24*7
3. Risk taking
4. Faster than humans
5. More accurate
6. Explore new markets

Demerits of Artificial Intelligence:

1. Unemployment
2. High cost
3. Making Humans lazy
4. Overthinking
5. Lack of implementation

V. Conclusion

As advised in this article, man-made brainpower in Ecommerce is assuming an indispensable part in driving inventive arrangements and client encounters. Some the main use instances of computerized reasoning in Ecommerce are in the space of customized shopping, item suggestions, and stock administration. With the fast turn of events and ceaseless advancement of exploration innovation, biometrics innovation, profound learning stage, voice examination innovation, picture acknowledgment innovation, robot programmed handling framework, text and normal language handling (NLP will grow consistently, and AI will keep on advancing the turn of events and change of internet business in the future without a doubt.

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An Article on Artificial-Neural-Networks

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Abstract: *The human brain demonstrates the presence of enormous Neural-Networks capable of performing cognitive, perceptual, and control tasks that humans excel at. The brain can perform computationally demanding perceptual acts (such as face recognition and speech) as well as control tasks (e.g. body movements and body functions). The brain's advantage is its efficient use of huge parallelism, highly parallel computing architecture, and imperfect information processing capability. We've covered the basics of ANN in this paper.*

Keywords: *Neural-Networks, Layering, Artificial Intelligence, Deep Learning, Machine Learning*

I. Introduction

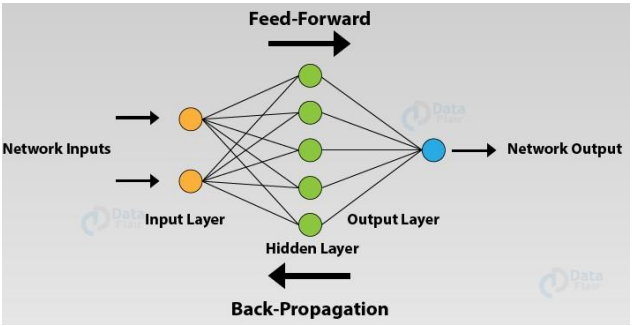
Artificial Neural-Networks (ANN) was invented in 1958 by the psychologist Frank Rosenblatt, originally known as perception. This is an attempt to stimulate a network of neurons that make up the human brain so that computers can learn and make decisions like humans. The original purpose was to model how the human brain processes visual data and learns to recognize objects. Simply put, ANN is an artificial human nervous system for receiving, processing, and transmitting information in the sense of computer science.

II. How Does ANN's Works?

An Artificial Neural-Network is made up of 3 components:

- Input Layer:- represents dimensions of the input vector.
- Hidden (computation) Layers:- These units are in between input and output layers. The hidden layer's job is to transform the input into something that the output unit can use somehow.
- Output Layer:- represents the output of the neural network.

Through these synaptic connections, each artificial neuron is connected to other neurons in the network, whose values are weighed, and the impulses propagating through the network are reinforced or dampened by these weight values. The training phase entails modifying these weight values so that the networks' final output gives you the proper response.

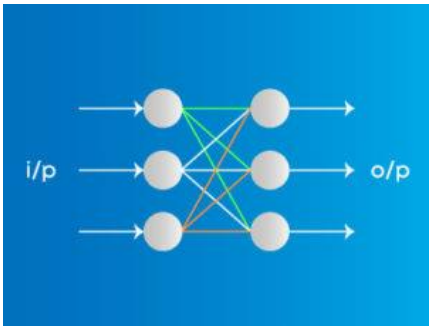


III. Types/Categories Of Artificial Neural-Networks

The three most commonly used types of Neural-Networks in artificial intelligence:

1. Feedforward Neural-Networks
2. Recurrent Neural-Networks
3. Convolutional Neural-Networks

1. Feed forward Neural-Networks:



The most basic version of Neural-Networks, in which input data only flows in one direction, going via artificial neural nodes and out through output nodes. Input and output layers are present when hidden layers may or may not be present.

Applications on Feed forward Neural-Networks:

- Simple categorization (where traditional Machine-learning based classification algorithms have limitations)
- Picture processing [simple straight forward image recognition]
- Computer vision [for difficult-to-classify target classes]
- Recognition of speech

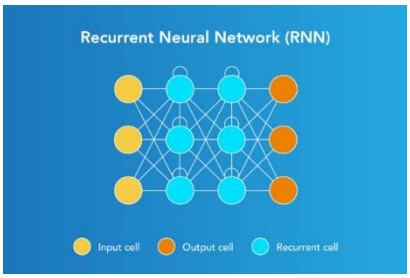
Advantages and Disadvantages of Feed forward Neural-Networks:

Advantages:
1. It's easier to design and manage because it's less complicated.
2. [One-way propagation] is quick and easy.
3. Extremely sensitive to noisy data

Disadvantages:

1. Due to the lack of dense layers and back propagation, it cannot be used for deep learning.

2. Recurrent Neural-Networks:



It's utilised in speech recognition and natural language processing. Recurrent Neural-Networks are designed to save the output of a layer and feed it back to the input to help forecast the layer's outcome. The first layer is usually a feed forward neural network, followed by a recurrent neural network layer, where a memory function remembers some information from the previous time step.

Applications of Recurrent Neural-Networks:

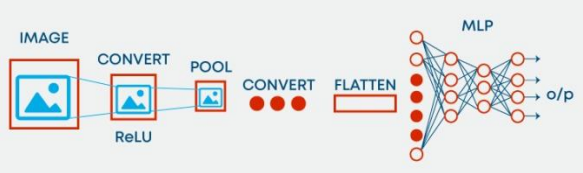
- Text processing like auto suggests grammar checks, etc.
- Text to speech processing
- Image tagger
- Sentiment Analysis
- Translation

Advantages of Recurrent Neural-Networks
1. One of the advantages is the ability to model sequential data in which each sample can be believed to be reliant on previous ones.
2. Used in conjunction with convolution layers to increase pixel efficacy.

Disadvantages of Recurrent Neural-Networks

1. Gradient vanishing and exploding problems
2. Training recurrent neural nets could be a difficult task
3. Difficult to process long sequential data using ReLU as an activation function.

1. **Convolutional Neural-Networks:**



Used in object recognition and video analysis. Instead of a two-dimensional array, a convolution neural network has a three-dimensional layout of neurons. A convolutional layer is the first layer. Each convolutional layer neuron only analyses data from a limited portion of the visual field. Like a filter, input features are taken in batches. The network decodes images in chunks and can perform these operations numerous times to complete the entire image processing.

Advantages of Convolution Neural Network:

1. Used for deep learning with few parameters
2. Less parameters to learn as compared to fully connected layer

Disadvantages of Convolution Neural Network:

- Comparatively complex to design and maintain
- Comparatively slow [depends on the number of hidden layers]

Neural-Networks that are used in Deep learning and machine learning are:

Deep Learning:

- Feed-forward Neural-Networks
- Recurrent neural network
- Multi-layer perceptron's (MLP)
- Convolutional Neural-Networks
- Recursive Neural-Networks
- Deep belief networks
- And many more.

Machine learning:

- Multilayer Perceptron (supervised classification)
- Back Propagation Network (supervised classification)
- Hopfield Network (for pattern association)
- Deep Neural-Networks (unsupervised clustering)

Applications of Neural-Networks:

i. Process modelling and control
ii. Machine Diagnostics
iii. Financial Forecasting
iv. Medical Diagnosis
v. Target recognition
vi. Voice recognition

Advantages and Limitations of Neural-Networks:

- A neural network can perform tasks that a linear program cannot.
- When an element of the neural network fails, its parallel nature can continue without any problem.
- A neural network learns and reprogramming is not necessary.
- It can be implemented in any application.
- It can be performed without any problem.

Limitations:

- The neural network needs training to operate.
- The architecture of a neural network is different from the architecture of microprocessors. Therefore, emulation is necessary.
- Requires high processing time for large Neural-Networks.

IV. Conclusion

Because Neural-Networks learn simply from examples, they are well suited to predicting time series. There is no need to incorporate more information, which might produce more confusion than benefit. Neural-Networks have the ability to generalise and are noise resistant.

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A Survey on E-Commerce

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Abstract: *In today's commercial world, e-commerce is booming. It entails the purchasing and selling of goods and services over an electronic network, as well as the transmission of payments or data. It's a paradigm change that has an impact on both marketers and customers. E-commerce, on the other hand, is more than just another technique to improve existing company operations. It is pioneering a complete transformation of the traditional business model. This huge shift in business paradigm is gaining traction all across the world, and India is no exception. E-commerce has grown in popularity as a result of widespread internet use, and entrepreneurs, particularly start-ups, are increasingly turning to this alternative as a differentiating business strategy. Furthermore, E-Commerce has a substantial environmental impact. Although the concept is widely employed in today's commercial environment, it has yet to be fully explored. This paper discusses the current state of E-Commerce as well as its history.*

Keywords: *Business, Electronic commerce, Customers, E-business, Marketing.*

I. INTRODUCTION

A business model is a way of doing business that allows a company to earn income and survive. To be successful in e-commerce, businesses must design and implement a strategy. E-Business Model is a business model that tries to exploit and leverage the unique properties of the internet and the World Wide Web. A business model's components handle every aspect of a company's operations, including expenses, revenues, operating strategies, corporate structure, and sales and marketing methods.

II. HISTORY

1)1969:(CompuServe is founded)

- Founded by electrical engineering students Dr. John R. Goltz and Jeffrey Wilkins, early CompuServe technology was built utilizing a dial-up connection.
- CompuServe dominated the ecommerce environment through the mid-1990s, introducing some of the first kinds of email and internet connectivity to the public in the 1980s.

2)1979: (Michael Aldrich invents electronic shopping)

• By connecting a modified TV to a transaction-processing computer via telephone line, English inventor Michael Aldrich introduced electronic shopping, allowing closed information systems to be opened and shared by outside parties for secure data transmission — and the technology became the foundation for modern ecommerce.

3)1982: (Boston Computer Exchange launches)

• Boston Computer Exchange was the world's first ecommerce company when it originally opened its doors. Its main purpose was to act as an online marketplace for customers looking to sell their old laptops.

4)1992: (Book Stacks Unlimited launches as first online book marketplace)

• Book Stacks Unlimited was founded by Charles M. Stack as an internet bookstore. The company originally employed a dial-up bulletin board format. The site, however, transitioned to the internet in 1994 and began operating under the Books.com name.

5)1994: (Netscape Navigator launches as a web browser)

• The web browser Netscape Navigator was co-created by Marc Andreessen and Jim Clark. Before the rise of modern giants like Google, Netscape Navigator became the primary web browser on the Windows platform in the 1990s.

6)1995: (Amazon launch)

- Jeff Bezos introduced Amazon primarily as an ecommerce platform for books.

7)1998: (PayPal launches as an ecommerce payment system)

• Founded by Max Levhin, Peter Thiel, Like Nosek, and Ken Howery as Confinity, PayPal first appeared on the ecommerce scene as a money transfer service. By the year 2000, it had merged with Elon Musk's online banking company and was on its way to being well-known.

8)1999: (Alibaba launches)

• With more than $25 million in capital, Alibaba Online began as an online marketplace. By 2001, the corporation had turned a profit. It grew into a large B2B, C2C, and B2C platform that is still in use today.

9)Year 2000: (Google introduces Google AdWords as an online advertising tool)

• Google Adwords was created to allow ecommerce businesses to advertise to people who search on Google.

•

Online retailers began employing the technology in a pay-per-click (PPC) setting with the help of short-text ad copy and display URLs. Search engine optimization and pay-per-click advertising are two different things (SEO).

10)2004: (Shopify opens) • Tobias Lütke and Scott Lake founded Shopify after attempting to open an online snowboarding equipment store. It's a point-of-sale system and an ecommerce platform for online retailers.

2005-11-11: (Amazon introduces Amazon Prime membership)

• Amazon Prime was introduced as a method for customers to enjoy free two-day shipping for a one-time cost.

Other benefits of membership included cheap one-day shipping, access to streaming services such as Amazon Video, and members-only events such as "Prime Day."

•

This calculated move increased client loyalty and encouraged repeat purchases. Free shipping and quick delivery are two of the most typical requests from internet shoppers nowadays.

2005-12-12: (Etsy launches)

• Etsy was founded, letting craftspeople and small businesses to sell their wares (including digital ones) on an online marketplace. This took the makers community online, allowing them to contact a global audience of buyers 24 hours a day, seven days a week.13)2009: (BigCommerce launches)

BigCommerce was founded by Eddie Machaalani and Mitchell Harper as a 100% bootstrapped ecommerce storefront platform. The platform has processed more than $25 billion in merchant purchases since 2009, and the firm currently has offices in Austin, San Francisco, and Sydney.

2011: 14) (Google Wallet introduced as a digital payment method)

• Google Wallet was launched as a peer-to-peer payment service that allowed users to send and receive money via their mobile device or PC.

• Users can pay for goods and services using their digital wallets by linking them to a debit card or bank account.

• As of today, Google Wallet and Android Pay have merged to form Google Pay.

2011: (Facebook introduces sponsored stories as a type of early advertising) • Sponsored stories were the first form of early advertising given by Facebook to Business Page owners. Ecommerce enterprises might reach specific audiences and appear in the news feeds of various target audiences with these paid ads.

• Stripe is a payment processing firm that was created with developers in mind. It was founded in 2011. John and Patrick Collison created the company.

• As online customers began to use their mobile devices more regularly, Apple developed Apple Pay, which allowed users to pay for products or services using an Apple device.

In the year 2014, (Jet.com launches)
• Jet.com was created by entrepreneur Marc Lore, Mike Hanrahan, and Nate Faust (who sold his prior company, Diapers.com, to Amazon.com).

2017: 16) (Shoppable Instagram is introduced)

• Instagram Shopping was launched in collaboration with BigCommerce, an ecommerce platform. Since then, the service has spread to other ecommerce sites, allowing Instagram users to click an item and quickly navigate to its product page for purchase.

2017 (Cyber Monday sales surpass $6.5 billion)

• On Cyber Monday, online sales surpassed $6.5 billion, a 17 percent increase over the previous year.

17)2020: (COVID-19 Drives Ecommerce Growth)

• COVID-19 outbreaks around the world pushed people online to new heights. Ecommerce transactions totaled $82.5 billion in May 2020, up 77 percent from the previous year. Using regular year-over-year gains, it would have taken four to six years to reach that level. Consumers are turning to the internet to make purchases that they would regularly make in stores, such as food and household items, clothing, and entertainment. Many customers said they'll keep shopping online until a COVID-19 vaccination becomes available.

➢ **The Future of E-commerce: -**

• In the United States alone, ecommerce revenue is predicted to reach $479 billion by 2022, with the toys, hobby, and DIY vertical witnessing the most increase. This isn't a fleeting fad, either.

• It's also worth noting that, in the future, ecommerce specialist Gary Hoover's data predicts that ecommerce retail sales will finally catch up to brick-and-mortar sales.

• This indicates that, while the online sales trend will continue to increase, there will still be plenty of work to go around.

• However, that's not all.Soon, most ecommerce interactions will be an omni-channel experience for shoppers.

• This means they'll expect to be able to study, explore, shop, and buy across devices and

platforms without interruption (like a standalone web store, an Amazon presence, etc.).

• Robust customer journeys and personalisation. • Artificial intelligence-enabled shopping are two other ecommerce trends to keep an eye on in the future.
• Cryptocurrencies.

Overall, we must keep in mind that ecommerce is still relatively young in the retail landscape.
The future is full with possibilities, but its success and longevity will be determined largely by future buyer preferences.

III. What is E-Commerce?

- • E-commerce is the online purchase and sale of commodities (or services). It includes mobile shopping and online payment encryption, as well as a wide range of data, systems, and tools for online buyers and merchants. Most ecommerce businesses utilize an ecommerce shop and/or an ecommerce platform to manage their online marketing and sales, as well as their logistics and fulfillment. E-commerce is currently one of the fastest expanding industries in the world economy. According to one estimate, it grows at a rate of approximately 23% every year. By the end of the decade, it is expected to be a $27 trillion business.
- • "E-commerce" is an abbreviation for "Electronic commerce."**E-Commerce** or **Electronic commerce** is a process of buying, selling, transferring, or exchanging products, services, and/or information via **electronic** networks and computers.

❖ **Consists of**

1. Buyers: these are people with money who want to purchase a good or a service.
2. Sellers: these are people who offer goods and service to buyer.
3. Producers: these are the people who created the products and services that sellers offer to buyers.

- **Meaning of E-commerce in simple terms:**
  - ✓ Electronic marketing is the practice of purchasing and selling goods and services via an electronic system such as the internet.
  - ✓ Electronic commerce, often known as e-commerce, is the purchasing and selling of goods and services, as well as the transmission of payments or data, through an electronic network, most commonly the internet. Here are a few recent examples to help you grasp the concept quickly:
  - ✓ Flipkart, Shopify, Amazon, Olx, eBay, and other online marketplaces
  - ✓ In the realm of e-commerce, there are a few things to keep in mind.
  - ✓ E-commerce has changed the way people shop and consume products and services in their daily life. More and more people are turning to their computers and smart devices to order goods, which can easily be delivered to their homes. As such, it has disrupted the retail landscape. Amazon and Alibaba have gained considerable popularity, forcing traditional retailers to make changes to the way they do business.

✓ But that's not all. Not to be outdone, individual sellers have increasingly engaged in e-commerce transactions via their own personal websites. And digital marketplaces such as eBay or Etsy serve as exchanges where multitudes of buyers and sellers come together to conduct business in a very modern way.

➢ **Process of E-commerce:-**

• A web browser is used by a customer to access the home page of a merchant's website on the internet. The customer looks through the site's product catalog and chooses what they want to buy. The goods you've chosen are placed in an electronic version of a shopping cart. When the customer is ready to purchase the things she wants, she enters a bill-to and ship-to address for purchase and delivery.

• The merchant's site displays a receipt confirming the customer's purchase when the credit card number is confirmed and the order is completed at the commerce server site.

• The order is subsequently forwarded to a processing network for payment processing and fulfillment by the commerce server site.

➢ **Advantages of E-commerce: -**

1. Convenience: Online shopping makes purchases easier, faster, and less time-consuming, with 24-hour sales, fast delivery, and simple returns.

2. Personalization and customer experience: E-commerce platforms may generate rich user profiles that allow them to tailor the products they are offered and make recommendations for other products they might like. This enhances the customer experience by making customers feel understood on a personal level, which increases the likelihood of brand loyalty.

3. Global marketplace: Customers from all over the world may shop on e-commerce sites, and businesses are no longer limited by geography or physical obstacles.

4. Personalization and product recommendations: E-commerce companies can keep track of their visitors' browsing, searching, and buying habits. They can utilize this information to provide meaningful and personalized product recommendations, as well as get vital market intelligence. "Frequently bought together" and "Customers who viewed this item also viewed" sections of Amazon product pages are two examples.

5. Product and price comparison: In ecommerce, sellers might use tools or compare products on their own. This gives them a good notion of the product options accessible, as well as the normal rates, if a product requirement isn't met.

- Online comparison is faster and includes more products - It saves time when performing this comparison because all of the information is available on the purchasing site. Sellers in a physical store may not have access to as many facts - they simply have a better understanding of their own goods.This is one more benefit for the customer too. When people see many items ready for purchase, they feel more confident about spending.

6. No reach limitations: A seller with a physical store may only be able to reach a certain number of buyers. They can deliver to the customers' homes but there can be distance limitations. Several e-commerce marketplaces have their own logistics and delivery system.

7. Faster response to buyer/market demands: Every interaction is faster when you begin selling online. Ecommerce marketplaces offer you a streamlined logistics or delivery system. What this means is that the buyers order gets delivered efficiently. Product returns management is one more plus point that can be handled quickly – you either refund the payments or give a replacement.

8. Several payment modes: Buyers like personalization – the same goes for paying for their orders. Ecommerce marketplaces permit multiple payment modes that include UPI, cash on delivery, card on delivery, net banking, EMIs on credit or debit card and pay-later credit facility.

➢ **Dis-Advantages of E-commerce: -**

1. Security: Because of cybercriminals and hackers, online portals have been in the news a lot. It's a major problem because your account could be hacked and your funds wiped out if you're not careful.

- This is an unfortunate aspect of e-commerce sites, and no website can guarantee that financial information will not be compromised on its platform. To prevent data breaches, the website owner must take significant steps to change the password.

2. Site failure: E-commerce is completely reliant on an internet connection. A major disadvantage of e-commerce is the inability to make purchases due to a site crash. Such a minor word site collapse can bring down an entire corporation in a matter of seconds. This can happen if you do not have a good bandwidth connection as you will face serious issues while loading pages and placing orders. It is impossible to make a purchase if the site you are looking at crashes down.

- Ensure that your website is on the right platform where there are already precautions in place for this eventuality.

3. Late delivery: One of the most typical drawbacks of e-commerce platforms is late delivery. When a buyer orders a goods, he is guaranteed that it will arrive within seven days or within a specific time frame. In most circumstances, this does not occur, and you are left waiting. Finally, although the site informs you that the product will be delivered on this day, the portal does not provide particular delivery times. There have been countless cases where a person who was supposed to pick up a package had to wait for hours for it to arrive. His entire day has been squandered, and he has been unable to go outside as planned. The customer becomes enraged because he is harassed needlessly.

4. Some things are difficult to purchase online: If you believe you can buy anything online, you are mistaken. There are some things, such as ice cream, spectacles, and precious metals such as gold and silver, that you do not want to buy online even if you have the opportunity. You can't trust yourself to buy something without physically feeling, trying, and testing it, which can be a disadvantage for an e-commerce site. All the photographs and promises in the world won't be enough to persuade you to purchase certain products, such as a gold and diamond bracelet. Will you make the effort to go to a real store to verify and then make a purchase, or will you trust the online store to satisfy your expectations?

5. Lack of privacy: One of the most important drawbacks of e-commerce is the lack of privacy. Before making a purchase, a consumer must supply personal information such as his address, name, and phone number. Some websites lack advanced encrypted technology to secure your personal information from hackers, which is a major source of concern. If this sensitive information is released, it can cause a slew of issues for consumers. Some websites illegally acquire sensitive information, which is why consumers are hesitant to utilize e-commerce portals since they must provide personal information that could be exploited.

6. Exorbitant technological costs: E-commerce necessitates the use of modern platforms in order to improve performance. It will be unable to provide seamless transactions if it is disrupted by software, network, or domain issues. Appropriate technology infrastructure is expensive and requires significant investment. It also needs to be updated on a regular basis to keep up with the times. A downside of the e-commerce portal is the high technological cost of a successful operation.

7. Fear of the unknown: People are afraid of the unknown. The majority of e-commerce transactions are faceless and paperless, with no required verification. Customers are apprehensive to make card payments in advance because most firms do not have a physical presence. They are concerned that if the requested product does not

arrive, they will be unable to recover their funds. How would people track down the online store and collect their hard-earned money if this happens?One of the disadvantages of e-commerce is the absence of the physical existence of the store.

8. Lack of personal touch: When you approach a retail establishment, you are greeted at the door and there are multiple personnel waiting to assist you if you have any problems. There is no one to assist you when you are on the internet making a decision. The human touch at the real store is both encouraging and enjoyable. Our interactions with salespeople assist us in making decisions. This is why in physical outlets, delicate personal touches are favored. This experience is valuable, but it is not available online, which appears to be an e-commerce disadvantage.

➢ **Types Of E-commerce:-**

1) Business to consumer (B2C):-

- Businesses that sell to consumers are known as B2C. Because the B2C model is the most frequent business model, it encompasses a wide range of options.
- Anything you buy as a consumer in an online store – think clothing, household necessities, and entertainment — is a B2C transaction.
- The decision-making process for a B2C purchase is substantially shorter than for a B2B buy, especially for lower-value items.
- Consider this: deciding on a new pair of tennis shoes is a lot easier than vetting and purchasing a new email service provider or food caterer for your organization.
- Because of the shorter sales cycle, B2C companies spend less money on marketing to generate a sale, but they also have a lower average order value and fewer recurring purchases than B2B companies. And B2C doesn't only include products, but services as well.

• B2C innovators have used mobile apps, native advertising, and remarketing to market directly to their customers while also making their lives easier.

• For example, consumers can easily connect with local lawn mowing services, garden and patio specialists, or snow removal experts using an app like Lawn Guru, while home service businesses can use House call Pro's plumbing software app to track employee routes, text customers, and process credit card payments on the go, benefiting both consumers and businesses.

2. Business to business (B2B):-

• A B2B business model is one in which a company sells its product or service to another company. The buyer is sometimes the ultimate user, although most of the time the buyer resells to the consumer.

• B2B transactions have a longer sales cycle, but greater order values and more repeat purchases.

• Recent B2B entrepreneurs have carved out a niche for themselves by eschewing catalogs and order sheets in favor of ecommerce storefronts and better niche market targeting.

•

Millennials will account for over half of B2B buyers in 2020, nearly double the number in 2012. B2B selling in the online realm is becoming increasingly significant as younger generations

enter the age of completing business transactions.

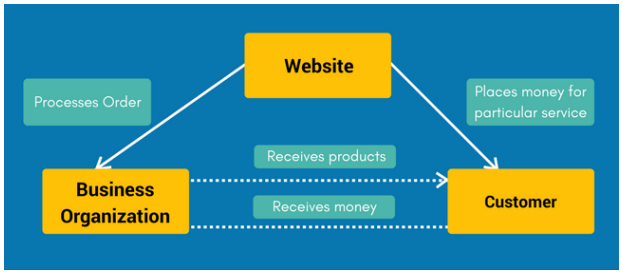
3. Consumer to business (C2B):-

• In this ecommerce approach, a site might allow clients to post jobs they need done and have businesses compete for the job. Affiliate marketing services are also classified as B2B.

• Elance (now Upwork) pioneered this strategy by assisting firms in hiring freelancers.

• The competitive advantage of the C2B ecommerce model is in the pricing of goods and services; this method provides consumers the power to choose their own price or have firms compete directly to suit their requirements.

• Recently, this approach has been creatively used to connect businesses with social media influencers in order to sell their products.



4. Consumer to consumer (C2C):-

- A C2C business — also called an online marketplace — connects consumers to exchange goods and services and typically make their money by charging transaction or listing fees.
- Online businesses like Craigslist and eBay pioneered this model in the early days of the internet.
- C2C businesses benefit from self-propelled growth by motivated buyers and sellers, but face a key challenge in quality control and technology maintenance.

5. Peer-to-peer (P2P):-

- A peer-to-peer (P2P) service is a decentralized platform whereby two individuals interact directly with each other, without intermediation by a third party. Instead, the buyer and the seller transact directly with each other via the P2P service. The P2P platform may provide services such as search, screening, rating, payment processing, or escrow.

6. Business to government (B2G):-

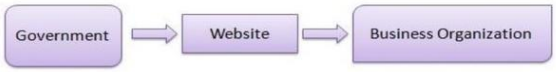
- Business to government (B2G) is the sale and marketing of goods and services to federal, state, or local agencies.
- Such websites are used by government to trade and exchange the information with various business organisation.
- It is endosed by the government and provide the medium to business to submit application forms to govt.
- Business-to-government (B2G) is a business model that refers to businesses selling products, services or information to governments or government agencies.
- We also call this way of doing business **B2A**, which stands for **business-to-administration**. The term refers to a company doing business either with the government or the public sector.
- Examples:

1. Purchase of products and services.
2. The B2G processes online.
3. Recruiting new employees.

7. Government to business (G2B):-

- Government-to-business (G2B) is a business model that refers to government providing services or information to business organisation. Government uses B2G model website to approach business organizations. Such websites support auctions, tenders and application submission functionalities.
- As a rule, a G2B model gives companies a convenient way to deal with payments and legal procedures, like document renewal, cutting down significantly on bureaucratic foot-dragging and paper work. A classic G2B example is a government website where businesses go to pay taxes.

G2B e-commerce



8. Government to citizen (G2C):-

- G2C also refers to the interactions between the government and its consumers in offering support either through responses to consumer concerns or government services and products. Such services include land searches, confirmation of genuine licenses and vehicle ownership searches.
- Bangalore Water Supply and Sewerage Board (BWSSB)-BWSSB is responsible for providing drinking water to the city and draining out sewerage. It maintains about 6000 km. Bangalore Electricity Supply Company (BESCOM) is responsible for power distribution in Eight Districts of Karnataka.

9. Business to employees (B2E):-

- Business-to-employee (B2E) electronic commerce uses an intrabusiness network which allows companies to provide products and/or services to their employees. Typically, companies use B2E networks to automate employee-related corporate processes. B2E portals have to be compelling to the people who use them. Companies are competing for eyeballs of their employees with eBay, yahoo and thousands of other web sites. [1]
- It relates to communication between business houses and its employees through online.
- It is an intra business network, which allows companies to provide products or services to their employees.
- For instance software companies offer work from employees from home simply known as work from home scheme to their employees.
- Examples of B2E applications include:
- Online insurance policy management
- Corporate announcement dissemination
- Online supply requests
- Special employee offers

10.Government to employees(G2E):-

- Government-to-employees (abbreviated G2E) is the online interactions through instantaneous communication tools between government units and their employees. ... G2E is an effective way to provide e-learning to the employees, bring them together and to promote knowledge sharing among them.
- G2E models are widely applied nowadays by respective state government in administrating employee details online.
- Examples:
    1) Treasurer.
    2) Firefighter.
    3) Police officer.
    4) Land surveyor.
    5) Database administrator.
    6) Records clerk.
    7) Social services assistant.
    8) Elementary school teacher.

➢ **Key Takeaways:-**

- E-commerce is the buying and selling of goods and services over the internet.
- Its is conducted over conducted over computer, tablets, smartphone, and other smart devices.
- Almost anything can be purchased through e-commerce today.
- It can be a substitute for brick-and-mortar store, though some businesses choose to maintain both.
- E-commerce operates in four market segments, including business-to-business, business-to consumer, consumer-to-consumer, and consumer-to-business.

➢ **E-commerce VS E-business:-**

- We use the term e-business to refer primarily to the digital enablement of transactions and processes within a firm, involving information system under the control of the firm.

- E-commerce include commercial transactions involving an exchange of value across organizational boundaries.

IV. Conclusion

E-commerce still represents one of the business methods that take advantage if done the right way, even if the stock market and commodities fell, but E-Commerce still able to survive and receive high transaction. E-commerce has a tremendous opportunity in the course of or business in Malaysia. In addition, it is also to introducing new techniques and styles in a transaction. Use the extensive E-Commerce in the Internet world is actually much better to bring the goodness of the individual or the state.

E-Commerce has undeniably become an important part of our society. The successful companies of the future will be those that take E-Commerce seriously, dedicating sufficient resources to its development. E-Commerce is not an IT issue but a whole business undertaking. Companies that use it as a reason for completely re-designing their business processes are likely to reap the greatest benefits. Moreover, E-Commerce is a helpful technology that gives the consumer access to business and companies all over the world.

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An International Open Access, Peer-reviewed, Refereed Journal

A Study on Cryptography

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Abstract: *The main aim of this paper is to provide a broad review of cryptography, with particular regard to keys. Cryptography is far too broad a topic to discuss in terms of how to safeguard digital information and provide security services. However, a general introduction of network security and cryptography is given, as well as a discussion of various techniques. After that, a thorough examination of network security and cryptography in keys is offered. The goal of cryptography is to enable an entity to associate its identity with a piece of data. The common attacks on cryptography were reviewed.*

Keywords: Symmetric, Asymmetric, Communication, Cipher, Keys

I. Introduction

Technology plays a crucial role in today's dynamic world. It brings together tools to promote development, makes tasks easier, solves multiple problems of mankind and permits information exchange. Information exchange or communication is perhaps one of the most important products of technological advancement. Communication at its simplest is the act of transferring information from one place to another.

Texting or Messaging has now become a popular and instantaneous means of communication worldwide. Over 560 billion texts are sent every month worldwide with the number of monthly texts sent increased more than 7,700% over the last decade. With the parallel development of hacking which is now much more sophisticated and harder to detect than a few years ago, it becomes crucial to maintain the confidentiality of information being transferred. This is where cryptography (cryptology) comes into light.

Cryptography

Cryptography (from ancient Greek :kryptos - hidden) is the study of secure communications techniques that allows only the sender and intended recipient of a message to view its contents . Now I am going to take the help of an example or a scenario to actually explain what is cryptography. Let's say we have a person named Andy. Andy delivers a note to his long-distance pal Sam. Obviously, he wants the communication to remain private and inaccessible to others. To send this message, he uses a public platform, such as the internet. Let's pretend there's a clever Eve who has gained covert access to this communication channel. He can do a lot more than just listen in now that he has access. He can, for example, alter the message itself. So, how can Andy ensure that no one in the middle (i.e. Eve) has access to the message intended just for Sam?

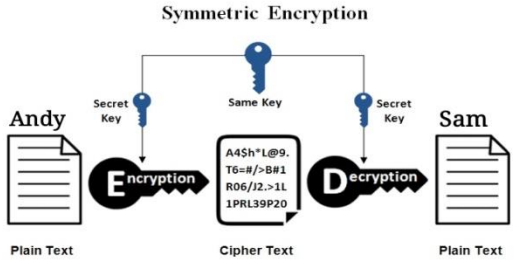
II. Existing System

The idea is to protect this communication from prying eyes, which is where cryptography comes in. Cryptography is divided into two groups based on the type of keys used and the

encryption algorithms used:

- Symmetric-key cryptography.
- ASymmetric-key cryptography.

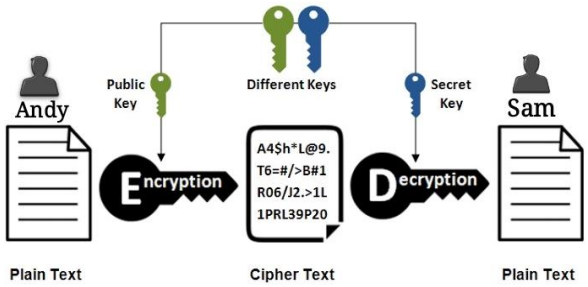
Symmetric-key cryptography



Symmetric-key cryptography is a type of encryption where only one key (a secret key) is used to both encrypt and decrypt electronic information. The individuals communicating via symmetric encryption must exchange the key so that it can be used in the decryption process. Both the sender and the recipient have identical copies of the key, which they keep private and never share. Let's look at how symmetric-key cryptography can protect Andy and Sam's connection. Andy changes his readable message to an unreadable form to secure his message. He turns the message to a series of random integers before encrypting it using a key. He gets a new value after applying this key to the numerical form of his message. This is referred to as ciphertext in cryptography. So Andy won't have to worry about someone in the middle detecting the private message if he sends the ciphertext or encrypted message via a communication channel. Even if a middle manager discovers the communication, he won't be able to decode it without a correct key to open it. So, let's say Eve discovers the message and manages to tamper with it, resulting in the message reaching Sam. To recover the original plain text, Sam would need a key to decrypt the message. So he'd transform a ciphertext to a numerical value that corresponded to the plain text using the key. The original plaintext message or an error will be returned after employing the key for decryption. This is a critical problem because Sam knows Andy's message is not the same as the message he got. As a result, the error indicates to Sam that the communication has been tampered with somewhere in the middle. The most important thing to remember is that the security of a single key system is solely dependent on keeping the encryption and decryption keys secret. The issue is that if the message is intercepted, a third party has all of the tools necessary to decrypt and read it. Cryptologists devised the asymmetric or public key scheme to address this problem.

ASymmetric-key cryptography

Each individual (B and A) in asymmetric encryption channel generates two keys each – a public key and a private key that are mathematically linked to each other (Note that one key cannot be used to derive the other) .

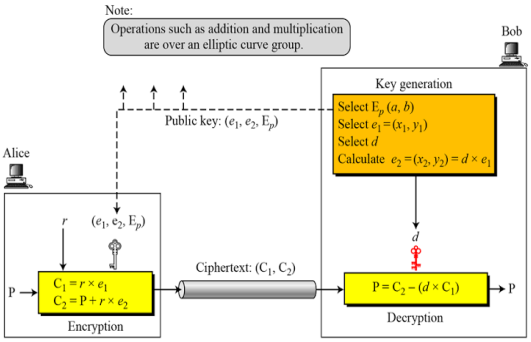


The communication is encrypted with the public key, and the message is decrypted with the private key. The recipient B's public key is used to encrypt the message, and the receiver B's private key is used to decrypt it. Let's look at how symmetric-key cryptography can protect Andy and Sam's communication route. Andy is the one who sends the message, and Sam is the one who receives it. Sam creates two keys: a public key and a private key.

Over the communication channel, Sam's public key is distributed to everyone. Andy changes his readable message to an unreadable form to keep his message secure. The ciphertext is then obtained by applying the public key (of Sam) to the numerical form of his message. Andy's ciphertext is sent to Sam over the internet. When Sam receives the ciphertext, he decrypts it with his own private key and extracts the information.

In the event that a third party gains access to the communication intended for Sam, he will need Sam's private key to decrypt it. This means that if you don't have the associated private key, you can't steal anything. In situations where security is critical, asymmetric key encryption is utilized. (Ex : Bitcoin)

III. Proposed System



In 1984, Taher Elgamal introduction a cryptosystem which uses the asymmetric key encryption method. It is based on discrete logarithms and Diffie Hellman key exchange algorithm. Elgamal cryptosystem deals with three aspects: Here Andy is the sender and Sam is the recipient.

1. Elgamal Key Generation - Public and private key

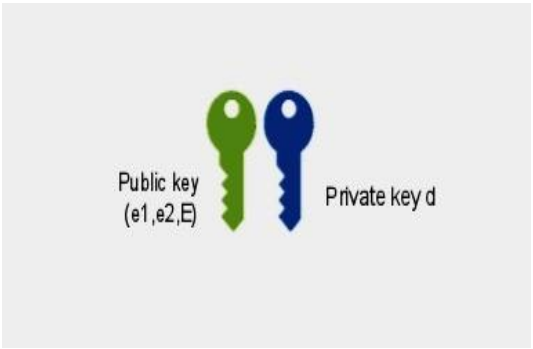
•Sam chooses E(a,b) with an elliptical curve over GF(p) or GF(2^n).

•Sam chooses a point on the curve $e_1(x_2,y_2)$.

•Sam chooses an integer d.

•Sam calculates $e_2(x_2,y_2) = d \times e_1(x_1,y_1)$.

•Sam announces E(a,b) ,$e_1(x_1,y_1)$ and $e_2(x_2,y_2)$ as his public key and d as his private key.



2. Elgamal key encryption

•Select a random integer R.

•Andy selects a point P on the curve as her plaintext. He then calculates a pair of points on the text as ciphertext.

$$C_1 = R \times e_1$$

• Compute second part of ciphertext C_2 .

$$C_2 = P + R \times e_2$$

• The final ciphertext is (C_1, C_2).

3. Elgamal key decryption

Sam after receiving the ciphertext C_1 and C_2, computes the plaintext using the formula;

$$P = C_2 - [\, d \times C_1]$$

The P calculated by Sam is the same as intended by Andy.

Disadvantage of Elgamal cryptosystem

• The potential disadvantage of the Elgamal cryptosystem is that the electronic message Expansion takes place during encryption hence the ciphertext is twice as long as the plaintext.

• It's need for randomness and it is relatively slower.

• Suppose a third party Eve gains access to the ciphertext, he would need to find the value of either R or d to obtain the plaintext. If Eve knows R, he can use $P = C_2 - (R \times e_2)$ to find the point P related to the plaintext. If Eve knows d, he can use $P = C_2 - (d \times C_1)$ to find the point P related to the plaintext. In $e_2 = d \times e_1$,Eve knows the value of e_1 and e_2 ,and hence he can find d.

Advantages of Elgamal cryptosystem

• The strength of Elgamal cryptosystem lies in its random encryption.

• The security of ECC depends on the difficulty of solving the elliptic curve logarithm problem.

•The plaintext can only be generated if the private key is in possession. This way the elgamal encryption offers maximum security.

• Elgamal encryption is used in the free GNU privacy guard software.

IV. Conclusion

In this paper we have described cryptography and its broad classification, the famous Elgamal public-key cryptosystem etc. Topics covered are Symmetric-key cryptography, ASymmetric-key cryptography, Elgamal cryptosystem, Analysis of Elgamal public-key cryptosystem and Advantages and Disadvantages of Elgamal cryptosystem.

V. References

[1] A. Bachir, M. Dohler, T. Watteyne, and K. K. Leung, ―MAC essentials for wireless sensor networks,‖ IEEE Commun. Surv.Tuts., vol. 12, no. 2, pp. 222–248, Second Quarter 2010.

[2] Pavan A C and P. Prasanna, ―Secure & Energy Efficient Scheme against Denial-of-Sleep Attack in WSN ‖, IJMTST | Volume: 2 | Issue: 05 | May2016.

[3] Himanshu Gupta, Vinod Kumar Sharma, ―Multiphase Encryption: A New Concept in Modern Cryptography‖, International Journal of Computer Theory and Engineering, Vol. 5, No. 4, August 2013.

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An Article on Bio Materials and Bio Devices

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Abstract: *The rapid advancement of biomaterials technology has sparked new developments in materials science, particularly when it comes to interacting with biological systems, which is based on microscale manipulation of fluids and cells. This article examines the most recent developments in biomaterials and bio devices, focusing on some of the most promising topics, such as functional biomaterials, cell manipulation, and flexible bio devices. These fields are linked not just by their basic concepts, which all use microfluidics to regulate material constitution and shape, but also by their ultimate goals in human healthcare.*

I. Introduction

Biomaterials are materials that interact with biological systems, whether they are natural or manufactured, alive or dead, and are frequently made up of many components. In medical applications, biomaterials are frequently employed to supplement or replace natural functions. A biomaterial is now described as a substance that has been designed to assume shape and is utilised to regulate the course of any therapeutic or diagnostic operation by controlling interactions with components of a living system. Biomaterials play an important part in medicine today, helping people recover function and heal after an accident or sickness. Biomaterials can be found in nature or created in the lab using a number of chemical methods that include metallic components, polymers, ceramics, and composite materials. They are frequently employed and adopted for medical applications, and so contain a living structure or biomedical equipment that performs or substitutes a natural function in whole or in part. Such functionalities can be somewhat passive, like as those found in a heart valve, or bioactive, such as those found in Hydroxy-apatite quoted hip implants.

For usage in biomedical products and devices, biomaterials can be re-engineered into moulded or machined parts, coatings, fibres, films, foams, and textiles. Heart valves, hip joint replacements, dental implants, and contact lenses are just a few examples. They are frequently biodegradable, with some being bio absorbable, meaning they are gradually cleared from the body after performing their intended function.

II. History of Biomaterials and Their Development

The oldest recorded usage of biomaterials dates back to antiquity, when ancient Egyptians employed animal sinew sutures. Loose teeth were tied together with gold wires for fastening artificial ones to nearby teeth as far back as ancient Phoenicia. Bone plates were effectively utilised in the early 1900s to support bone fractures and speed up their healing. Blood vessel replacement was in clinical trials in the 1950s and 1960s, while prosthetic heart valves and hip joints were in development.

During the early stages of development, materials identified or designs executed resulted in the component's premature loss of function due to mechanical failure, corrosion, or insufficient biocompatibility. The biocompatibility, biofunctionality, and availability of a biomaterial are the most important factors in its use. For example Iron

stents resulted in corrosion and ceramics proved a better candidate with respect to all above function except for their brittle behavior.

The modern field of biomaterials combines medicine, biology, chemistry and much more. From the recent influences from tissue engineering and material science .The field has grown significantly in the past decade due to discoveries in tissue engineering, regenerative medicine and more.

III. Types or Classification of Biomaterials

Natural – properties of these biomaterials can be controlled, they are abundant and inexpensive, chemistry and mechanical properties are very similar to that of natural tissue. But they have less mechanical strength which proves to be a disadvantage. Biological polymers or decullarized tissue .Biopolymers are natural polymers produced by the cells of living organisms derived from plant cellulose or collagen from animal source and polyester from micro-organisms

Important application is that of soft tissue replacement, wound dressing, and cartilage substitute. Example of a natural polymer is DNA and RNA. Synthetic-they are synthesized in the the laboratory. The proved good in soft tissue implants, drug delivery system etc.

Metals, ceramis, composite – metals and alloys are used as biomaterials due their excellent mechanical properties. High strength, fatigue resistance, easy fabrication and easy to sterilize serve as advantage. Whereas toxicity, corrosion and metal ion sensitivity turn out to be disadvantage.

IV. Biomaterials Application in Tissue Engineering

Biomaterials are an important part of tissue engineering. They're made to give an architectural foundation that's similar to native extracellular matrix, allowing cells to proliferate and eventually regenerate tissue. Bone and cartilage are two separate tissues with different chemical and mechanical properties. Despite their distinctions, the osteochondral interface is where they meet. This article provides an overview of contemporary biomaterials used in bone and cartilage applications, analyses key design issues, and speculates on future research potential.

V. Biomaterials Application in Heart Valve

A mechanical valve implant is used in 49 percent of the 250,000 valve replacement surgeries conducted in the United States each year. A bileaflet disc heart valve, often known as a St. Jude valve, is the most commonly utilised valve. The mechanism involves two semicircular discs that move back and forth, allowing blood to flow while also forming a seal against backflow. The valve is covered with pyrolytic carbon and secured to the surrounding tissue by a woven fabric mesh called Dacron (a commercial name for polyethylene terephthalate, developed by Du Pont). While incorporating the valve, the mesh permits the body's tissue to expand.

VI. Biomaterials Application in Skin Repair

"Artificial" tissue is usually created from the patient's own cells. When the damage is so severe that using the patient's own cells isn't an option, artificial tissue cells are created. Finding a structure on which the cells can grow and organise is the challenge. The scaffold must be biocompatible, able to adhere to cells, mechanically strong, and biodegradable. A copolymer of lactic acid and glycolic acid is one effective scaffold.

VII. Biomaterials in Drug Delivery System

The creation of controlled release systems for pharmaceuticals and bioactive chemicals is a key research focus in the pharmaceutical and chemical industries. A medication is dispersed within a polymeric carrier in many of these current and future delivery techniques. These carriers are made to deliver medications in a regulated manner over a period of time that can range from minutes to years.

Biomaterials are used by doctors, researchers, and bioengineers for a variety of purposes: Joint replacements, bone plates, intraocular lenses, bone cement, artificial tendons and ligaments, blood vessel prostheses, dental implants, contact lenses, stents, surgical sutures, and surgical mesh, blood vessel prostheses, dental implants, contact lenses, stents, surgical sutures, and surgical mesh

VIII. Current Research with Biomaterials

In material science rather than haphazardly looking for and discovering materials and exploiting their properties one instead tries to understand the materials fundamentally so that new materials with the desired properties can be created.

Bioinformatics and computation biology involve the use of techniques including informatics, statistics, computer science, AI, biochemistry to solve biological problems usually on molecular level. Advances in the field of biochemistry and nanotechnology could lead to big break throughs in the fight against dangerous viruses like Novel Corona virus.Researchers describe the possibilities being explored by the scientists combining biomaterials and nano technology to make vaccines mor effective and build surfaces that could fight and kill viruses on their own.

Biomaterials are materials engineered to interact with other biological systems in some way. Ex:joint replacements , dental implants , surgical mesh and drug delivery systems. Nanotechnology meanwhile focuses on building tiny structures and devices at the microscopic level. It has been used in medical field to target specific cells or tissues. The integration of nanostructures into the biomaterials gives them unique structures and special and inspiring properties. Hence a variety of Nano structural biomaterials have been applied in many aspects of daily life like medical treatment and diagnosis. This field is still fast developing and it has significant effects on improving our world. Researchers in MIT along with Brigham and Women's hospital have developed a new way to power and communicate with devices implanted deep within the human body. Such devices could be used to deliver drugs, monitor conditions inside the body.

A leap forward for biomaterials design using AI

Researchers have used AI to predict the degree of water repulsion and protein absorption by ultra-thin organic materials. By enabling accurate predictions of water repulsion and protein adsorption even by hypothetical materials the teams approach opens up new possibilities of screening and design of organic materials with desired function. Data driven approach allows for advanced material screening (Research by Tokyo Institute of Technology). Now using informatics in the field of inorganic material design has led to the rise of new types of catalyst batteries , semiconductors. Biomaterial design based on informatics, on the other hand, is still in its infancy. SAMS is one such entity that has emerged. They used machine learning and an artificial neural network (ANN) model to predict two critical aspects of ultra-thin organic materials known as self-assembled monolayers: the degree of water repulsion and affinity to protein molecules. SAMS have been frequently employed to generate model organic surfaces to investigate the interaction between proteins and materials due to their ease of production and diversity. SAMS are appealing for the development of a wide range of organic electronics and biological applications. Biomedical engineers are quite interested in the two features explored in the study. Implant materials with a low water contact angle, for example, allow for rapid integration with the surrounding hard tissues. Overall, the research opens the door to enhanced material screening and SAMS design, which could result in significant cost and time savings.

IX. Conclusion

Recent advances in plant cellulose-based biomaterial design and applications, characteristics, characterizations, and synthesis for skin tissue engineering and wound healing are discussed in this paper. Because of their amazing flexibility and three-dimensional polymeric structure, cellulose-based biomaterials are intriguing materials. They have the ability to mimic tissue characteristics, which is important in tissue engineering. Furthermore, environmental concerns have prompted scientists to shift their attention to eco-friendly materials and natural polymer-based materials for tissue engineering applications. As a result, cellulose is being evaluated as a suitable substitute for conventional polymers generated from crude coal, animal, and human biomolecules in a variety of biomedical applications. Natural biomaterials, in general, do not have good mechanical characteristics for

skin tissue engineering. However, by employing modified cellulose-based biopolymers, these limitations are overcome and immunogenic responses are avoided. Tissue engineering, on the other hand, is a rapidly growing area that focuses on the development of innovative biomaterials with changed properties in order to improve scaffold performance through physical, biochemical, and chemical tailoring. Also discussed is nanocellulose, which has a wide range of applications, including tissue engineering, enhanced wound dressing, and as a medium for drug and sensoric coupling. This review also discusses the potential cytotoxicity and immunogenicity of cellulose-based biomaterials.

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An Article on Nanomaterial and Technology for Sustainable Environment

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Abstract: *Humans come into close touch with nanoparticles, whether they are aware of nanotechnology or not. Nanotechnology is opening up new vistas for humans and introducing new items into the anthroposphere as time goes on. It has resulted in a significant advancement in the medical industry in terms of disease identification and treatment. Nanotechnology's benefits include Nanoimaging, nerve nano-repair, neuro protection, nano-neuromodulation, nano-manipulation, and so on. Nanoparticles have promising benefits not just in the medical field, but also in a variety of other fields, due to their unique qualities like as high reactivity, small size, and huge surface area. The demand for nanoparticles has increased as a result of greater use of these particles in modern science and technology, leading in increased contamination of the environment and increased exposure to biota in the biosphere. This study will give readers with a thorough understanding of nanotechnology and future applications of nanomaterials.*

Keywords: *Nanomaterial, Nanometer, Clean Energy, Green House*

I. Introduction

At the nanoscale scale, many essential things occur. On a nanoscale scale, something similar to the aroma of freshly cooked cookies occurs. Because the molecules emitted by the cookie when it bakes are so little, they are carried via the air to our noses. They float because gravity has no influence on them, and we can smell them when they are less than a nanometer. As a result, a nanometer is typically used to measure extremely small objects. Nanoscience is the study of unusual properties of materials smaller than 100 nanometers, whereas nanotechnology is the utilisation of these properties to produce new useful items. The ability to modify structures on an atomic scale makes this work conceivable. It's a multi-disciplinary field of applied science with a wide range of applications. It is a multi-disciplinary area of applied science and engineering that deals with the design and manufacture of extremely small components and systems.

Coming to the topic of the need of nanotechnology, when we question ourselves about what are some of the world's most pressing problems the first issue that pops out in our brain is the global warming trends to which the solutions include the need to better supply, store, and extend our use of the sustainable energy .So, the solutions must include more efficient electric storage cells and lightning and Nanotechnology can help. In fact many of the world's most pressing problems may be addressed in part by solutions coming from nanotechnology. Nanotechnology has recently been an incredibly exciting and profound era in the field of materials science and engineering.

The first tools to measure and make nanostructures were developed in the 1910s, but the actual development began with the discovery of electrons and neutrons, which demonstrated to scientists that matter can exist on a much smaller scale than we normally think of as small and/or what they thought was possible at the time. It was at this time that the fascination with nanostructures began. The Atomic Forces Microscope (AFM) and the Scanning Tunnelling Microscope (STM) were two of the first scanning probes to be developed. Scanning probe microscopy (STM) is a sort of scanning probe microscopy that allows you to see structures at the nanoscale. Manipulation of nanostructures can also be done with the scanning probes' tips. However, this is a lengthy procedure. This led to the development of various techniques of nanolithography electron beam lithography or nanoimprint lithography.

Two main approaches are used in nanotechnology:

Bottom up approach where materials and devices are built up atom by atom. Top down approach where they are synthesized or constructed by removing existing materials from larger entities that nanotechnology i

A unique aspect of nanotechnology is the vastly increased ratio of surface area to volume present in many nanoscale materials which opens new possibilities in surface-based science such as catalysis. The term nanotechnology was however was first coined in 1974 by Tokyo Science University professor Norio Taniguchi .Despite the views that nanotechnology is a farfetched idea with no near term applications nanoparticles, Nano powers and nanotubes already play a significant role in environmental remediation. In a way we can say that nanotechnology is playing an increasing role in solving the world energy crisis. Lanthanum Nanoparticles, Cerium Nanoparticles, Strontium Nanoparticles and other nanoparticles are finding application in the development of small cost effective Solid oxide fuels and Platinum Nanoparticles are being used to develop small proton exchange fuel cells. Next-generation lithium ion batteries will contain lithium nanoparticles, lithium nanoparticles, and lithium tetranate nanoparticles. Silicon Nanoparticles of ultra-high purity are being employed in new types of solar energy cells. As a result, we may conclude that nanotechnology goods, processes, and applications are likely to considerably contribute to environmental and climate protection by conserving raw resources, energy, and water, as well as lowering greenhouse emissions and hazardous wastes. It has also shown to be a versatile platform for tackling material sustainability in agriculture by developing smart systems for the controlled/precision release of nutrients, fertilisers, and pesticides.

As previously said, nanotechnology has shown to be a versatile platform for solving global environmental concerns (Diallo and Brinker 2011; Brinker and Ginger 2011). Nanomaterials have unique physicochemical features that make them particularly appealing as functional materials for environmentally friendly solutions. They have substantially larger and more active surface areas than bulk materials in terms of mass. Nanomaterials can be functionalized with a variety of chemical groups to improve their affinity for a certain substance, such as dissolved solutes and gases. Chemical groups that selectively target major biochemical elements and metabolic/signaling networks of aquatic bacteria and viruses can also be added to them. Nanomaterials are also opening up hitherto unimagined possibilities for the development of functional materials with superior electrical, optical, catalytic, and magnetic capabilities. Water-soluble supramolecular hosts, particles, fibres, and membranes are all possible form factors for these novel functional materials. We present an overview of current advancements in using nanotechnology to address global concerns in (1) water purification, (2) clean energy technologies, (3) greenhouse gas management, (4) materials supply and use, and (5) green manufacturing and chemistry in the sections below. acturing and chemistry are two things that come to mind while thinking about chemistry.

II. Water Purification

Clean water supply has emerged as one of the most pressing issues confronting society and the global economy in the twenty-first century. Many parts of the world have many issues in providing safe drinking water as well as clean water for agriculture, food processing, energy generation, mineral extraction, chemical processing, and industrial manufacture on a long-term basis. Water supplies are being challenged by increasing contamination and salinization of freshwater sources such as lakes, rivers, and groundwater aquifers, while demand for water is rising due to population expansion. According to a report published by the Intergovernmental Panel on Climate Change, global climate change will have a negative impact on the world's freshwater resources in several ways: (1) increasing the frequency of droughts and floods; (2) decreasing the amount of water stored in snowpack and glaciers; and (3) lowering overall water quality due to increased salinity and enhanced sediment, nutrient, and pollutant transport in many watersheds around the world. To meet the expanding demand throughout the world in the next decade and beyond, a much bigger amount of clean water must be created from impaired water (e.g., wastewater, brackish water, and seawater). Water treatment, desalination, and reuse technologies are all benefiting from the convergence of nanotechnology and water research and technology. We have chosen fifteen (15) previously published JNR articles for this special issue to highlight major achievements made possible by the application of nanotechnology to water.

Reverse osmosis (RO), nanofiltration (NF), ultrafiltration (UF), and microfiltration (MF) are pressure-driven membrane technologies that are becoming significant components of modern water treatment, reuse, and desalination systems around the world (Savage and Diallo 2005; Shannon et al. 2008). This JNR special issue has four (4) articles devoted to fundamental studies of membrane processes, materials, and systems. Swaminathan et al. (2012) evaluate the state-of-the-art of nanocapillary array membranes (NCAMs) as model systems for studying ion and particle transport in nanopores with characteristic length scales ranging from 1 to 100 nm in their article Ionic transport in nanocapillary membrane systems. NCAMs are nanoporous membranes with variable pore diameters that are manufactured utilising polycarbonate as a base polymer with track etching. Pore geometry, surface charge, and nonlinear electrokinetic phenomena emerging from the interaction of surface charge density and surface energy control ion and charged particle movement in nanopores with diameters below 100 nm, according to the scientists. They also discussed how basic knowledge derived from fundamental NCAM studies is opening up new avenues for designing (1) biomimetic membranes for water desalination and (2) 3D micro-/nanofluidic systems for sustainability applications such as chemical separations, analysis sensing, and energy conversion. Park et al. (2012a) describe the preparation, characterization, and evaluation of a new family of ion-selective nanofiltration (NF) membranes using polyvinylidene fluoride (PVDF) and hyperbranched polyethylenimine (PEI) as building blocks in their article Nanofiltration membranes based on polyvinylidene fluoride nanofibrous scaffolds and crosslinked polyethyleneimine networks. The crosslinked hyperbranched PEI networks are supported by PVDF nanofibrous scaffolds electrospun onto commercial PVDF microfiltration (MF) membranes in these innovative nanofibrous composite (NFC) membranes. In comparison to commercially existing membranes, one of the main goals of this research was to construct positively charged NF membranes that can operate at low pressure (less than 10 bar) with high water flux and enhanced rejection for monovalent salts like NaCl. The NFC–PVDF membrane with crosslinked PEI/trimesoyl chloride networks has a high water flux (30 L m2 h1) and high rejections for MgCl2 (88%) and NaCl (65%) at pH 6 and pressure of 7 bar, according to proof-of-concept measurements. PVDF nanofibers and hyperbranched PEI appear to be promising

building blocks for the fabrication of a new generation of high-performance NF membranes for (1) water purification and (2) metal extraction from non-traditional sources such as mine tailings and industrial wastewater, according to the findings of this study (Fromer and Diallo 2013).

Due to their enormous surface areas and exceptional optical/electronic capabilities, metal oxide nanoparticles offer a lot of potential as catalyst materials for water purification (Savage and Diallo 2005). Titanium dioxide (TiO2) nanoparticles have emerged as promising photocatalysts for water treatment in the recent decade. TiO2 nanoparticles have a wide range of applications and can act as both oxidative and reductive catalysts for organic and inorganic contaminants. The synthesis, characterisation, and assessment of TiO2-based photocatalysts for water treatment are the subjects of three (3) articles in this JNR special issue. Kuvarega et al. (2012) study the photocatalytic activity of MWCNT/N, Pd co-doped TiO2 nanocomposites in the paper Multiwalled carbon nanotubes decorated with nitrogen, palladium co-doped TiO 2 (MWCNT/N, Pd co-doped TiO 2) for visible light photocatalytic degradation of Eosin Yellow in water. The photodegradation of Eosin Yellow was evaluated under simulated solar and visible light irradiation to investigate catalyst reactivity. Using simulated solar light and visible light, they found that the 0.5 wt percent MWCNT/N, Pd co-doped TiO2 composite had high degradation rate constants of 3.42 102 and 5.18 103 min1, respectively. Mahlambi et al. (2012) describe the fabrication of TiO2 nanocatalysts on CCA supports in their paper Synthesis and characterisation of carbon covered alumina (CCA) based TiO 2 nanocatalysts with increased visible light photodegradation of Rhodamine B. The CCA-TiO2 photocatalysts had a stronger reactivity under visible light than their unsupported counterparts, according to the authors. Metal oxide nanoparticles are also opening up new ways to improve the efficiency of magnetic separations in water purification (Ge et al. 2011; Ling and Chung 2011). The synthesis, characterization, and assessment of MNPs for water treatment are the subjects of four (4) articles in this JNR special issue. Okoli et al. (2012) discuss the synthesis, characterization, and evaluation of composite magnetic nanoparticles (MNPs) with an iron oxide core and a shell consisting of sorbed Moringa oleifera proteins in their article Protein-functionalized magnetic iron oxide nanoparticles: time efficient potential-water treatment. The authors claimed that their protein-stabilized MNPs may be used in water treatment to reduce turbidity (i.e. suspended particles) from surface water. Okoli et al. (2012) also shown that by combining MNPs with magnetic separations, they were able to remove more than 90% of the turbidity from a test surface water sample in under 12 minutes. Using conventional gravity separation with a synthetic and non-recyclable coagulant such as alum, only 70% of the turbidity was removed in 60 minutes.

III. Clean energy technologies

One of the most pressing issues confronting the twenty-first century is global climate change (Solomon et al. 2007). Increasing emissions of greenhouse gases such as carbon dioxide (CO2) from the combustion of fossil fuels (e.g., coal and petroleum) have been identified as the primary drivers of global climate change over the previous two decades (Solomon et al. 2007). As the world population exceeds 8–10 billion by 2050, meeting the growing need for energy while considerably lowering CO2 emissions would necessitate the deployment of orders of magnitude more clean and renewable energy systems than are currently in existence. Nanotechnology opens up hitherto unimagined possibilities for the advancement of clean and sustainable energy systems. Clean energy technologies are the subject of four articles in this JNR special edition. Due to its abundance, diversity, and ease of implementation with minimal environmental impact in terms of water use and land utilisation, solar photovoltaics has emerged as the most appealing source of renewable electrical energy. Patel et al. (2012b) investigate the use of graft copolymers as

structure-directing agents for the fabrication of mesoporous thin films containing titanium dioxide (TiO2) layers used as anodes in their article Poly(vinyl chloride)-g-poly(2-(dimethylamino ethyl methacrylate) (PVC-g-PDMAEMA) graft copolymer templated synthesis of mes Following that, the authors used these new mesoporous TiO2 films to create a photoanode for a dye-sensitized solar cell (DSSC) with a 3.2 percent energy conversion efficiency at 100 mW/cm2. When utilising a TiO2 layer with a larger porosity and lower interfacial resistance between the anode and the cathode, this performance was improved. According to the authors, they achieved one of the highest reported energy conversion efficiency for a quasi-solid-state DSSC with a 600-nm-thick TiO_2 film. The article SnO_2, IrO_2, Ta_2O_5, Bi_2O_3, and TiO_2 nanoparticle anodes: electrochemical oxidation coupled with the cathodic reduction of water to yield molecular H_2 by Choi et al. (2012) discusses hydrogen generation by solar water splitting using organic contaminants in wastewater as sacrificial electron donors. This research could be significant since solar radiation is intermittent, and large-scale solar power implementation would necessitate efficient devices that transform solar energy into high-density chemical fuels. The scientists proved the viability of a scaled-up rooftop prototype of a hybrid photovoltaic electrolysis system (Fig. 2) that uses semiconductor nanoparticles placed on metal substrates as electrodes for hydrogen generation and organic compound oxidation in wastewater.

Transportation accounts for roughly 66 percent of oil consumption and 33 percent of CO2 emissions in developed countries like the United States (Davis et al. 2008; EPA 2008). As a result, fuel cell automobiles have the potential to meet the world's expanding need for transportation vehicles while also cutting CO2 emissions dramatically. The most promising energy conversion devices for automotive applications are polymer electrolyte membrane fuel cells (PEMFCs). Poly(vinyl alcohol) (PVA) membrane matrices were implanted with sulfated TiO2 nanoparticles (TS) and nitrilotri(methyl phosphonic acid) in these novel polymer electrolyte (PE) membranes (NMPA). At 150 °C, one of the scientists' novel PE membranes [PVA–TS–(NMPA)3] attained a proton conductivity of 0.003 S cm1. The mechanical strength of this membrane was also enhanced, which is important for applications like PEMFCs. Chung et al. (2012) discuss nanotechnology convergence for clean energy generation and novel multi-scale modelling paradigms using the fuel cell system as a benchmark example in their article Nanotechnology convergence and modelling paradigm of sustainable energy system using polymer electrolyte membrane fuel cell as a benchmark example (Fig. 3). Understanding and modelling complicated multi-physics events at various time and length scales, as well as the development of an optimization framework for application-driven nanotechnology research trends, are all part of this approach. The authors' novel holistic integration from atomistic/molecular phenomena to meso-/continuum scales is covered by their new modelling paradigm. In multi-scale model integration and system design, the authors also consider system optimization with respect to lower order parameters for a coarse-graining technique.

IV. Greenhouse Gases Management

Currently, fossil fuels generate around 80% of the energy utilised on the planet. Despite the development of numerous non-CO2-emitting energy sources, the globe will continue to burn considerable amounts of fossil fuels for the foreseeable future. As a result, carbon capture and storage is gaining traction as a potential short-to-medium-term option for lowering anthropogenic CO2 emissions into the environment. Recent developments in CO2 separation technologies utilising various membranes, including thermally rearranged (TR) polymeric membranes with CO2 selective nanocavities, show that nanotechnology has the potential to provide efficient, cost-effective, and environmentally acceptable solutions for CO2 separation, capture, and recent developments in

CO2 separation technologies utilising various membranes, including TR polymeric membranes with CO2 selective nanocavities.

V. Materials Supply and Utilization

The development of the next generation of sustainable technology and goods will also require innovations in the sustainable supply and exploitation of resources. Metals are utilised to make vital components for a wide range of products and finished items, such as aeroplanes, vehicles, cell phones, and biomedical devices. Plastics, solvents, adhesives, fibres, resins, gels, and medications are just a few of the key items and finished commodities made from carbon-based compounds generated from petroleum. Fromer and Diallo (2013) examine the use of nanotechnology to improve or achieve materials sustainability for energy generation, conversion, and storage in their essay Nanotechnology and Clean Energy: Sustainable Utilization and Supply of Critical Materials. There is a growing recognition that developing and deploying renewable energy systems on a wide scale will necessitate significant amounts of technological metals. Many current problems involving the sustainable utilisation and supply of critical materials in clean/renewable energy technologies could be addressed, according to the authors, by using (1) nanostructured materials with enhanced electronic, optical, magnetic, and catalytic properties, and (2) nanotechnology-based separation materials and systems that can recover critical materials from non-traditional sources such as mine tailings, industrial wafers, and other waste streams. Because societal, economic, and environmental factors all play a role in sustainability, it is critical to integrate fundamental science (e.g., materials synthesis, characterization, and modelling) with engineering research (e.g., system design, fabrication, and testing), commercialization (e.g., new products), and societal benefits in all cases (e.g., new jobs and cleaner environment).

As a result, nanotechnology solutions for sustainable development cannot be addressed solely through small-scale and single-investigator research grants. Sustainability research and development must be integrated with broader research goals and included from the start in major interdisciplinary programmes led by interdisciplinary teams of investigators and/or dedicated government-funded research and development facilities. So et al. (2012) examines South Korea's nanotechnology policy for sustainability throughout the last decade. It was also noted that, along with the United States, Japan, and Germany, numerous significant legislative enactments promoting both basic and application-driven research have helped South Korea become one of the leading countries in nanotechnology R&D. The writers also go through Korea's nanotechnology program's current (Third Phase) (2011–2020), which focuses on nanotechnology convergence and integration with the information technology, energy, and environmental sectors.

VI. Outlook

The world's global sustainability concerns are complicated, involving a number of interconnected areas. Nanotechnology has shown to be a versatile platform for developing technical answers to the world's global sustainability concerns. We offered a retrospective of the use of nanotechnology to improve sustainable development in this JNR paper. More specifically, we discussed the findings/results of selected articles from this special issue in order to highlight key advances in the following global sustainability topical areas: (1) water purification, (2) clean energy technologies, (3) greenhouse gas management, (4) materials supply and utilisation, (5) green manufacturing and chemistry, and (6) societal perspectives. Our analysis shows that nanotechnology continues to offer unrivalled prospects for developing functional materials for sustainable technologies and products with better electrical, optical, catalytic, and magnetic capabilities. Water-soluble supramolecular hosts, particles, fibres, and membranes are all possible form factors for these new nanomaterials. As a result, they've emerged as promising building

blocks for a wide range of sustainable applications, including (1) water treatment, reuse, and desalination, (2) energy generation, conversion, and storage, (3) CO2 capture, storage, and conversion, (4) environmental monitoring and remediation, and (5) material extraction, purification, and recovery. Because sustainability is determined by the complex interactions between the "social system" (i.e., the institutions that support human existence on Earth), the "global system" (i.e., the Earth's ecosystems that support human life), and the "human system" (i.e., everything else), it is critical to consider the complex linkages between the "social system" (i.e., the institutions that support human existence on Earth), the "human system" (i.e., everything else), and the sustainability. The United Nations began preparing its post-2015 development agenda after the June 2012 Rio Conference on Sustainable Development. Human rights, equality, and sustainability are the three guiding principles of this new agenda. The post-2015 UN development plan will necessitate significant changes in the ways we produce and consume things, manage natural resources, and govern our societies. Furthermore, the convergence of knowledge, technology, and society (CKTS) will be necessary to develop the transformative innovations and innovative technology/products needed to achieve a sustainable, healthy, secure, and peaceful world. We expect nanotechnology to remain a key component of CKTS because it has the potential to push the boundaries of sustainability and address all critical needs of human development on Earth, such as basic commodities (such as energy, water, and food), finished goods (such as cell phones, cars, and aeroplanes), and services (e.g., shelter, healthcare and employment).

However, before large-scale deployment of nanotechnology-based solutions and products for the global sustainability challenges facing the world in the next 10–20 years, it is critical to ensure that any potential adverse effects of nanotechnology on human health and the environment are effectively assessed and addressed.

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Live Attendance System Using Image Processing

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Abstract: *Attendance is a mandatory regularity of each organization. Manual attendance marking may be a troublesome, and time overwhelming work. It's vulnerable to error and manipulation to be happed. There are several innovative technologies have been developed to take attendance. Some prominent ones are biometric, thumb impressions, access card, and fingerprints. The method proposed in this paper is to record the attendance through image using face detection and face recognition. This system provides an economical and good methodology for marking attendance. Face detection, labeling the identified faces, training a classifier based on the labelled dataset, and face recognition are the four components of the proposed method. Positive and negative photos were used to create the database. To recognize the faces in a classroom, the entire database was partitioned into training and testing sets and then processed by a classifier. The third step is to take attendance using a facial recognition technique, in which an image of a classroom is provided as input, and faces are discovered along with their IDs. To avoid missing frames owing to rotational difficulties, the frames of a minute-long video are taken into account.*

Keywords: *Image Processing, Haar patterns, Adaboost*

I. Introduction

Maintenance of attendance is an important issue of every school and colleges since it is one of the primary ways to check the regularity of every student. At the moment, schools and colleges track attendance using an attendance sheet, which is a time-consuming process. Using the same time may enable the student to obtain more information from the instructor. Furthermore, because attendance is manually recorded, it is easy to manipulate. It's also tough to authenticate each student in the class. As a result, a face detection mechanism and a face recognition approach are proposed to maintain attendance. It not only saves time, but it also prohibits students from falsifying attendance records. As a result, it raises awareness among students to attend classes on a daily basis, as attendance will be tracked by an automated machine. As image recognition is very complex and challenging one affecting variety of parameters such as intensity, orientation, expression and size.

The proposed system is intended to detect and recognize the students from facial image captured in video. The entire system works autonomously and gives efficient results, in turn making attendance system effective in this growing world of technology for educational achievements. The rest of the paper is structured as follows. Section II evaluates the several existing algorithms for face detection and recognition. Section III describes the proposed method including classification procedure. Section IV shows the experimental results of the proposed system. Section V gives the conclusion of proposed system.

II. Literature Review

The majority of the researchers focused their efforts on image processing. Face detection and recognition are common image processing sub-processes. A number of algorithms for detecting and recognising a human face are available in the literature. Eigen face detection, Fisher faces, and Haar cascades are three essential methods described here.

Eigen face detection: Eigen face detection is a powerful method for detecting and recognizing faces. The components that partition the face into

feature vectors are known as Eigen faces. These vectors are also utilized to discriminate between different faces. The Eigen values of each face can be considered as a linear combination. With a few weights for each Eigen face, the face images can be rebuilt. This algorithm's processing speed is fast and even in terms of time consumption. Because Eigen face detection is pixel dependent, its accuracy is affected by light intensity. It means that it can be put to a lot of use in settings where there is enough light. This method's drawback is that it is susceptible to lighting conditions.

Fisherface: Face recognition is another application of this method. The subspace projection matrix will be generated using principal component analysis and linear discriminant analysis. The fisherface technique, unlike the Eigen face construction procedure, takes the matrix and turns it into a vector. It's similar to Eigenface, but it produces better results in low-light situations. The difficulty in building the projection matrix is a drawback of this method. More storage space is required for this.

Haar cascades: Similarly, several algorithms have been created to detect the face. Haar cascades are the most popular among them. The rectangular Haar features will be developed to detect various elements of a grey scale image, such as white and black areas. As a border, a rectangular frame will be created to aid crop the face alone from the full image. It's good for detecting several faces in a single image. The RGB image is converted to grey scale in the pre-processing step, as previously stated. The black pixels were saved, and their total number was deducted from the total number of white pixels. The output was compared to a threshold, and if the traits were found to be similar, the objective, such as a face, was detected.

III. Proposed Methodology

In general, finger prints, retinal scans, access cards, and other methods of taking attendance would be used. Face recognition is used in the proposed method in the paper. The Haar cascades concept has been used to recognize the faces of people in a photograph. The purpose is to take attendance in a classroom without the instructor's intervention. Haar cascades have an advantage over existing algorithms in that they can recognize faces in less time. For each user, a separate Haar cascade will be constructed. Negative or background photographs (images that do not contain a face) can be collected and trained here. As a result, no faces will be detected in vacant places by the system. Additionally, gather positive images or photos with faces to train the classifier that generates the Haar cascade files. Face detection can be done using the same files. As a result, Haar cascades can be used not just for face recognition but also for object detection in general.

In this paper, four steps of implementation are recommended. The first step, as illustrated in Fig. 1, focuses on face detection images acquired for two seconds in video. In addition, all frames are transformed to greyscale. The converted grey scale image is saved in the dataset in stage two, ready to be trained in the next step. Finally, if an input image containing trained faces is provided, the faces are identified along with the student ID (registered data) associated with each individual face during the dataset creation process.

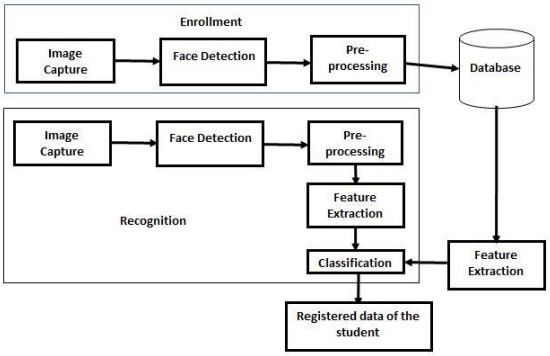


Fig. 1 - The proposed methodology for maintaining the attendance.

Viola Jones Algorithm

Viola Jones was the one to formulate the first ever real-time face detection algorithm which helped to detect faces from the images. In this module, a complete algorithmic description is implemented which includes feature computation using integral images, selection of features with the help of adaboost training and cascading for efficient allocation of computational resources. This algorithm provides fast and accurate detection.

Fig. 2 - Snapshot of face detection window

Fig 2 shows the snapshot of the face detection in image frame. To compute face detection, Viola – Jones algorithm is used. Viola Jones algorithm is divided in four phases:

1. Haar Feature Selection

In Haar feature selection, compute scalar product between the image and Haar templates. Then, calculate the difference between the number of black pixels and number of white pixels to obtain numerous features. All the images are normalized using mean and variance to recoup the effect of different lighting conditions. Images having variance value lower than one with little information of interest are excluded.

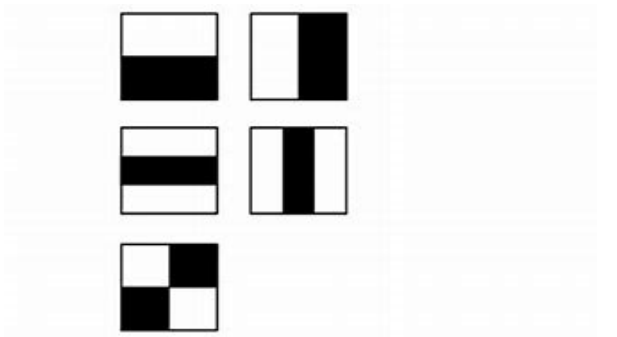


Fig. 3 - Haar patterns

Fig 3 shows Five Haar patterns that are used to compute various features from the facial images. These haar patterns marked with black or white pixels are moved over an image to compute all the features. These features help to detect faces from an image with required computation.

2. Creating an Integral Image

Integral Image is an effective way of computing the summation of pixel values in a given image. It is mainly used to compute the mean intensity value within a given image.

Firstly, create an integral image which helps to compute value at each pixel (o,p) which is the addition of pixels above (o,p) and pixels to the left of (o,p) inside a rectangular window. For integral image, the value in the Summed Area Table at (o,p) is simply calculated by:

$$Q(o,p) = E(o,p) + Q(o-1,p) + Q(o,p-1) – Q(o-1,p-1)$$

where E(o,p) is the value of the pixel at (o,p), Q(o1,p)is pixel value directly to the left of (o,p), Q(o,p1) is pixel value directly to the right of (o,p) and Q(o1,p-1) is the pixel value to the top – left of (o,p).

3. Adaboost Training

Adaboost training is used to select a subset of features and to construct the classifier. Adaboost refers to a particular method of training a boost classifier. In Boost classifier every weak learner takes input in a form of object and returns the value showing class of the object. This technique creates strong classifier from number of weak classifiers. To amplify the performance of the system on classification problems, adaboost training is done.

The training of the classifier is done as follows:

Each instance of training dataset is weighted. Set the initial weight as:

$$\text{weight } (wi) = 1/Z$$

where Z is the number of training instances A weak classifier is prepared on training data using weighted samples.

Now, calculate the stage value for trained model to provide weighing using the formula given below:

$$\text{stage} = \ln((1-\text{err})/\text{err})$$

where err is misclassification rate.

Here, stage weight shows that more accurate models have more weights or much contribution to final prediction.

Update the weight of a training instance (w) using the formula:

$$w = w*\exp(\text{stage}*\text{terr})$$

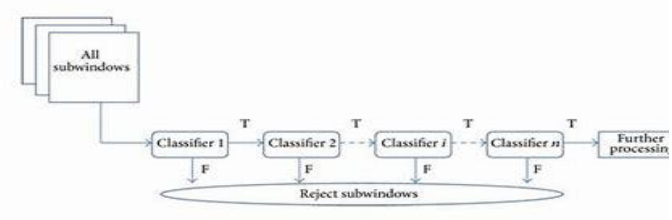
where w is the weight for training instance i and terr is the prediction error for training instance i. The strong classifier is formulated from the number of weak classifiers:

$$S(x) = m1s1(x) + m2s2(x) + m3s3(x) + \ldots\ldots$$

where S(x) is strong classifier and m1s1(x) is weak classifier.

4. Cascading Classifiers

Cascading is a peculiar case of learning which concatenates multiple classifiers. All information gathered from the output of the given classifier is used as an additional data for the next classifier in the cascade. Cascading classifiers are trained with several hundreds of "positive" sample images of face and arbitrary "negative" images (i.e., background). Both the positive and negative images must be of the same size. Once the classifier is trained it is applied to an image to detect the faces. To search for the faces from the entire image frame, the search window travels across the image and checks every location of the classifier.



Experimental Results

Conditions	Eigenface	Fisherface	Proposed method
Training Time	1081 ms	5023 ms	920 ms
Recognition%(static images)	85	89	93
Recognition%(Real time)	68	74	85
Occluded faces%	2	2.5	2

V. Conclusion

The method suggested here is concerned with face detection and recognition, which aids in maintaining attendance. The face was detected using Haar features based on the Viola-Jones approach. The Haar cascades have been found to be extremely useful in detecting faces with fewer variances in the training image collection. However, in order to generalize the system, fine tuning in terms of the number of cameras required and the length of the video clip must be performed. Given the increased amount of CC footages, the work can be expanded to detect illegal behaviors in groups and to recognize their locations. The final goal of the study is to create a proper automated system to maintain the system utilizing a multi-modal approach.

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An Article on Artificial Intelligence for Biodiversity Conservation

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Abstract *- Artificial intelligence (AI) promises to be an invaluable tool for nature conservation, but its misuse could have serve real-world consequences for people and wildlife. AI benefits the conservation of wildlife, forests, rivers and other natural resources. AI is being used to understand pattern in animal detection and counting, wildlife poaching and enhance the patrol efforts in response, research advances, field tests and real world development.*

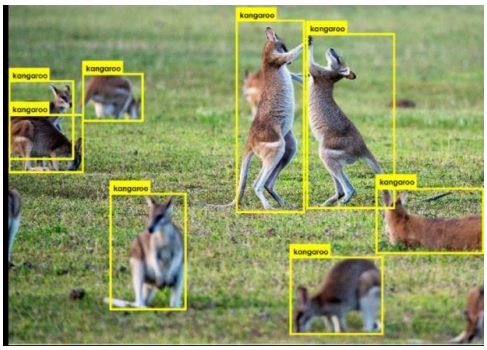
Keywords *- Animal Counting, Poaching, Machine Learning, Environmental Monitoring.*

I. Introduction

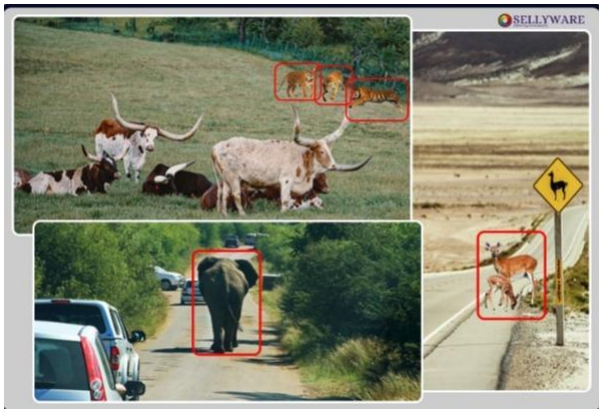
AI can play a vital role in detecting, recognizing and keeping track of wild animals wandering in their natural environment or conserved within the wildlife sanctuaries. Most importantly, AI can help in preventing the extinction of endangered plants and animals. Animal conservation is becoming one of the key issues in saving biodiversity on the earth. AI can play a vital role in detecting recognizing, and keeping track of wild animals wandering in their natural environment or conserved within the wildlife sanctuaries.

II. AI in animal detection and counting:

- Enlarged species at bink of extension are ***kept*** in special conservation.
- AI enabled machines like machine learning in robotics or drone image
- Dataset can keep an eye on such animals helping the wildlife conservation
- Authorities keeping their population under observation



Similarly computer vision technology in AI enabled drones can detect the types and species of animals inform researchers about their activities. The machine learning algorithms developed with a wide ranging huge quality of traning datasets equips AI to recognize the different species of animals.



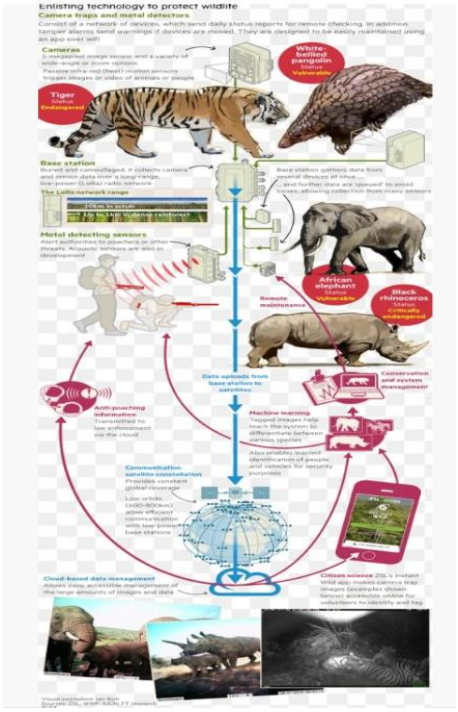
- Large animals like elephants and whales can be spotted from the satellites.
- Researchers can gather the data and keep an eye on such animal.
- Animal detection and their counting are important to make sure if their population is increasing or decreasing

III. Detecting poachers to save animals:

- Intensity killing the animals is another activity reducing the population of endangered species.
- Poaches kill animals like elephants for their horns that are sold at very high rates in the international markets.
- But now AI can help in controlling such unlawful actions through a human-less monitoring system.
- AI-enabled drones and night version cameras can detect such poachers on the ground.

The forest rangers to take the action against them before they kill any animal. The AI-enabled cameras with quick alert systems can easily spot humans with weapons and other unusual activities.

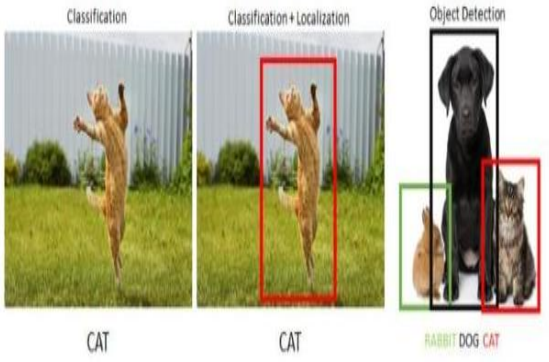
- The combination of the machines with humans working together with forest rangers can accomplish more such actions.
- Intelligent visibility from the sky, there is a great opportunity for the wildlife animals.
- And to make a drones detect varied animals, a relevant amount of high-quality training datasets are required for training the machines learning algorithms.
- Make tougher laws.



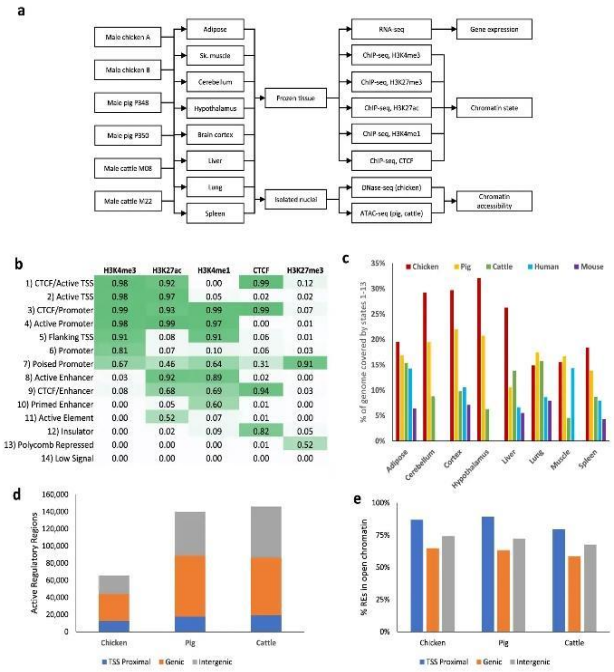
IV. Annotation for animal counting

- Reckoning the wild animals is another challenging task, especially when they are living into their natural environment. But thanks to AI, such animals identifiable to machines like drones.
- All types of animals are annotated here with best level of accuracy for right detection.
- Genetic improvement of domestic animal species has been a key driver of reducing the environmental footprint of animal source foods, which are of critical nutritional importance in developing countries.

- It is widely accepted that most of the causative genetic variants associated with complex traits are located in non-coding genic and intergenic regions that most of the causative genetic variants



Understanding the genetic basis of economically important complex traits in domestic animals is a primary focus of animal agriculture, as such knowledge provides the essential basis for the continued genetic improvement necessary to meet the projected increased demand using fewer animals.



- Experiment design schematic for the study.
- Emission probabilities of the 14-state ChromHMM model.
- Percent of the genome annotated with any functional state
- The number of regulatory elements identified in each species, separated by TSS proximal genic and intergenic.
- Percentage of regulatory elements that co-occurred with open chromatin in the tissues in which they are active

V. Conclusion

If AI can be fully and efficiently deployed into the animal conservation, it can help in saving the biodiversity of the earth. And it is only possible when the AI models are trained with the right machine learning datasets. And to develop such a fully functional model, AI companies need high-quality animal detection dataset for machine learning training to identify animals and objects with the right precision

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A Secure Whirlpool Hashing Approach using CFB Mode

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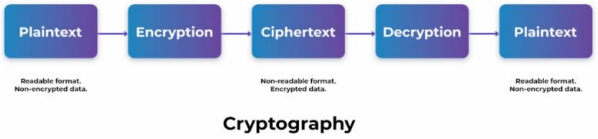
ABSTRACT –In the virtual world, data theft is on the rise, and data security has become a top priority for anybody connected to the Internet. Cryptography is an example of a data-protection method. Cryptography ensures that data is only available to the intended recipient and prohibits unauthorised people from changing or altering it. Various algorithms and approaches have been developed to attain the desired level of security. We are using two strategies to improve the security levels (Whirlpool Hash Function and Cipher Feedback Mode- CFB). Cryptography is a technique for encrypting data using certain algorithms that render the data unreadable.*to the human eye unless it is decrypted by algorithm that are predefined by the sender.*

Keywords: Cryptography, Encryption, Decryption, Whirlpool, CFB, Data Security.

I. INTRODUCTION

Cryptography is a fundamental component of computer security. It is a method for ensuring data confidentiality. Cryptography is a word with Greek roots that means "secret" and "writing." The basic premise of cryptography is to cypher data in order to ensure data confidentiality in such a way that an unauthorised person cannot decipher it. It restricts access to a message's contents to only the sender and intended recipient.

Cryptography also includes techniques like microdots and merging to obfuscate information in photographs. Cryptography has its origins in Roman and Egyptian civilizations. Cryptography is a technique for safeguarding and encrypting data at the time of communication.



Cryptography

i. Encryption

In Cryptography, Encryption is the first step in the encryption process.

Encryption is the process by which a sender transforms the original data into a different form and sends the resulting message over the network. To convert the plaintext (original communication) into ciphertext, the sender needs an encryption technique and a key (encrypted message). Encryption's primary goal

is to safeguard the privacy of digital data stored on computer systems.

ii. Decryption

In Cryptography, decryption is the process of converting translated data into its original form is called as Decryption. It's generally a rear process of encryption. It decodes the translated information, So that an authorized stoner can only decipher the data because decryption requires a secret key or word.

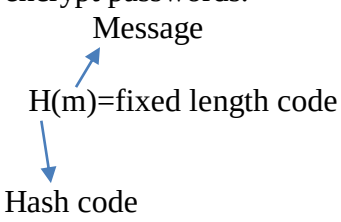
iii. Components of Cryptography:

- Plaintext: The original message or data that is utilised as input to the algorithm. It is the data that needs to be safeguarded during transmission.
- Encryption Algorithm [5-6]: On the plaintext, the encryption algorithm makes different substitutions and transmissions
- The secret key is a value that is independent of both the plaintext and the algorithm. Depending on whatever key is utilised at the time, the algorithm will yield a different result.
- Ciphertext: This is a scrambled message that is generated as an output. It is determined by the plaintext and secret key for a certain communication..
- Decryption Algorithm:- The reverse of the encryption algorithm is the decryption algorithm. It generates the original message from the cypher text.
  Cryptanalyst: In all circumstances, the goal of the cryptanalyst is to be able to decrypt new portions of ciphertext without the use of additional information. The goal of a cryptanalyst is to figure out what the secret key is.
  A cryptanalyst is a person who specialises in analysing and cracking codes and cyphers.

iv. Types of cryptography:

- Symmetric cryptography: It is the most basic type of encryption algorithm, using only a single shared key to encrypt and decrypt data. Secret key cryptography, or private key cryptography, is another name for it.

- Asymmetric cryptography:
  Asymmetric cryptography, commonly known as public key cryptography, is a kind of symmetric encryption. It encrypts and decrypts using a pair of keys.
- Hash Function:
  This algorithm does not make use of any keys. A hash value with a fixed length is calculated based on the plain text, making it impossible to reconstruct the plain text's contents. Hash functions are used by various operating systems to encrypt passwords.



II. EXISTING SYSTEM

Whirlpool

- It's an iterated cryptographic hash algorithm that replaces the compression function with a symmetric key block cypher. It is necessary to prepare the message for processing.
- The original message's length must be less than 256 bits. Before being processed, a message must be padded.
- To make the padding length an odd multiple of 256 bits, a single 1 bit is followed by the requisite 0 bits. After padding, a 256-bit block is inserted to determine the original message's length.
- The block is processed as if it were an unsigned integer. Whirlpool generates a 512-bit digest from multiple 512-bit

block messages. It is set to all 0s and 1s and serves as the encryption key for encrypting data.

- Whirlpool generates a 512-bit digest from multiple 512-bit block messages. It's set to all 0s and 1s, and it's used as the cypher key to encrypt the first block.
- After being EX-ORed with the previous cypher key and the plaintext block, the resulting ciphertext becomes the cypher key for the following block. After the last XOR operation, the message digest is the final 512-bit ciphertext.

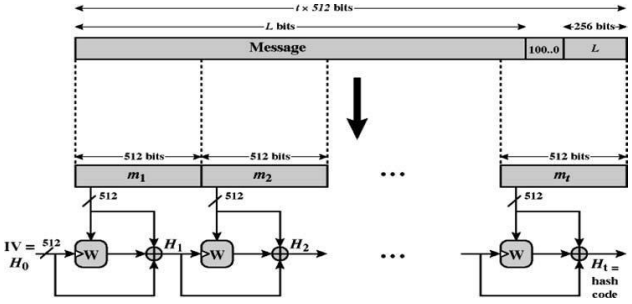


Fig - Whirlpool cipher

It's a non-feisted block cypher that can be used in a hash algorithm. There are ten rounds in all. The block and key sizes are both 512 bits. This encryption employs 11 512-bit round keys, numbered k0 through k10. It employs the use of states and blocks. A block is defined as a 64-bit row matrix. The state is an 8*8 byte square matrix. Four transformations are used in each round.

1. Nonlinear transformation is provided by sub bytes. Bytes are represented by two hexadecimal numbers, the left of which determines the row and the right of which defines the column of the replacement table.

2. Permutation is provided by the Shift Column. Column D undergoes 0 bytes of shifting (no shifting), whereas column 7 undergoes 4 bytes of shifting.

3. Mix row operative: This is a matrix transformation that multiplies each row by 8*8 matrices.

4. Add Round Key: The round key adds a key by a key schedule to the existing state using bitwise XOR.

III. PROPOSED SYSTEM

Cipher Feedback (CFB) Mode.

The ciphertext block receives feedback from the encryption process in this mode, allowing it to encrypt the next plaintext block.

Operation:-

Let's say a message block is of size s' bits, where 1sn is the number of bits. The initial random n-bit input block for the CFB [1-4] mode is an initialization vector (iv). The iv does not have to be kept hidden.

- The top register is loaded with the initialization vector iv.
- The data value in the top register is encrypted with the key k of the underlying block cypher.
- To generate cypher text block, only 's' number of most significant bits (left bits) of the result of the encryption process are collected and XORed with's' bit plaintext message block.
- The ciphertext block is fed into the top register by moving existing data to the left, and the process is repeated until all plaintext blocks have been processed.
- The previous ciphertext block is encrypted with the key, and the result is then XORed to the current plaintext block.

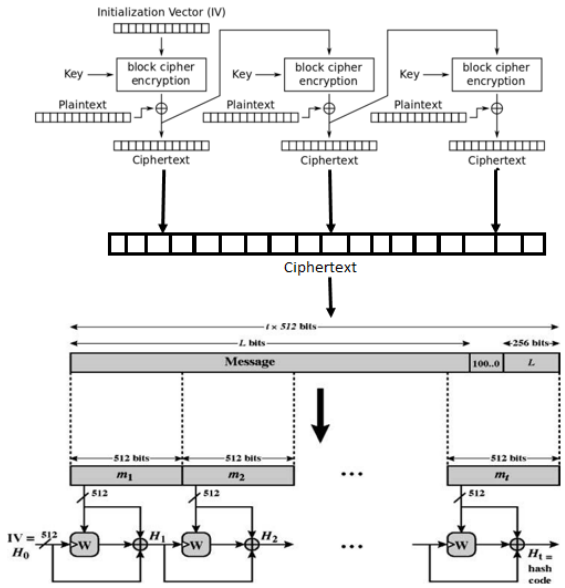


Fig - Whirlpool cipher with CFB mode

The resulting ciphertext is delivered to the whirlpool as plaintext. It should be fewer than 2256 bits long and divided into 512-bit blocks. It is initialised for each cypher that generates the ciphertext and is used to encrypt the first block. After being XORed with the previous cypher key and the plaintext block, the resulting ciphertext becomes the cypher key for the following block. After the last XOR operation, the message Digest is the final 512 bit ciphertext.

ADVANTAGE

- More security

DISADVANTAGE

- Time consuming

IV. CONCLUSION

The major goal of using the Whirlpool Hash Function with Cipher Feedback Mode is to boost security to a higher level. Cryptography is essential for attaining the basic objectives of security, such as authentication, integrity, and confidentiality. This study focuses on safeguarding data from unauthorised access.

V. REFERENCES

[1] "Recommendation for block cipher modes of Operation methods and techniques" Evans DL, Bond PJ, Bement AL, Dworkin M. USA: NIST Special Publication; 2001. pp. 800–83.

[2]"Block Cipher Chaining Modes of Operation" Knudsen LR. 2000 Oct.

[3] "Counter Chain: A New Block Cipher Mode of Operation, Journal of Information Processing Systems" El-Semary AM, Azim MMA. Information Journal of Process Systems. 2015; 11(2):266–79.

[4]"Cipher Block Chaining Mode Using AES" Pavan A. C, Shweta. S. Magadum - International Journal of Innovative Science and Research Technology, Volume 5, Issue 3, March – 2020, ISSN No:-2456-2165

[5] "Implementation of Advanced Encryption Standard" by M. Pitchaiah, Philemon Daniel, Praveen, — in International Journal of Scientific & Engineering Research Volume 3, Issue 3, March - 2012

[6]"Encryption Process With Block Cipher & Mac", Pavan A. C - Journal of Emerging Technologies and Innovative Research (JETIR), January 2020, Volume 7, Issue 1, (ISSN-2349-5162)

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An Article on Cryptocurrency

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Abstract: *Since the release of lead-off revolutionary 'Crypto Currency',it has evolved unpredictably and unmatched speed over the course of its short life-span.Bitcoin was released to the public sector in January 2009,since then more than 550 cryptocurrencies have been developed,but with atom of success. Research on the industry is still insufficient.Bitcoin is the only cryptocurrency which is mainly being focused on and immovably being fast-forward by fluid industry developments , including new coins, technological progression, and increasing government regulation of the markets. Though the industry is unstable ,it is presenting a challenge to research, a thorough evaluation of the crypto currency industry writ large is necessary. This paper is aiming for providing a short complete analysis of the crypto currency industry with particular analysis of Bitcoin.*

Keywords: *Cryptocurrency, Bitcoin, Blockchain, Trading.*

I. Introduction

In recent times, crypto currency has become a subject of discussion among the public at large scale. It is a sort of digital currency which uses cryptography i.e it encrypts the data ensuring secure transfer of digital money, while hiding the identity of its users. In other words, it is a collection of binary data designed as a circulating medium where an individual coin ownership is saved in a computerised ledger that is encrypted strongly for security purposes of transaction. The first ever decentralized crypto-currency created was 'BITCOIN', which began trading in January 2009.

Here are few largest cryptocurrencies by their market capitalization

1. Bitcoin (BTC)
   - Price: $56,399
   - Market cap: $1.1 trillion
2. Ethereum (ETH)
   - Price: $3,496
   - Market cap: $413 billion
3. Binance coin (BNB)
   - Price: $430
   - Market cap: $72 billion
4. Cardano (ADA)
   - Price: $2.12
   - Market cap: $70 billion
5. Tether (USDT)
   - Price: $ 1.00
   - Market cap: $69 billion

II. Cryptocurrency in India

The impact of cryptocurrencies on the Indian economy is clearly picturized as the prices of the cryptocurrency market are falling down. The Indian government has made themselves clear by taking a stand for not providing a legal status for cryptocurrency in India. Despite this people have taken the risk of trading. According to broker discovery and comparison platform broker chooses "India leads with highest number of crypto owners all over the world at 10.07 crore as per the report on 13 oct 2021.

III. Advantages of Using Cryptocurrency

- A cryptocurrency transaction is generally a quick and straightforward process.
- Every cryptocurrency transaction is recorded in a public list called Blockchain.
  - Blockchain is a method of recording information in a way that makes it difficult or impossible to change, hack or cheat the system.
- Blockchainis an attempt to cut out mediators where therewill be no payments processing fees.
- Now-a-days in the large sector people are going with cryptocurrency payment.
- This account is yours alone.

There are few limitations too, they are as follows:

- You may lose your virtual portfolio or delete your cryptocurrency..
- Some people don't think it is safe to turn 'real' money into bitcoins as the value of cryptocurrencies such as bitcoins can change dramatically.
- **As the cryptocurrency** market is not regulated by the **FinancialEthicsAuthority** (FCA)**,norules** are in place to protect your business..
- Cryptocurrency swaps are vulnerable to cyber attacks which could lead to an irreparable loss of your investment.

Cryptocurrency has become a new and attractive platform for investors, scammers and hackers for the past couple of years. The recent price swings of cryptocurrencies are unpredictable, making the crypto market uncertain. The investors should be aware about the risks involved in the crypto market and the fundamentals that will keep the crypto investments safe and protect the digital assets.

Here are some things you can do to take care.

- Although there are many types of wallets to store these assets, the investors should store their assets in a cold or physical wallet with only a little amount of money on the online wallet. This way, the large amount of money will be out of reach from the scammers.
- Use a secure network and strong passwords and make sure that this information is not disclosed to the wrong persons..
- One should stay suspicious and cautious during investing in a new offer or deal.
- Avoiding bad tweets and other social media updates.
- Backing up wallet data regularly.
- Utilizing multi-signature features.

IV. The Future of Cryptocurrency

- A beneficial rise in economic activities: Bitcoin, the most famous of these cryptocurrencies, has already permitted many people and companies to develop and flourish, while many also rely on trading as their source of income.The economy is moving slowly to adjust to these needs and cryptocurrencies have great potential to meet them..
- Great opportunities for poorly banked countries:as there are now a lot of applications and programs that make it easier to use cryptocurrencies and bring them closer to the wider audience.A further advantage of using cryptocurrency is that it is completely decentralized, so trade can be done freely across borders.The use of technology will make it easier to make financial connections, empower and empower everyone.

V. Conclusion

As cryptography matures, it will become highly stable and easily transferable,and a reserve of value that will make it more used by companies, government and everyone else in everyday life..

Cryptocurrency is still much in its infancy and some people are still skeptical about it but it is here to stay and has been adopted into more experience and will be a currency used by everybody that is only a matter of time with acceptance and how widely discussed it is, the future of crypto is sure to be brilliant.

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Green Innovation in Cryptocurrency

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Abstract: *The cryptocurrency community serves as a special green energy buyer that could enable public to implement, considerably more solar and wind generation capacity. This implementation, in addition to energy storage, intent to ease the adaptation to cleaner electricity. Cryptocurrency mining, in combination with renewable energy is well suited to accelerate the energy transition. These developments are merely the beginning of a promising exploration of solutions, to help the adaption to clean energy future.*

Keywords: *Cryptocurrency, Blockchain, Bitcoin, Energy Consumption, Bitcoin Mining.*

I. Introduction

In this digital age, money is taking a new form. cryptocurrency, based on a peer-to-peer network wherein to send money to somebody, you wouldn't have to send it through an intermediary like a bank instead could just send it directly to somebody else's wallet. transactions are recorded and verified on a public ledger known as blockchain, resembling to the conventional standard of banks using a ledger, but with cryptocurrency instead of being in a centralized bank, all those verifications are being done by thousands of people around the world by use of computer hardware called ASIC miner. Some widely known cryptocurrency includes Bitcoin, Ethereum, Dogecoin, ripple, cardano.

Cryptocurrency mining is the process of utilizing computing hardware called ASIC miner for solving a complex algorithm called the sha-256 algorithm, an extremely difficult math problem that has 2^256 possible answers for the intention of verifying transactions on the cryptocurrency blockchain and mining new blocks in the blockchain and in return, cryptocurrency miners are incentivized by receiving little bits of cryptocurrency.

Cryptocurrency system has numerous advantages over centralized currencies-

- Decentralized currency
- Inability to counterfeit
- Transparent
- Very low transaction fee

it can move massive sums of money cheaply including one on April 10th of 2020 in which 146,500 Bitcoin's worth 1.1 billion dollars moved in a single transaction for a fee of roughly five dollars.

Creator of Bitcoin, Satoshi Nakamoto's viewpoint on Bitcoin: "It's the same situation as gold and gold mining. The marginal cost of gold mining tends to stay near the price of gold. Gold mining is a waste, but that waste is far less than the utility of having gold available as a medium of exchange. I think the case will be the same for Bitcoin. The utility of the exchanges made possible by Bitcoin will far exceed the cost of electricity used. Therefore, not having Bitcoin would be the net waste." [3]

II. Objectives

The objectives of this study as follows-

1. Cryptocurrency's Energy Consumption
2. Cryptocurrency Mining and green innovation
3. Green Innovation in Cryptocurrency Mining

III. Discussion

A. Cryptocurrency's Energy Consumption

The rise of Bitcoin over the last several years has made some people millions of dollars and inspired millions of other people to get in as well and also sparked a lot of debate for some people.one aspect of cryptocurrency that's been getting a lot of attention lately is the energy usage of about 120 TWh per year, about the same as country like Sweden with a population of 1.04 crores.

Bitcoin uses a lot of electricity, there's no argument there, but so does many other things.

Industry	Energy Consumption in TWh
Manufacturing	17,710
Mining	2,760
YouTube	250
Appliances plugged in but not turned on	0.6

Table 1. Electricity Consumption

The reality is, any particular thing on a huge scale consumes more power than a small country and also none of this comparison are fair because cryptocurrency isn't a kitchen appliance or a country, instead it is a secure payment infrastructure that enables to store and transfer funds without a middleman.

B. Cryptocurrency Mining and green innovation

Much of cryptocurrency's electricity comes from renewable energy sources, a recent study by Centre for Alternative Finance from the Cambridge suggests that 39% of electricity used by cryptocurrency network is from renewable source of energy and that is notable, because there are very few industries that have hit, that level of renewable energy use. The Cost of solar and wind energy has fallen 90% and 71%, respectively, over the last decade. The cost of solar and wind energy are now 3-4 cents / kWh and 2-5 cents / kWh, respectively. On the contrary, the cost for fossil fuels such as coal or natural gas is ~5-7 cents / kWh. Thereby the solar and wind energy source are already cheaper than coal and natural gas. Wind and solar energy also just reached cost comparative with both geothermal and hydroelectric, which at around 3-5 cents / kWh are inexpensive, but are geographically limited. Cryptocurrency mining has become influential in accelerating the green energy, the reason being, miners operate where electricity is cheapest, since cheaper electricity means more profits. Given that, renewable energy sources like solar, wind, geothermal and hydroelectric cost half the price of coal and natural gas. Thereby, crypto mining, can and has optimized renewable energy utilization.

C. Innovation in Bitcoin Mining

SolarCoin is a cryptocurrency that seeks to motivate solar installations. like Bitcoin, SolarCoin cannot be mined using energy consuming computing hardware instead solar energy must be produced to mine SolarCoin.

SolarCoin is offered to owners of solar panels to reward solar power generation, not consumption. SolarCoin's goal is to make solar energy more accessible by arriving a point where the value of this cryptocurrency exceeds the production cost of producing this renewable power.

Mint Green is a Canadian company specializing in heat recovery from cryptocurrency mining. Mint Green's mining model is that energy is used twice, first to mine Bitcoin, and then to provide industrial heating using the heat generated by ASIC miners. Mint Green's commercial partnership with Vancouver Island Sea Salt uses a liquid immersion mining system

to heat large evaporation tanks to produce gourmet flake salt. Their second collaboration with a distillery utilizes heat from cryptocurrency mining in the mash process of whisky production. As the mining industry continues to evolve and optimize, the innovative use cases for repurposing heat are just one of many ways that Bitcoin's environmental impact can be lowered. nonetheless, cryptocurrency is a comparatively new industry and is still being developed, so succeeding energy-efficient technology and innovations are anticipated.

IV. Conclusion

Things only have value because we say it has value and agree on that value, like 10 Rupee note is only worth 10 Rupee because we have all agreed that it is worth 10 Rupee. So, if you consider cryptocurrency as valuable asset or usable currency, then all of that electricity is worth it, but deem it as a gamble, then it just looks like madness. Cryptocurrency is a modern, decentralised digital currency, offering more than finance, by accelerating renewable energy source and thereby, we must encourage cryptocurrency.

V. References

[1]Bitcoin - Wikipedia

[2]Joe Scott.(2021). Exactly How Bad Is Bitcoin For The Environment? | Answers With Joe.youtube

[3]Satoshi Nakamoto.(2010).Bitcoin is thermodynamically perverse.twitter

[4](2021). Bitcoin is Key to an Abundant, Clean Energy Future. square

[5](2021). The cryptocurrency that aims to inspire solar installations.energymatters

[6](2021). Green Innovation in Bitcoin Mining: Recycling ASIC Heat.braiins

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Smart Agriculture and Agro Based Industries: An Article

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Abstract: *Because IoT sensors can provide information about agriculture fields and then act on it based on user input, smart agriculture is a new concept. The study attempts to make use of growing technology, such as the Internet of Things (IoT) and smart agriculture through automation. The ability to monitor environmental variables is a key aspect in increasing the production of efficient crops. The invention of a system that can monitor temperature, humidity, and wetness, among other things, is a characteristic of this study. This paper provides a thorough introduction of IoT technologies, as well as the types, benefits, and drawbacks of smart farming systems. Agro-based industrial development is dependent not only on a country's innovation and capital outflow, but also on the availability of raw resources and physical infrastructure. Agriculture is a major source of raw materials for major businesses such as paper, sugar, textiles, fertilisers, chemicals, edible oil, and so on. Agro-based industries have the potential to play a significant role in alleviating poverty, unemployment, and inequality in India, as well as contribute significantly to the overall development of the economy by efficiently utilising local raw materials, potentially increasing gainful employment opportunities for poor people, particularly landless, marginal, and small farmers. The performance of India's agro-based industries is discussed in this article.*

I. Introduction

Population expansion is accompanied by a rise in the need for food production. According to the FAO, the global population will reach 9.73 billion by 2050, and will continue to rise until it reaches 11.2 billion by 2100. Many obstacles obstruct agricultural output, resulting in lower crop productivity, such as soil salinity in arid climates. Furthermore, the climate has an impact on crop quantity and quality, as well as increasing soil sensitivity to desertification. As a result, it is critical to concentrate on surveying land resources for use in agricultural growth in dry regions. One of the most significant pillars of national income is the agricultural industry. As a result, deploying new technology to better the agriculture sector is a critical issue for the countries' national economies. Smart agriculture is a new concept that refers to managing farms with internet of things, sensors, positioning systems, robots, and artificial intelligence, among other technologies, to raise the number and quality of goods while reducing the amount of human labour required for production. Agriculture, farming, and husbandry have all been important occupations throughout human history. Agriculture and industry are intertwined in the development process because agriculture provides input to industry

and industry offers output to agriculture in order to enhance production. Agriculture production is the foundation of many industries.

Agriculture provides raw materials and other essential inputs to agro-based industry. Agro-based industries provide more prospects for industrial expansion and integration of the economy's many sectors. Food processing industries and non-food processing industries are the two types of agriculture-based enterprises.

II. Technologies used in Smart Agriculture

Sensors - Sensors give information that helps farmers monitor and optimise their crops by adjusting to changes in the environment. Weather stations, drones, and robots used in agriculture are equipped with the sensors. Mobile apps built expressly for this purpose can be used to control them. With the use of mobile phone apps, sensors can be controlled directly over wifi or via cellular towers using cellular frequencies.

Drone technology- is utilised to monitor the health of plants as well as collect data on manufacturing processes. Drones collect precise data that farmers can use to make long-term decisions about replanting, ground mapping, damage control, and other things**.**

Satellites - Satellites can detect agricultural conditions over tens of thousands of square metres. Satellite data can be used by farmers to determine soil and crop conditions and features, monitor growth, and analyse soil and irrigation needs.

Robotics - Farmers can focus more on boosting overall crop yields by using agricultural robots to automate slow, repetitive, and boring jobs. Harvesting and picking, avoiding insecticides for weed control, evaluating soil faults, and other tasks are all performed by robots in agriculture.

Analytics and data science - Data science can provide practical insights on what to plant, when to plant, and what farm methods to use that are specific to a farmer's land and ownership patterns. Making well-informed decisions can help farmers save money and increase their profits. With AI incorporated in agriculture analytics, you can extract useful information that can lead to improved plant and animal health, crop yields, sustainable practises, and more. Manage product research data for plant, soil, and animal health to improve precision agriculture.

III. Types of Smart Agriculture using IOT

1. **Monitoring Climate Conditions** - Weather stations, which combine numerous smart farming sensors positioned around the field, collect various data from the environment and transfer it to the cloud, are probably the most popular smart agriculture gadgets. The information provided can be used to map climate conditions, select appropriate crops, and take the necessary steps to improve their capability (i.e. precision farming).
2. **Greenhouse automation** - Greenhouse farming refers to the practice of producing crops and vegetables in a controlled environment such as a greenhouse. Light, ventilation, humidity, and temperature may all be managed in greenhouses. This enables the farmer to develop and maintain optimal

micro-ecosystems for his or her plants, allowing them to grow strong, attractive, nutritious, and tasty plants. Through IoT integrated technology, a smart greenhouse not only monitors but also manages the environment. As a result, there is no need for human intervention.

3. **Crop management** Crop management devices are another sort of IOT product used in agriculture and a component of precision farming. They should be installed in the field, just as weather stations, to collect data unique to crop farming**,** such as temperature and precipitation, as well as leaf water potential and general crop health. As a result, you'll be able to keep track of your crop's progress and any irregularities in order to efficiently prevent diseases or infections that could impair your production.
4. **Cattle monitoring and management** Cattle monitoring and management - Similar to crop monitoring, IOT agriculture sensors can be attached to farm animals to monitor their health and log performance. Livestock tracking and monitoring aid in the collection of data on the health, well-being, and physical location of livestock. Such sensors, for example, can identify sick animals, allowing farmers to separate them from the herd and avoid contamination. Using drones for real-time cattle tracking also helps farmers save money on labour.
5. **Precision farming** - Precision farming, often known as precision agriculture, focuses on efficiency and data-driven decision-making. It's also one of the most common and successful IOT applications in agriculture. Farmers may collect a wide range of data on every aspect of the field microclimate and ecosystem with IOT sensors, including illumination, temperature, soil condition, humidity, CO2 levels, and insect infestations. Farmers may use this information to calculate the best amounts of water, fertiliser, and pesticides for their crops, cut costs, and create healthier, more productive crops..
6. **Agricultural Drones** - The use of agricultural drones in smart farming is perhaps one of the most promising agro tech breakthroughs. Drones, also known as UAVs (unmanned aerial vehicles), are better fitted to collect agricultural data than aeroplanes and satellites. Drones can also undertake a wide range of duties that traditionally needed human labour, including as growing crops, controlling pests and illnesses, agriculture spraying, crop monitoring, and so on.
7. **Predictive analytics of smart farming** - Precision farming and predictive data analytics are inextricably linked. While IoT and smart sensor technology provide a goldmine of highly relevant real-time data, farmers can use data analytics to make sense of it and make important predictions such as crop harvesting time, disease and infestation risks, yield volume, and so on. Data analytics tools make farming, which is inherently highly dependent on weather conditions, more manageable and predictable.
8. **End-to-end farm management systems** - The so-called agricultural productivity management systems reflect a more comprehensive approach to IOT goods in agriculture. A variety of farm IoT devices and sensors are typically put on the

premises, as well as a robust dashboard with analytical capabilities and built-in accounting/reporting functions. This allows you to monitor your farm from afar and streamline most of your business processes.

Advantages of smart agriculture

1. **Increased Production**- Crop treatment, such as precise planting, watering, pesticide application, and harvesting, has a direct impact on yield rates.
2. **Water Conservation**- Water is only used when and where it is needed, thanks to weather projections and soil moisture sensors.
3. **Real-Time Data and Production Insight**- Farmers can see production levels, soil moisture, sunlight intensity, and other factors in real time and from afar to help them make better decisions.
4. **Lowered Operation Costs** - Planting, treatment, and harvesting operations that are automated can reduce resource use, human error, and total cost.
5. **Increased Quality of Production** - Analyzing production quality and results in relation to treatment might help farmers improve product quality by adjusting methods.

6. **Accurate Farm and Field Evaluation** - Tracking production rates by field over time provides for precise forecasting of future crop yield and farm value.

.7. **Improved Livestock Farming** - Animals' reproduction and health events can be detected sooner using sensors and equipment. The ability to trace the location of geo fence can help in livestock management and monitoring.

8. **Reduced Environmental Footprint** - All conservation initiatives, such as reduced water usage and higher productivity per land unit, have a favourable impact on the environment.

9. **Remote Monitoring** - Local and commercial farmers can use an internet connection to monitor many fields in multiple locations across the world. Decisions can be taken instantly and from any location.

10. **Equipment Monitoring** - - Farming equipment may be tracked and maintained based on output, labour efficiency, and failure prediction.

Disadvantages of smart agriculture

Smart agriculture's disadvantages

1. Smart agriculture necessitates continuous internet access. This requirement is not met in rural areas. Furthermore, the internet connection is slower.
2. Smart farming equipment necessitates farmers understanding and learning how to use technology. This is a significant challenge in implementing smart agriculture farming on a large scale across countries.

3. In the case of equipment such as robots and computer-based intelligence for operating the devices, it is highly unlikely that a typical farmer will be able to possess or even develop this knowledge.

4. Farmers are not accustomed to these cutting-edge technologies. They are unable to comprehend computer language or artificial intelligence. The Internet of Things (IoT) is being used in smart agriculture.

Things are critical that will necessitate the use of artificial intelligence and computer-based intelligence. This cannot be balanced in this context.

2. Farmers must understand and learn how to use technology in order to use smart farming equipment. This is a significant challenge in implementing smart agriculture farming on a large scale across countries.
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5. If the devices are to be modified based on the farmers' skill level, it will cost a lot of money to transform these types of equipment. This, on the other hand, means that the process will be extremely expensive.
6 Huge investments in this space are unlikely because the farming industry is not seeing higher profits. Even after the machines have been modified, farmers may continue to operate them incorrectly, causing them to be damaged or sent to be repaired. Because these pieces of equipment are already expensive, repairing or replacing it will cost a significant amount of money. Whether there is a repair or not, the cost of maintenance rises.

IV. Agro Based Industries

Agro based Industries are those industries which use agricultural products as their basic raw materials. Major agro-processing industries include food processing, sugar, pickles, fruit juice, and beverages. Textiles, sugar, paper, and vegetable oil are examples of agro-based industries. Agricultural products are used as raw materials in these industries. The textile industry is the largest in the organised sector. Cotton textiles, woollen textiles, silk textiles, synthetic fibres, and jute textile industries are all part of it. Textiles have long been an important part of the industrial sector. It generates nearly a fifth of industrial output and a third of export earnings.

The Importance of Agriculture - All branches of agro-based industry are vital because they increase industrial products, provide employment, earn foreign exchange, raise income levels, and also employ women. employment, earn foreign exchange, increase income level and also provide employment to women and provide a base for development for backward areas.

Types of Agro based Industries

Agro-based industries are divided into different categories based on the raw materials they use and the services and output they give. -

1. **Agro-processing units** - These units do not produce any new products. Instead of creating new products, they simply process the basic ingredients to extend their shelf life by adding preservatives and package them in a way that makes transportation easier and less expensive.
2. **Agro-produce manufacturing units** - These units work on new product development, with the finished goods differing significantly from the raw materials used. Sugar mills, solvent extraction facilities, and textile mills are

just a few examples.

3. **Agro-input manufacturing units** - These units are primarily responsible for the development of the agriculture sector since they create commodities that are essential for boosting agricultural production, including mechanisation.

4. **Agro-service centre** - These are basic units that provide people with agricultural-related services such as farm equipment repair, educational programmes, and so on.

India's top agro-based industries Cotton, jute, silk, wool, and man-made fibres are used in the textile industry as raw materials. Household, clothes, and furniture are examples of end products.

India's textile industry is the country's most important agro-based sector. Garment production is the focus of this sector. It is a self-sufficient industry that manufactures everything from raw materials to finished value-added products for its customers. It makes a significant contribution to the country's economy.

Cotton Textile - Cotton is used as a raw material in the production of this textile industry's product. It encompasses a large section of its parent industry and is currently expanding at a rapid pace.

- **Woolen Textiles** - India's woollen textile industry is split between cottage and factory production. This industry, which primarily operates in Northern India, employs sheep wool as a raw material.

Silk Textiles - After China, India is the world's second-largest producer of silk, which is significant because the silk textile industry accounts for a considerable portion of India's total exports. Around 55 lakh people are employed in the sector. Sericulture refers to the specific field of silk production in agriculture.

These are some of the subdivisions of the textile industry; other divisions include synthetic textiles.

2. **Industry of Food Processing** — Any form of agricultural produce can be used as a raw material. Food that has been refined. India's food processing sector is one of the world's largest, making it the country's fifth-largest industry and the most important agro-based industry. India's food processing sector is one of the largest in the world.

. The food processing industry in India is one of the most important parts of our economy because it provides employment for many people in our country

.

3. **Dairy Industry** - End Products: Butter, Cheese, Cream, Condensed Milk, Dried Milk, Packaged Milk, Ice Cream, etc. Dairy Industry - Raw Material: Milk The dairy industry is one of India's most important industries, accounting for up to 4% of the country's GDP. It is one of the best sources of second-hand money for Indian farmers, making it one of the most popular occupations in rural areas across the country. For many years, it has been practised all over India, resulting in India contributing 20% of total global milk supply.

4. **Sugar Industry** - Sugarcane is used as a raw material in the sugar

industry.

Brown sugar, white sugar, and other sugars are the end products.

India is the world's largest sugar consumer, as well as the world's largest sugarcane and second-largest sugar producer, making the sugar business one of India's most important agro-based sectors. Sugarcane is our country's primary source of sugar production; therefore, while this industry employs a large number of people in India, this support does not last throughout the year because this business is primarily active during the sugarcane harvesting months.

5. **Vegetable Oil Industry**- Raw Materials: Olives, peanuts, safflowers, and other nuts and seeds, as well as their crude oil

Edible vegetable oil is the final product.

Vegetable oil is the principal source of fat in the Indian diet. Vanaspati is a hydrogenated vegetable oil that is commonly used in India. Different materials are used in different regions depending on the technology. The most widely utilised raw materials in this industry are coconut, mustard, and peanut. Because of its huge volume of oilseed output, Madhya Pradesh ranks #1 among all vegetable oil-producing states.

6. **Tea Industry** - Green tea leaves are the raw material used in the tea industry.

End-products include instant tea, cosmetics, and other similar items.

Tea is a popular beverage in India, and it is also widely produced. Assam, West Bengal, and Kerala are the primary producers of tea. The industry operates all year and employs approximately 1 million people while producing a billion kilos of tea each year, making it the world's second-largest tea producer.

7. **Coffee Industry** - Seeds or coffee beans are used as raw materials in the coffee industry.

End-products include instant coffee, tea, and other beverages.

Coffee is favoured for its ability to blend well. Because of its particular flavour, Indian coffee has carved out a niche for itself. It is Asia's third-largest coffee grower, contributing 70% of total production to the worldwide market.

8. **Leather Goods Industry** - Cattle hide is used as a raw material in the leather goods industry.

Leather goods, belts, and other such items are the end product.

Hides and skins from cattle, large animals, and small animals such as sheep and goats are the primary raw materials used in this sector. Kanpur is known in India for its leather industries, and it has some of the best leather industries in the country, with high-quality products. This business is also noted for employing a significant number of young people, providing a large number of job chances for our country's youth.

9. **Jute Industry** - End Products: Gunny bags, Hessian, Carpets, Ropes, Strings, Packing Material, etc.

Raw Material: Jute The jute industry is one of West Bengal's most prominent sectors, with 60 of the state's 70 jute mills located along the Hooghly River's banks. The jute business is a significant agro-based industry in India, supporting the livelihoods of over 4 million people. The jute sector is currently rising at a rapid pace, and it has now established itself as an important part of our economy.

10. **Bamboo Industry** - Bamboo is the primary raw material.

Furniture, plywood, matboards, handicraft, utensils, and other items are

examples of end products.

Bamboo plantation is a common practise in India's eastern regions, and it provides a valuable source of income for these areas. Bamboo-based sustainable products are becoming increasingly popular as environmental challenges are brought to light, making the bamboo sector one of the most important bamboo industries.

All of these agro-industries are critical to the economy of our country. Because they employ a big portion of our population while also sustaining our economy. The profit proportion of farmers is also determined by the demand from these businesses. Although other factors play a role, once the ultimate crop is produced, it is entirely dependent on industry demand. As a result, agricultural and agro-based sectors are mutually reliant on one another for growth.

Need for Agro-based industries

1. They are appropriate for rural locations because they are focused on raw materials.
2. To address the issue of unemployment.
3. To earn money and improve one's standard of living.
4. To promote agricultural and industrial expansion in a balanced manner.
5. To explain the issue of farming community exploitation.
6. To give agriculture a major boost and operate as a demand and supply driver. 7. To reduce the amount of perishable agricultural items wasted.
8. To prevent people from migrating from urban to rural areas.
9. To create appropriate backward places.

V. Conclusion

The current work illustrated the importance of smart agriculture on improving and increasing agricultural production in order to contribute to reducing the food demand gap. IOT is considered the backbone of smart agricultural technology, as it connects all components of smart systems, not only in the agricultural field but also the other applications. Concerning the use of IOT in agriculture, it can be used in many practices such as farm monitoring, irrigation, pest control, harvesting, etc. IOT connects several sensors with processing units, then analyzes data, then makes appropriate decisions in real-time. Finally IOT can be used in so many types such as greenhouse automation, crop management, monitoring climate conditions etc., This work reviewed the types of integration IOT with technologies of IOT , advantages and disadvantages of smart agriculture. Agro-based industries are a good relationship between agriculture and industry that can result in economic and social benefits for the whole population. The above presentation clearly specifies the significance of smart agriculture and agro based industries. Though industries are considered as modern temples of economy, without agriculture no economy or industry can survive for long.

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E-Commerce : A Survey

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Abstract *– E-commerce is a modern method of business, where a business person or a customer can buy and sell their products online; a vendor can also start a business without having an organization. Where it abolishes the cost of services and improves the quality of goods. This article includes the definition of E-Commerce, E-Commerce impact on customers, advantages and disadvantages of E-Commerce and types of E-Commerce models.*

Keywords *– E-Commerce, Business, Consumers, Market, Firms.*

I. INTRODUCTION

E-Commerce has revolutionized the way that online shopping has been conducted, E-commerce is more efficient and sustainable for many reasons. It reduces the waste of natural resources by allowing consumers to purchase needed products without driving to a store or buying them from different stores. The energy consumption, the packaging of products and time consumption of going to a store can be avoided. TheE-Commerce assiduity is expanding at a rapid-fire pace. In 2013, Global online deals amounted to$ 1 trillion and in 2017 this figure grew to$ 4 trillion. Moment E-commerce takes up nearly 15 of all retail deals and further than 2 billion people use the internet worldwide. E-commerce poses intriguing business challenges, especially in terms of sourcing force and structure guests trust in online deals.

II. E-COMMERCE

The term electronic commerce (E-commerce) refers to a business model that allows companies and individualities to buy and vend goods and services over the internet.

E-Business versus E-commerce

Though-, numerous times, the terms E-Business and E-Commerce are used interchangeably, yet more precise delineations would distinguish between the two. Just as the term 'Business' is a broader term than 'Commerce', E-Business is a more elaborate term and comprises colorful business deals and functions conducted electronically, including the further popular quantum of deals called E-Commerce. E-Commerce covers a establishment's relations with its guests and suppliers over the internet.

E-Commerce Impact on consumers

For a consumer, E-Commerce is more accessible. It requires only a computer and an internet connection to shop for products available on the internet. Utmost particulars can be plant on E-Commerce platforms at competitive prices that are frequently cheaper than those in retail stores. In addition, requests that vend habituated products are more profitable to guests as they can buy

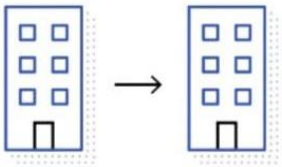
particulars cheaply from them. E-Commerce platforms also arrange to transport products and monitoring of guests for refunds or complaints.

III. TYPES OF E-COMMERCE MODELS

Electronic commerce can be classified into four main categories. The basis for this simple classification is the parties that are involved in the transactions. So the four basic electronic commerce models are:

1. Business to Business (B2B)
2. Business to Consumer (B2C)
3. Consumer to Consumer (C2C)
4. Consumer to Business (C2B)

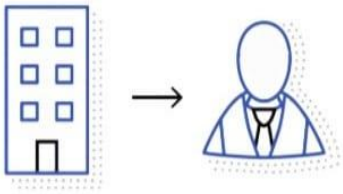
Business to Business (B2B)



Business to business

This is business to business deals. Then the companies are doing business with each other. This generally occurs when a business is sourcing accoutrements for their product process for affair that's furnishing raw accoutrements to the other company that will produce affair. The final consumer isn't involved, so the online deals only involve the manufacturers, wholesalers, retailers etc.

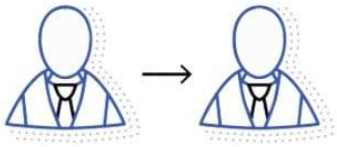
Business to Consumer (B2C)



Business to consumer

Then the company will vend their goods or services directly to the consumer. The consumer can browse their website and look at products, filmland, read reviews. Also they place their order and the company vessels the goods directly to them. Popular exemplifications are Amazon, Flipkart, Jabongetc.

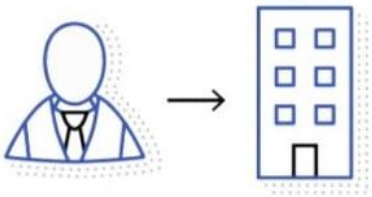
Consumer to Consumer (C2C)



Consumer to consumer

Consumer to Consumer requests provides an innovative way to allow guests to interact with each other. Traditional requests bear Business to Client connections, in which a client goes to the business to buy a product or service, but in C2C no company is involved. It helps people to vend their goods and means directly to an interested party. Generally, goods traded are buses, bikes, electronics etc. OLX, Quiker etc follow this model.

Consumer to Business (C2B)



Consumer to business

This is the reverse of B2C, Consumer to Business is a business model where an end- stoner or consumer makes a product or services that an association uses to complete a business process or gain a competitive advantage. For illustration, when a consumer writes reviews or when a consumer gives useful ideas for new product development also that consumer is creating value for the business if the business adopts the input.

Benefits of E-Commerce to Busniess Organisation

- Expands the business to public and transnational requests.
- Gradational decline in cost of operations.
- Facilitates pull force chain operation.
- Competitive advantage over challengers.
- Proper time operation and support business process.
- Small enterprises co-occur with big enterprises.

Benefits to Consumer and Society

- Flexibility.
- Competitive price/discounts/waive offs.
- More options and choices and customised products.
- Quick and timely delivery.
- Employment potential.
- Facilitate E-Auctions and E-Tenders.
- Interaction with consumers.
- Wider outreach.

Disadvantages of E-Commerce

* The launch-up cost of thee-commerce gate is veritably high. The setup of tackle and the software, the training cost of workers, the constant conservation and keep are all relatively precious.

* Late delivery.

* Some products are delicate to buy online.

* Lack of sequestration is a serious disadvantage ofE-Commerce. A client has to give his particular details. Some spots don't have advanced translated technology that can cover your particular details from hackers.

* Shipping is an integral part of commerce and if you don't have applicable structure also it can beget serious issues and come a disadvantage ofE-Commerce.

*E-Commerce deals are substantially faceless and paperless without any due evidence. Utmost of the associations don't have a physical actuality and guests are reluctant to make card payments beforehand.

* AnE-Commerce point is heavily dependent on its website. If it isn't duly projected or the software isn't enforced the point can face technology interruptions. Guests tend to lose faith veritably fluently and shift their commitment to other doors that they find accessible.

IV. CONCLUSION

E-Commerce isn't an IT issue but a whole business undertaking. E-commerce brings convenience for guests as they don't have to leave home and only need to browse websites online. E-Commerce isn't just about conducting business deals via the internet. Its impact will be far- reaching, and more prominent than we know presently. This is because the revolution in information technology is passing contemporaneously with other developments, especially the globalization of the business. Companies that useE-Commerce as a reason for fullyre-designing their business processes are likely to reapthe topmost benefits. Also,E-Commerce is a helpful technology that gives the consumer access to bbusinessesand companies each over the world.

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Smart Agriculture and Agro Based Industry using various Technologies

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Abstract *- Agriculture now-a-days has become smart agriculture by using various techniques.Agriculture is one of the basic means to lead a fruitful life.The revolutionary changes of agriculture methods are shaking the existing agriculture methods and they are creating new opportunities along a range of challenges.This article highlights the potential of using IOT,drones,AI over agriculture, as well as challenges.expected to be faced when integrating this technology with the traditional farming practices.*

Keywords *– IoT, Smart Farming, Drones, Agriculture*

I. Introduction

Humans invented agriculture between 7000 and 10,000 years ago during the New Stone Age. Agriculture is the milestone in the history of human civilization.Agriculture is a basic process to produce food and other desirable products by cultivation of plants,seeds and livestock.Agriculture plays a very important role in the lives of the humans,animals and it is the backbone of our country.Agriculture provides employment opportunities to many people other than providing raw materials. The term "SMART AGRICULTURE" refers to the usage of technology like internet of things, robotics, drones, AI on your farm. The main goal is increasing the quality and quantity of the crops. Smart Agriculture is a hi-tech and effective system of doing agriculture in a sustainable way. It is an application of implementing connected devices and innovative technologies together into agriculture. Agro-based industries are those industries which use agricultural products as their basic raw materials. Also, they add[till] usual products some of the examples of the agro-based industries in India are as follows: coffee,tea,leather goods industries etc.The two types of agro based industries are Agro-produce manufacturing units and Agro-produce processing units.They help in increasing industrial production. Approximately 42% of the Indian population is employed in the agricultural sector alone.

II. IoT Implementation on Agriculture

In IOT , A system is designed to keep regular check on the farmland with the help of the sensors,which sense components like temperature,light,humidity,soil , moisture etc. farmers can check with the condition of their field, whether the crop is in good or bad condition from anywhere anytime using the IOT platform. Any changes detected by the sensors are analyzed and the farmer is notified. IOT has brought huge benifits like adequate minimal use of water,optimization of inputs and many more. It is the process of reducing the need of physical work of farmers and growers and thus

increasing productivity in every possible manner. Therefore, using IOT in agriculture has a promising future as a driving force of efficiency, sustainability in this industry.

III. Robotics Implementation on Agriculture

Agriculture robots,commonly known as agbots are starting to gain attention among farmers with increasing demands for agriculture products and shortage of labour across the world The future of agriculture will be using various small,highweight ,minivehicles.To control, pest,fertilize the crops ,to water a crops over a large area ,agbots will be used.picking fruits,milking cows and other jobs which required human labour are now being done by robots.Agbots will also be employed for packing,boning agriculture products and many more.Agbots have arms that can perform various farm duties .

IV. Drones Implementation on Agriculture

An agricultural drone is an aerial vehicle where there will be no any driver inside that,but will be operated by hand to help optimize agriculture operations, increase crop production and monitor crop growth.In the Agriculture sector,the usage of drones are rapidly growing as a part of sustainable agriculture management.. Drones can map the property, report on crop health, improve spraying accuracy and irrigation systems. Drones look like a small helicopter since it has multiple rotors. The study on drones depicts that the shots/pictures taken with the help of drones provide a very good/high rate of resolution even on cloudy days.The two main types of drones that provide us with more advantages are rotary drones and fixed wing drones. Some of the applications of drones are payload carrying, bird control, crop spraying, mapping, and surveying.

V. Artificial Intelligence Implementation on Agriculture

AI is a developing technology in the field of agriculture. AI systems are helping to improve the overall harvest quality and accuracy known as precision agriculture. It helps in determining disease in the plants, pests and poor nutrition . AI sensors can detect and target seeds and then decide which herbicide to check within the region. AI based equipment and machines has taken today's agriculture system to a different level. This technology has enhanced crop production and imposed real time monitoring on harvesting, processing and marketing.AI in agriculture is a more efficient way to produce, harvest and sell essential crops. Implementing AI empowered approaches in farming can help farmers respond smartly to climate changes. The growth in AI technology has strengthened agro-based businesses to run more efficiently than ever.

VI. Agro Based Industries

Agro-based industry is an industry that involves the processing of raw materials from the field and farm into finished products. All branches of agro-based industry are very important because of the increase of industrial products, provide employment facilities, get foreign exchange, increase income level and also provide employment to women and provide a base for development for backward areas. Farmers get reasonable cost of the agro-based product by getting a connection between the agro-based industry and farmers. Rural infrastructure is developed with the help of these agro based industries. Example: Raw material: milk: output: butter, cream etc. Raw material: sugarcane: output: brown sugar, white sugar etc.

Advantages

1. It allows farmers to maximize yields by using minimum resources such as water, fertilizers, seeds etc.
2. Solar powered and mobile operated pumps save electricity.
3. Improved livestock farming.
4. It delivers high quality crop production.
5. It provides real time data.
6. Remote monitoring.

Disadvantages

1. Smart agriculture needs the availability of the internet continuously, so the rural parts of the developing countries do not fulfill this requirement.Anyway the internet connection is slow in those areas.
2. Smart farming-based equipment requires farmers to understand and learn

the usage of the technology. This is the major function in adopting smart agriculture farming at large scale across the countries.

3. If there are faulty sensors then it will lead to the situation where the wrong decisions are taken.
4. Sometimes, the machines used in smart agriculture can impact the environment in a negative manner.

VII. Conclusion

Smart farming is growing in importance due to the combination of the expanding global population, the increasing demand for higher crop yield. Smart farming can make agriculture more profitable for the farmer. Implementing IOT, drones ,robotics AI over agriculture gives us a future look of a better INDIA. Therefore, smart farming has a real availability to deliver a more productive and sustaining form of agricultural production, based on a more performance and resource-efficient approach in real world.In the next coming years, smart agriculture is delivered to create a large impact on the agricultural economy by bridging the gap between small and large scale businesses. A good relationship between agriculture and smart agriculture can result in economic and social benefits for the Actual population.

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E-COMMERCE IN SUPPLY CHAIN MANAGEMENT (ECSCM)

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ABSTRACT OF THE STUDY/REVIEW:

E-Commerce in Supply chain is practiced in manufacturing industries using internet to carry out value added activities, so that products produced by the manufacturers, and customers and results in good return on investment.

E-Commerce in Supply chain management is the manufacturers, logistic organizations, distributor's suppliers, retailers, and customers.

E-Commerce in Supply chain management has the concept of coordination between various processes in supply chain, and is very essential in reducing cost.

E-Commerce in Supply chain can reduce its procurement cost by suppliers significantly by providing suppliers access to information regarding inventory, as the suppliers becomes access to procurement, it can reduce the cost, and focus on the value of the materials, and get more involved in vendor selection, sourcing, and managing good relation with suppliers.

E-Commerce in Supply chain implementation can be brought bought about: 1. Improve information system between suppliers and customers. 2. Constitute a team of members from the organization from the organization, to carry out better implementation between the suppliers. 3. Identify leaders in the organization who are capable to lead a time to bring in efficiency in E-Supply chain 4. Divide the product identification according to segments: Tier I Tier II Tier III.

E-Commerce in Supply chain ensure organization to get timely, and accurate forecast with regard to service conditions, and allow better production, planning, based on requirement and cycle time for production.

Key Words: E-Commerce: Procurement: Sourcing: Implementation: Production: Planning: Logistic: Suppliers: Retailers: Customers:

INTRODUCTION:

E-Commerce in supply chain is not just setting up of a Web-site, that is limited to also selling on-line products, with suitable configuration of the required infrastructure, logistic, secured payment, also accelerate promptness, to meet the customers expectation in supply chain.

The advantages of E-Commerce in Supply chain: 1. Reduce inventory: 2. Improves efficiency: 3. Cost reduction: 4. Increase the ability to implement just-in-time on delivery and enhance customer service. 5. Increase revenue thus providing increase customer service.

E-Supply chain management is a collaborative use of technology to improve the operations of supply chain activities, as well as management of supply chain. The main factor contributed to the transaction from Supply chain Management to E-Supply chain management is to: 1. Need for reduction in cost, improvement through modern management in organization from supplier to customer. 2. Introduction to computerization, of the internal function of the organization with better management methods: 3. the need for efficiency and agility of the organization in order that they can respond to the higher demands of the customer. 4. The efforts to optimize the organization by having lower inventory both in manufacturing, and distribution.

E-Commerce in Supply chain also include: 1. Supply chain replenishment with integration of production distribution process and organization can use this process to reduce inventory, eliminate stock points, and increase the velocity of replenishment by synchronizing supply and demand. 2. E-procurement can use Web based technology to support procurement of key process including requisitions, sourcing contract ordering and payment, since it supports both direct, and indirect material, and employs Web-based function such as on-line catalogues, controls purchase orders: 3. Inventory management using wireless devices which can achieve improvements in inventory management, by using bar-coding, and wireless devices including Radio Frequency Identification. 4. Collaborative planning requires buyers and sellers to develop share demand forecast of multiple supplies along with supply chain to improve planning and fulfillment of customer demand.

In supply chain E-Commerce, does increase the capacity of the warehouse, customer proximity, so that the consumers is liable to fulfill orders in supply chain. In supply chain E-Commerce through automation, in process, is also liable to increase he capacity, offer better shipping deals for orders, better price, discounts, in supply chain.

Supply chain in E-Commerce is able to demonstrate the kitting of items, in one lot for easy assembly of the products, as an when they delivered to customers for easy reference of assembly, without spending much time on the product assembly in supply chain.

PURPOSE OF THE STUDY:

With the advent of internet and electronic communication E-Supply chain management, has enabled organization to be more responsive to the customers, and the same technological advancement are changing the market place and providing and impetus for change for strategic alliance.

Traditional supply chain management along with E-supply chain management has a resulting impact on strategic, alliance, which considers the inherent ability to be dynamically adaptable in supply chain.

E-Commerce in Supply chain management comprises of process, and the main phases of standardization, interdependency, identification of business process mapping, and flow analysis in supply chain.

E-Commerce in Supply chain is a concept introduced to the need of adaptability, and flexibility in a highly dynamic e-business, environment which focus on network integration, in electronic linkage, and technological enabled relationship.

The rapid development of information technology, and global competition has no bound limits in supply chain, since the supply chain is undergoing global pressure, and competition, and is being deeply thought, and re-designing,

Supply chain E-Commerce has also concurred with one time invoice, easier for payment, documentation, process orders faster, as this becomes liable for better, also with simple procedures in supply chain.

LITERATURE REVIEW

E-Commerce in Supply chain environment, E-Network , business network, should satisfy customers demands through network connected supply chain to serve end consumer, customer responses from supply chain, strategy in the market value in supply chain, can jointly create profitable revenue through integrated solution for the responses in 75% of the supply chain..

E-Commerce in Supply chain is a combination between the internet, the supply chain management, concept, which is developed as a result of the evolution of the information technology, as well as re-engineering of the organization, business process towards partners co-operation enabled by the internet by about 60% in supply chain..

E-Commerce in Supply chain is the internet impact on the integrity of the original business process from end-user to the many suppliers of products services, which also provides information to customers, also to other partners in the organization and creates value of about 50% in supply chain.

E-Commerce in Supply chain management is to help business integrate resources in the supply chain; strengthen products, also the cash management, with the reduction in the operation cost. E-Commerce in Supply chain management, as an organizational business will be able to gather real-time, information concerning customer orders, inventory receivables, payable sales, performances in different locations in supply chain. E-Commerce in Supply chain management benefits is liable to shortened sales periods, lower sales costs, bring better co-operation with suppliers with an improved efficiency of 80% in supply chain,

RESEARCH METHODOLOGY:

Real-time management with E-Commerce Supply chain management has the impact to supply chain which has planning, execution, and control over supply chain.

Negotiation management in E-Commerce in Supply chain management enables buyers to negotiate with suppliers in the price term of certain immediate profits. Negotiation procedure are set up according to the power of the user in supply chain.

Manufacturing planning in E-Commerce in Supply chain management is a comprehensive planning, also a simulation system, that combines flexible forecasting techniques time based demand supply planning, with planned based execution environment, that help supply chain, to respond quickly to changes in customer demand also the operational requirement in supply chain.

E-Commerce in Supply chain management in which E-Procurement process supports the procurement, also the sourcing activities through internet technologies, and enables efficient negotiations, between buyers and suppliers, thus to reduce cost, sharing information, since procurement involves retrieving sharing and storing large quantities of data and information.

E-Commerce in Supply chain management is a network of suppliers, manufacturers, warehouses, distributors, retailers, who co-ordinate plans and activities develop products by converting raw materials into finished goods or products.

RESULTS:

E-Commerce in Supply chain involves various approaches used to integrate suppliers, manufacturers also the distributors in performing functions, material procurement, material transformation, in intermediate, also the finished product, the distribution of these products to the distribution centre's, and then to the point of sale in supply chain.

E-Commerce in Supply chain management is a concept that can be described as a network of independent organization that are not only distributors or certain products, and services in supply chain, but also stimulate the demand and lead the synchronization of capabilities, and resources in whole supply chain in order that they provide levels of operational efficiency and leadership in the market.

E-Commerce in Supply chain management can also propose customer relationship, customer service, manufacturing demand management, e-fulfillment, procurement, manufacturing, floor management, product development, and commercialization, and reverse logistics, which become a part of related to the process of integration of internet, with business process in supply chain.

Tactical in supply chain management is an operation management technique, which seeks to integrate and optimize the capabilities of internal business functions, also to direct them to new opportunities for cost reduction, which through increased channel by working with matching function from E-Commerce in supply chain management.

Tactical supply chain management can be divided into activities like supplier management, inventory optimization, product service, processing, customer management, customer order, channel supply support facilitate financial transaction market information flows, electronic transformation flows, integrated logistic in E-Commerce in supply chain management.

Strategic E-Commerce in Supply chain management transfers sequential supply chain network, into focused supply chain based on strategic function through collaboration of the organization for correlated supply chain process in management.

DISCUSSIONS AND FINDINGS:

Web technology in E-Commerce in supply chain management enables the integration and synchronization of all supply chain information, and process. Web based application allows the reduction of transactional cost, E-Commerce in Supply chain management cost standards enable low cost in integration of customer supplier product information and competitions for supply chain , the business process of document, and data in real-time in supply chain.

E-Commerce in Supply chain management generates more value for customers through agile flexible collaboration, and intelligence used in the system built on a dynamic network of Web-enabled organization systems.

Internet of Things invisibly carry real time value addition in supply chain, monitoring products in E-Commerce supply chain, so as to realize that information sharing is also a part of the commercial activity, which is liable to play a greater role, in protection of the information security, efficiency, with low-cost of information, with flow of logistic, cash-flow, human reasoning in supply chain.

Supply chain management uses the competences and resources to exploit them in more efficient manner into the extended virtual organization, and E-Commerce in Supply chain management extends multiple application support organization to win a competitive advantage, because they create more value for customers, also have the goal to satisfy the client requirement in the best possible way in real-time supply chain management.

E-Commerce in Supply chain management application allows the creation of extra value for the customer and has the goal to satisfy the client requirement in the best possible way, and in real time in supply chain.

Internet Technology has much an impact on E-Commerce in supply chain, for proper procurement, so as to enable for buying, products at the click of the mouse, on comfortably sitting in one place of work in supply chain,

Internet based technology has enabled E-Commerce in supply chain with modern technology, better application, having impact on distribution, planning, also with responsibility to bring improvement in supply chain.

Supply chain challenges the on-going business organization with the focus on issues of optimizing E-Commerce in supply chain, serving procurement on on-line satisfaction, so as to value procurement of suppliers thus optimizing the impact of reliable service fulfillment in supply chain.

FUTURE WORK AND CONCLUSIONS:

E-Commerce in Supply chain management does allow the creation of additional or extra value for the customer, and have a goal set to the client requirement in the best possible way, and in the requirement of real time in supply chain, and switching over to a Web based application in E-Commerce in Supply chain require for streamlining supply chain activities, manufacturing consistent quality of service, also controlling distribution of the data which otherwise cannot be achieved without a providence in supply chain.

E-Commerce in Logistic is an application of internet based technology to traditional logistic process or Web based application also services in E-Commerce in Supply chain management, dealing with the efficiency of transportation, distribution, and storage of products along the demand in supply chain management.

E-Commerce in Supply chain management system can improve supply chain management by allowing effective communication, between the organizations in supply chain, as well as providing access to information. In general the problem of reducing information overloading which is considered to be another advantage of E-Commerce in Supply chain, which is analyzed as the role of information sharing, also collaborating the behavior, which may be indicated as a positive impact of commitment, reciprocity, through performance in supply chain.

E-Commerce in Supply chain management is a concept of combination between internets, the supply chain management, also the true balance between the internet also supply chain. E-Commerce in supply chain management is a new dimension concept, and developed as an evolution of the information technology, as well recognizing the organization, business process, towards the organization cooperation enabled by internet.

Freight forwarding, distribution, in E-Commerce in supply chain, holding inventory are to able to interface with procurement, to initiate documentation process, pick-up, generate documents, file with custom authorities, clear the shipment details in supply chain.

SOURCES OF INFORMATION OBTAINED ELECTRONIC MEDIA:

1. **IMPORTANCE OF SUPPLY CHAIN MANAGEMENT IN E-COMMERCE: Author Divesh Singhal**
2. **SUPPLY CHAIN MANAGEMENT IN E-COMMERCE: PROCESS: BENEFITS:OPTIMIZATION: EasyeCom Publications:**
3. **SUPPLY CHAIN MANAGEMENT E-COMMERCE ENABLING B2B ON LINE REVENUE ACCELERATION: Author Denise Castillo:**
4. **OPTIMIZATION OF E-COMMERCE SUPPLY CHAIN MANAGEMENT: Min Wu: Academic Editor: Zihan.V.**

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IoT: Object Tracking using Mobile Bluetooth Technology

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Abstract

The main focus of our article is to identifying and tracing an object by using Bluetooth enabled android devices. Initially, objects have to be tagged with the Bluetooth which are more needed in our real time usage then with the help of android application we could get the list of the object, its range and the distance of that object in the scale of feet.

It is essential for us to clutch our IDs, passport, handbags, travel cards, wallets, keys etc. along whenever we set off. However, people nowadays are clumsy to leave their belongings when they are too hectic on their work and social lives. Due to increasingly heavy reliance on social media, phones are the least forgotten. Hence, in this article by developing an android application which acquaintances Bluetooth devices which are tagged into the valuables. This application is suitable for everyone in their day to day life especially most helpful to the elders and the disables.

Keywords: Object Detection, Tracking, Bluetooth, Tracing.

1. Introduction

Internet of Things(IoT) is a network of physical objects or people called "things" that are embedded with software, electronics, network, and sensors that allows these objects to collect and exchange data. The goal of IoT is to extend to internet connectivity from standard devices like computer, mobile, tablet to relatively dumb devices like a toaster. IoT makes virtually everything "smart," by improving aspects of our life with the power of data collection, AI algorithm, and networks. The thing in IoT can also be a person with a diabetes monitor implant, an animal with tracking devices, etc.

Fig 1: IoT Applications

IoT comes with many tiny tools for signal reading/writing such as RFID(Radio Frequency Identifier), Zigbee, Bluetooth etc.,

Fig 2: Bluetooth, RFID and Zigbee

In this article, main focus of our objective is to tracking and tracing an objects by using Bluetooth enabled android device. Here objects must be tagged with Bluetooth devices which are most needed in our real time usage then with the help of android application

by getting the list of the objects in its Bluetooth range and the distance of that objects in the scale of feet.

The purpose of the proposed system is mainly to track items that are likely to be lost or forgotten, using a Smartphone and hence, users by enabling their Smartphone's Bluetooth whenever they want their devices to get tracked in this system tracing could identify nearby devices and track their location by moving the handheld device.

1.1 Objectives of the proposed system

- Spiking the Bluetooth device for needful things.
- Bluetooth device connectivity.
- Mobile application to identify the device and its distance.

1.2 Advantages of the Proposed System

- If user has an annoying habit of losing things, a Bluetooth device that can be attached to any object can be located within few minutes.
- User can see how close they are to the missing item, within a 100 feet distance.
- Reduces human stress.
- Less time to detect the missing items.

2. Literature Review

A Literature Survey looks at the current and past theories behind the subject, which is being studied. It is a concise representation of these theories and information aimed to give both the researcher an idea of the dissertation will be based upon before they pre-sent their own findings.

2.1 Bluetooth overview

Bluetooth is a wireless technology that enables any electrical device to wirelessly communicate in the 2.5 GHz ISM (license free) frequency band. It allows devices such as mobile phones, headsets, PDA's and portable computers to communicate and send data to each other without the need for wires or cables to link to devices together. It has been specifically designed as a low cost, low power, radio technology, which is particularly suited to the short range Personal Area Network (PAN) application. (It is the design focus on low cost, low size and low power which distinguishes it from the IEEE wireless LAN technology).

2.1.1 Bluetooth Technology and Specifications

Invented in 1994 by engineers from Ericsson, a Swedish company, Bluetooth enables the sharing of music, images, and other data wirelessly over a personal area network (PAN) which is defined by the device's antenna. The technical specifications and de-tails of Bluetooth are described here, including frequencies and different types of antennas available along with their effective ranges. A radio frequency refers to rate at which radio signals are transmitted. The effective signal range of a Bluetooth device, which is defined by its antenna class, is the range at which other Bluetooth devices may be discovered and connected.

2.1.2 Radio Classes and Power

Although the Core Specification for Bluetooth requires a minimum range of 33 feet (10 meters), manufacturers are allowed to set their own limits to appropriately meet the needs of their products' intended users. Class 3 radios are characterized by ranges of 3 feet (1 meter). Class 2 radios are more commonly found in mobile phone devices and must provide a range of at least 33 feet (10 meters). Finally, Class 1 radios must offer a minimum range of 330 feet (100 meters). Class 1 radios are typically used for industrial applications.

Bluetooth technology was designed to operate at very lower power. Class 1 radios operate at a maximum of 100 mW or 20 dBm, while Class 2 radios, the most commonly used radios, function at 2.5 mW or 4 dBm. Class 3 radios operate at the rate of 1 mW or 0 dBm. A typical laser pointer produces 5 mW of light power and a typical hearing aid consumes less than 1 mW. For further comparison, 1kW, which is 1000 mW, may be used to power a small electric heater. [1] The goal of this article is to analyze and review the previous approach towards object tracking and detection using video sequences through different phases. Also, identify the gap and suggest a new approach to improve the tracking of object over video frame. [2] This paper presents a comprehensive review of various object tracking approaches reported in literature and proposes a new categorization to group various tracking approaches to streamline future researches.

It also discusses, in detail, methods used in each category for tracking single and multiple objects.

Finally, the paper concludes by setting directions for further research. [3] Extracting and predicting object structure and dynamics from videos without supervision is a major challenge in machine learning. To address this challenge, we adopt a key point-based image representation and learn a stochastic dynamics model of the key points. Future frames are reconstructed from the key points and a

reference frame. By modeling dynamics in the key-point coordinate space, we achieve stable learning and avoid compounding of errors in pixel space. Our method improves upon unstructured representations both for pixel-level video prediction and for downstream tasks requiring object-level understanding of motion dynamics.

3. System Architecture

The architecture design applied to our application is Client – Server Architecture. The client – server model is a computing model that acts as distributed application which partitions tasks or workloads between the providers of a resource or services, called servers, and service requesters, called clients.

The entire project is broadly classified into two groups

- Server
- Client

Here are the reasons why we should use the Client – Server design pattern.

Architecture of an application in which mobile (client) request and receive services from the Android Bluetooth application (server).

3.1 Server

Server is implemented as a standalone application which automatically detects the Bluetooth devices. Server also provides the feature to the system admin to add details about the strength of the Bluetooth devices and its distance. Server is implemented using Java Eclipse.

3.2 Client

Client in this system is the user having the Bluetooth device which are capable of receiving the message from the server. The advantages from this pattern are Centralization, backup and recovery, security, proper management, up gradation and scalability. Android mobile application using Eclipse.

Client Application

Fig 3: Client – Application Architecture

3.3 Architecture of the Proposed System

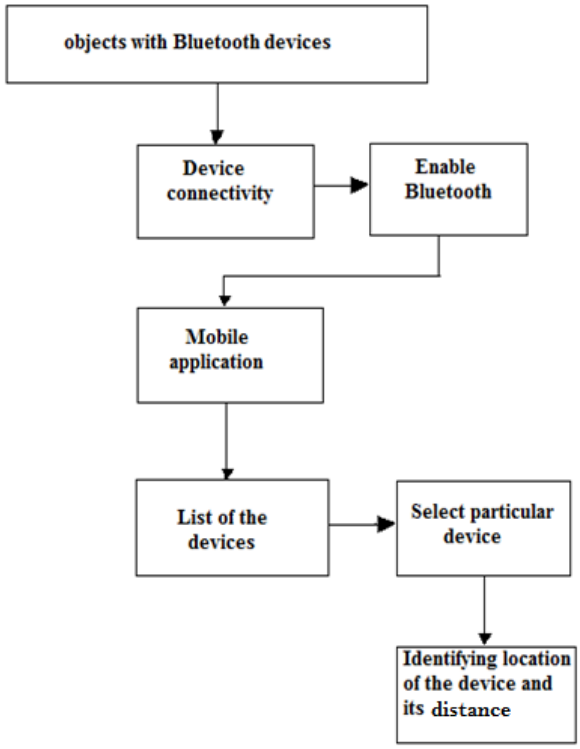


Fig 4: Architecture of the proposed system

4.Implementation

Implementation of the system means the process of converting a new or revised system design into an operational one. Implementation phase is less creative than the design phase. Implementation includes all those activities that take place to convert from the old system to a new system. The new system may be totally new, replacing an existing manual on an automated system.

This project facilitates the administrator to enter the Bluetooth signal strength details and other important information about the client. As server is implemented as the stand alone system, it does not provide the admin with lot of features as all the works are done by the server itself.

1.Client List: When the administrator clicks on "Client list" he will be able to view the Bluetooth device names of all the clients whose Bluetooth feature has been enabled. Here the administrator cannot see the message sent to the client by the server.

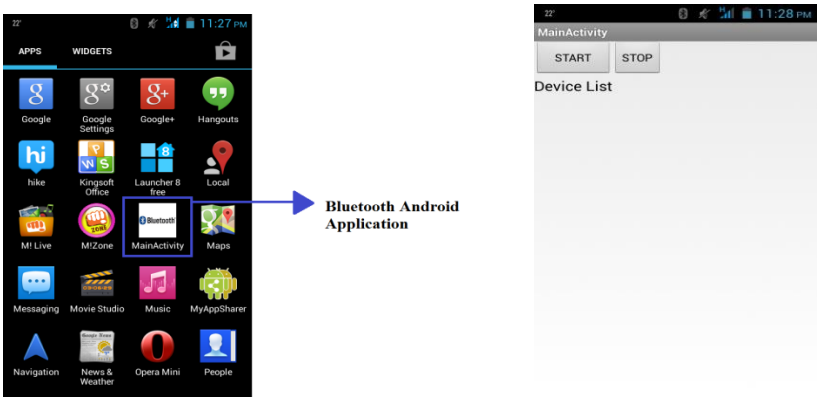
2.When the administrator clicks on any discovered Bluetooth device, the administrator will be able to see the strength and distance of that selected object.

4.1 General Algorithm

Step 1. Tagging the Bluetooth device for needful things.
Step 2. Bluetooth device connectivity.
Step 3. Mobile application to identify the device.
Step 4. Detect the Bluetooth enabled device in the surrounding.
Step 5. List of the Bluetooth device
Step 6. Selecting the specific object that user want to search and that will give the strength and distance of that object
Step 7. Repeat step 1 to 6 for detecting a missing object.

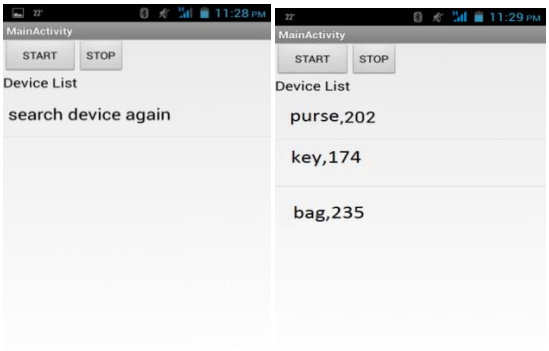
4.2 Bluetooth device connectivity and Mobile application to identify the device

User Interface:

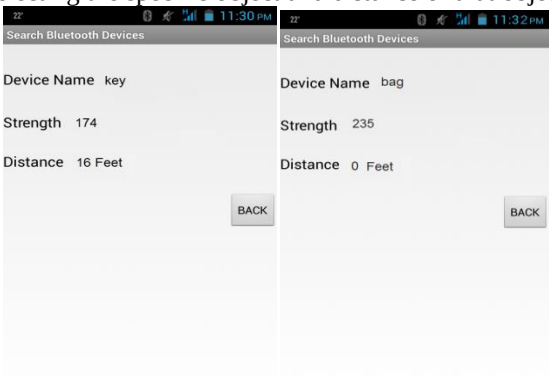


After selecting MainActivity icon onto user interface screen user will get the main window of the application we showed above.

Detect the Bluetooth enabled device and list of the Bluetooth device



Selecting the specific object and distance of that object



5. Outcomes

A test Case (TC) is a set of test inputs, execution and expected results developed for particular android mobiles Here is some test casing has done for different android mobiles that will show how the signal strength. To measure Bluetooth signal between two or more mobile phones and detect nearest phone in range. After a lot of testing we came to idea to do periodically discovering for Bluetooth devices and measure RSSI (Radio Signal Strength Indicator) via EXTRA_RSSI. All devices must be always in discovery mode and also must periodically scan for other devices. The below table shows that how RSSI value changes from one android mobile to another along with the graph.

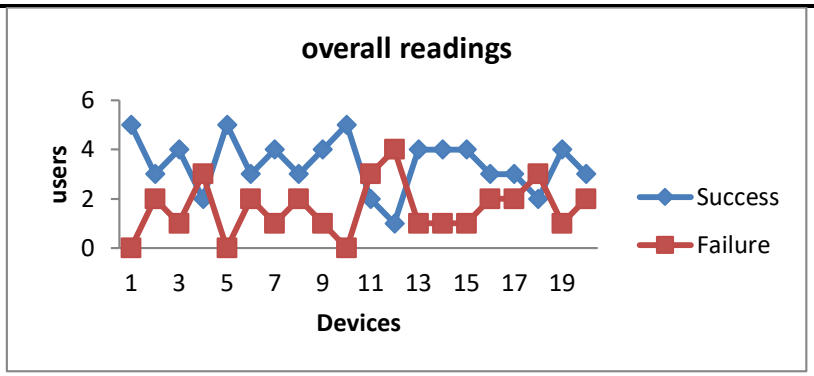
Test Cases Description

Here are the test cases for different android mobile. Here we took Micromax, Samsung, LG and Sony Android Mobile to take the readings of the Bluetooth strength of the particular Android mobile. According to the Bluetooth strength of the different android mobile we are fixed the distance upto 0 to 20 feet.

As we know that the Bluetooth strength varies based on the RSSI i.e. Radio Signal Strength Indicator. So we have done this test cases for Samsung, LG and Sony Android Mobiles.

Table 1: Readings for Samsung Android Mobile

Signal Strength		-22 to -31	-31 to -83	-84 to -86	-86 to -88	-89 to -90		
Feet		0	1 to 5	6 to 10	11 to 15	16 to 20		
Devices	users						Success	Failure
Key	u1	√	√	√	√	√	5	0
	u2	√	×	×	√	√	3	2
	u3	√	√	√	×	√	4	1
	u4	√	√	×	×	×	2	3
	u5	√	√	√	√	√	5	0
Wallet	u1	√	×	√	√	×	3	2
	u2	√	√	√	√	×	4	1
	u3	√	√	×	√	×	3	2
	u4	√	√	√	×	√	4	1
	u5	√	√	√	√	√	5	0
Pass port	u1	√	×	×	√	×	2	3
	u2	√	×	×	×	×	1	4
	u3	√	√	√	×	√	4	1
	u4	√	√	√	√	×	4	1
	u5	√	×	√	√	√	4	1
Hand bags	u1	√	√	×	√	×	3	2
	u2	√	×	√	×	√	3	2
	u3	√	×	√	×	×	2	3
	u4	√	×	√	√	√	4	1
	u5	√	√	×	×	√	3	2
Percentage							68%	32%



Graph 1: Overall graph for success and failure

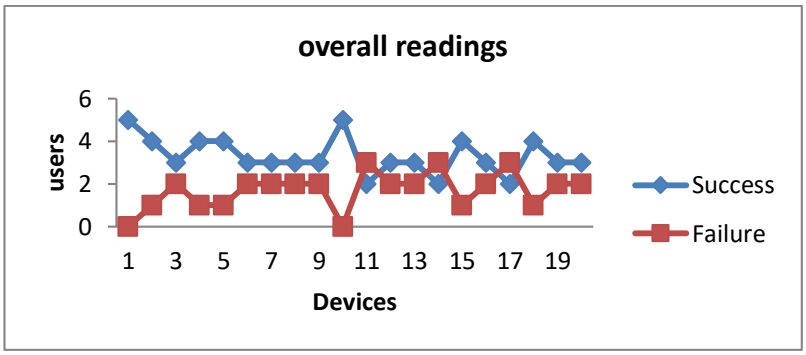
The above Table 1 shows that the Bluetooth strength for Samsung Android mobile i.e. for 0 feet the signal strength varies from -22 to -31, for 1 to 5 feet the signal strength varies from -31 to -83, for 6 to 10 feet the signal strength varies from -84 to -86, for 11 to 15 feet the signal strength varies from -86 to -88, for 16 to 20 feet the signal strength varies from -88 to -90. Using this observation, we are developed the Android application for Samsung Android mobile for identifying a missing objects. Using this observation, testing has been done on Android application with Samsung Android mobile.

The graph 1 indicates the overall success and failures that we got in each test cases and their percentage. We got **68%** of success and **32%** of failure in this Android mobile.

Table 2: Readings for LG Android Mobile

Signal strength		25 To 30	45 to 60	65 to 80	85 to 92	93 to 98		
Feet		0	1 to 5	6 to 10	11 to 15	16 to 20		
Devices	Users						Success	Failure
Key	u1	√	√	√	√	√	5	0
	u2	√	√	√	×	√	4	1
	u3	√	×	√	×	√	3	2
	u4	√	√	×	√	√	4	1
	u5	√	×	√	√	√	4	1
Wallet	u1	√	×	√	√	×	3	2
	u2	√	√	×	√	×	3	2
	u3	√	√	×	√	×	3	2
	u4	√	×	√	×	√	3	2
	u5	√	√	√	√	√	5	0
Pass Port	u1	√	×	×	√	×	2	3
	u2	√	×	√	×	√	3	2
	u3	√	×	√	√	√	3	2
	u4	√	√	×	×	×	2	3
	u5	√	×	√	√	√	4	1
	u1	√	√	×	√	×	3	2

Hand Bags	u2	√	×	×	√	×	2	3
	u3	√	√	√	×	√	4	1
	u4	√	×	√	×	√	3	2
	u5	√	√	×	×	√	3	2
Percentage							66%	34%



Graph 2: Overall graph for success and failure

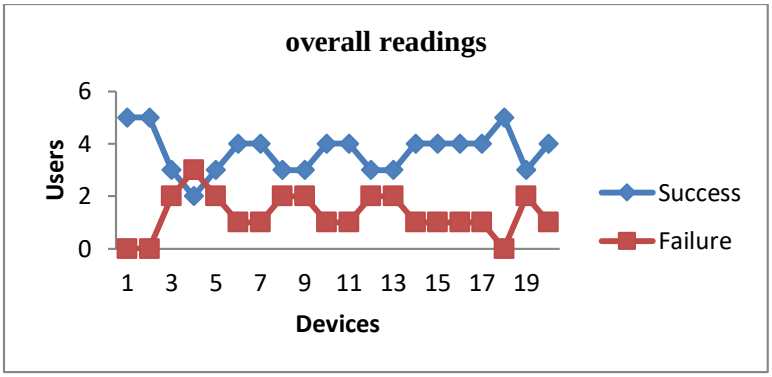
The above Table 2 shows that the Bluetooth strength for LG Android mobile i.e. for 0feet the signal strength varies from 25 to 30, for 1 to 5feet the signal strength varies from 45 to 60, for 6 to 10feet the signal strength varies from 65 to 80, for 11 to15feet the signal strength varies from 85 to 92, for 16 to 20feet the signal strength varies from 93 to 98. Using this observation, testing has been done on Android application with LG Android mobile.

The graph 2 indicates the overall success and failures that we got in each test cases and their percentage. We got 66% of success and 34% of failure in this Android mobile.

Table 3: Readings for Sony Android Mobile

Signal strength		18 to 25	26 to 80	81 to 92	93 to 96	97 to 101		
Feet		0	1 to 5	6 to 10	11 to 15	16 to 20		
Devices	Users						Success	Failure
Key	u1	√	√	√	√	√	5	0
	u2	√	√	√	√	√	5	0
	u3	√	×	×	√	√	3	2
	u4	√	×	√	×	×	2	3
	u5	√	×	√	×	√	3	2
wallet	u1	√	√	√	×	√	4	1
	u2	√	√	√	×	√	4	1
	u3	√	√	×	√	×	3	2
	u4	√	×	×	√	√	3	2
	u5	√	√	×	√	√	4	1

Passport	u1	√	√	√	√	×	4	1
	u2	√	√	×	√	×	3	2
	u3	√	√	×	×	√	3	2
	u4	√	×	√	√	√	4	1
	u5	√	√	×	√	√	4	1
Hand bags	u1	√	√	√	×	√	4	1
	u2	√	√	√	√	×	4	1
	u3	√	√	√	√	√	5	0
	u4	√	×	√	×	√	3	2
	u5	√	√	×	√	√	4	1
Percentage							74%	26%



Graph 3: overall graph for success and failure

The above Table 3 shows that the Bluetooth strength for Sony Android mobile i.e. for 0 feet the signal strength varies from 18 to 25, for 1 to 5 feet the signal strength varies from 25 to 80, for 6 to 10 feet the signal strength varies from 81 to 92, for 11 to15 feet the signal strength varies from 93 to 96, for 16 to 20 feet the signal strength varies from 97 to 101. Using this observation, testing has been done on Android application with LG Android mobile.

The graph 3 indicates the overall success and failures that we got in each test cases and their percentage. We got 74% of success and 26% of failure in this Android mobile.

6. Conclusion

In our real life, as we forget the most needful things by keeping some-where and when its need arrives we spend more time to search and loose our patience to search the object. Here we took it as a challenging task to locate the objects using Bluetooth enabled devices. In real time it will be more useful for human beings to identify the most needed object at the right time. In our application we have proved that any object which are tagged with Bluetooth could be easily traceable with the range. Our algorithm achieves an average 69.3% of accuracy rate.

References

1. Mukesh Tiwari, Rakesh et al,:A Review of Detection and Tracting of Object from Image and Video Sequences. International Journal of Computational Intelligence Research ISSN 0973-1873 Volume 13,pp 745-765, Number 5 (2017).

2. Rachana Verma, A Review of Object Detection and Tracking Methods, International Journal of Advance Engineering and Research Development. pp 569-578, vol 4(2017).

3. Matthias Minderer, Chen Sun Ruben et al., Unsupervised Learning of Object Structure and Dynamics from Videos, International Conference on Neural Information Processing System, 2019.

4. Rupesh Kumar Rout., A Survey on Object Detection and Tracking Algorithms, International Journal of Computer Application, volume 3, 2017.

5. Alper Yilmaz, Omar Javed, and Mubarak Shah. Object tracking: A survey. Acm Computing Surveys (CSUR), 38(4):13, 2006.

6. Gary Bishop and Greg Welch. An introduction to the kalman filter. Proc of SIGGRAPH, Course, 8:27599–3175, 2001.

7. J Cezar Silveira Jacques, Claudio Rosito Jung, and Soraia Raupp Musse. Background subtraction and shadow detection in gray-scale video sequences. In Computer Graphics and Image Pro-cessing, 2005. SIBGRAPI 2005. 18th Brazilian Symposium on, pages 189–196. IEEE, 2005.

8. Budi Sugandi, Hyoungseop Kim, Joo Kooi Tan, and Seiji Ishi-kawa. A block matching technique for object tracking employing peripheral increment sign correlation image. In Computer and Communication Engineering, 2008. ICCCE 2008. International Conference on, pages 113–117. IEEE, 2008.

9. Alan J Lipton, Hironobu Fujiyoshi, and Raju S Patil. Moving tar-get classification and tracking from real-time video. In Applica-tions of Computer Vision, 1998. WACV'98. Proceedings., Fourth IEEE Workshop on, pages 8–14. IEEE, 1998.

10. http://www.parallax.com/html_pages/robotics/boebot/boebot.asp

11. http://www.robotics.com/arobot/arobotboebot.html

12. "WhatisBluetooth?" http://www.palowireless.com/infotooth/whatis.asp

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BREAST CANCER DETECTION USING MACHINE LEARNING

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Abstract

Breast Cancer (BC) is common cancer for women around the world, and early detection of Breast Cancer can greatly improve prognosis and survival changes by promoting clinical treatment to patients early. So it's amazing to be able to possibly help save lives just by using data, python, and machine learning. According to the world health organization (WHO) Breast cancer is the most frequent cancer among women, impacting 2.1 million women each year, and also causes the greatest number of cancer-related deaths among women. In 2018, it is estimated that 627,000 women died from breast cancer -- that is approximately 15% of all cancer deaths among women in more developed regions, rates are increasing in nearly every region globally. To improve breast cancer outcomes and survival, early detection strategies for breast cancer: early diagnosis and screening. Limited resource settings with weak health systems where the majority of women are diagnosed in late stages should prioritize early diagnosis programs based on awareness of early signs and symptoms and prompt referral to diagnosis and treatment. Early diagnosis strategies focus on providing timely access to cancer treatment by reducing barriers to care and/or improving access to effective diagnosis services. The goal is to increase the proportion of breast cancer identified at an early stage, allowing for more effective treatment to be used and reducing the risks of death from breast cancer. Since early detection of cancer is key to effective treatment of breast cancer e use various machine learning algorithms to predict if a tumor is benign or malignant, based on the features provided by the data.

Keywords— Machine Learning, Breast Cancer, Python

INTRODUCTION

Breast cancer is a dangerous disease for women. If it does not identify in the early stage then the result will be the death of the patient. It is common cancer in women worldwide. Worldwide near about 12% of women are affected by breast cancer and the number is still increasing. The doctors do not identify each and every breast cancer patient. That's the reason Machine Learning Engineer/ Data Scientist comes into the picture because they have knowledge of maths and computational power. The early diagnosis of BC can improve the prognosis and chance treatment to patients. Further accurate classification of benign tumors can prevent patients undergoing unnecessary treatments. Thus, the correct diagnosis of breast cancer and classification of patients into malignant or benign groups is the subject of much research. Because of its unique advantages in critical features from complex breast cancer datasets, machine learning is widely recognized as the methodology of choice in breast cancer classification and forecast modeling.

LITERATURE SURVEY

Background

Breast cancer is the most common female cancer worldwide including India, where advanced stages at diagnosis, and rising incidence and mortality rates, make it essential to understand cancer literacy in women. We conducted a literature review to evaluate the awareness levels of risk factors for breast cancer among Indian women and health professionals.

Review of Literature

Twenty-four recent research articles have been reviewed to explore the computational methods to predict breast cancer. The summaries of them are presented below. Chaurasia et al. developed prediction models of benign and malignant breast cancer. Wisconsin breast cancer data set was used. The dataset contained 699 instances, two classes (malignant and benign), and nine integers [1] valued clinical attributes such as uniformity of cell size. The researchers removed the 16 instances with missing values from the data set to become the data set of 683 instances. The benign were 458 (65.5%) and malignant were 241 (34.5%). The experiment was analyzed by the Waikato Environment for Knowledge Analysis (WEKA). Naive Bayes, RBF Network, and J48 are the three most popular data mining algorithms that were used to develop the prediction models. The researchers used 10- fold cross validation methods to measure the unbiased estimate of the three prediction models for performance comparison purposes. The models' performance. an evaluation was presented based on the method". effectiveness and accuracy. Experimental results showed that the Naive Bayes had gained the best performance with a classification accuracy of 97.36%; followed by RBF Network with a classification accuracy of 96.77% and the J48 was the third with a classification accuracy of 93.41%. In addition, the researchers conducted sensitivity analysis and specificity analysis of the three algorithms to gain insight into the relative contribution of the independent variables to predict survival. The sensitivity results indicated that the prognosis factor Class was by far the most important predictor.

PROPOSED ALGORITHM

Load Breast Cancer Dataset and Explore

We are loading breast cancer data set using scikit-learn load_breast_cancer class. Scikit-learn provides clean datasets for you to use when building MLmodels. And when I say clean. I mean the type of clean that's ready to be used to train a ML model. The dataset comes with scikit-learn package itself. You don't need to download anything. Within just a few lines of code, you'll be working with the data.

	mean radius	mean texture	mean perimeter	mean area	mean smoothness	mean compactness	mean concavity	mean concave points	mean symmetry	mean fractal dimension	radius error	texture error	perimeter error	area error	smoothness error
0	17.99	10.38	122.80	1001.0	0.11840	0.27760	0.3001	0.14710	0.2419	0.07871	1.0950	0.9053	8.589	153.40	0.006399
1	20.57	17.77	132.90	1326.0	0.08474	0.07864	0.0869	0.07017	0.1812	0.05667	0.5435	0.7339	3.398	74.08	0.005225
2	19.69	21.25	130.00	1203.0	0.10960	0.15990	0.1974	0.12790	0.2069	0.05999	0.7456	0.7869	4.585	94.03	0.006150
3	11.42	20.38	77.58	386.1	0.14250	0.28390	0.2414	0.10520	0.2597	0.09744	0.4956	1.1560	3.445	27.23	0.009110
4	20.29	14.34	135.10	1297.0	0.10030	0.13280	0.1980	0.10430	0.1809	0.05883	0.7572	0.7813	5.438	94.44	0.011490
5	12.45	15.70	82.57	477.1	0.12780	0.17000	0.1578	0.08089	0.2087	0.07613	0.3345	0.8902	2.217	27.19	0.007510

compactness error	concavity error	concave points error	symmetry error	fractal dimension error	worst radius	worst texture	worst perimeter	worst area	worst smoothness	worst compactness
0.04904	0.05373	0.01587	0.03003	0.006193	25.38	17.33	184.60	2019.0	0.1622	0.6656
0.01308	0.01860	0.01340	0.01389	0.003532	24.99	23.41	158.80	1956.0	0.1238	0.1866
0.04006	0.03832	0.02058	0.02250	0.004571	23.57	25.53	152.50	1709.0	0.1444	0.4245
0.07458	0.05661	0.01867	0.05963	0.009208	14.91	26.50	98.87	567.7	0.2098	0.8663
0.02461	0.05688	0.01885	0.01756	0.005115	22.54	16.67	152.20	1575.0	0.1374	0.2050
0.03345	0.03672	0.01137	0.02165	0.005082	15.47	23.75	103.40	741.6	0.1791	0.5249

worst compactness	worst concavity	worst concave points	worst symmetry	worst fractal dimension	target
0.6656	0.7119	0.2654	0.4601	0.11890	0.0
0.1866	0.2416	0.1860	0.2750	0.08902	0.0
0.4245	0.4504	0.2430	0.3613	0.08758	0.0
0.8663	0.6869	0.2575	0.6638	0.17300	0.0
0.2050	0.4000	0.1625	0.2364	0.07678	0.0
0.5249	0.5355	0.1741	0.3985	0.12440	0.0

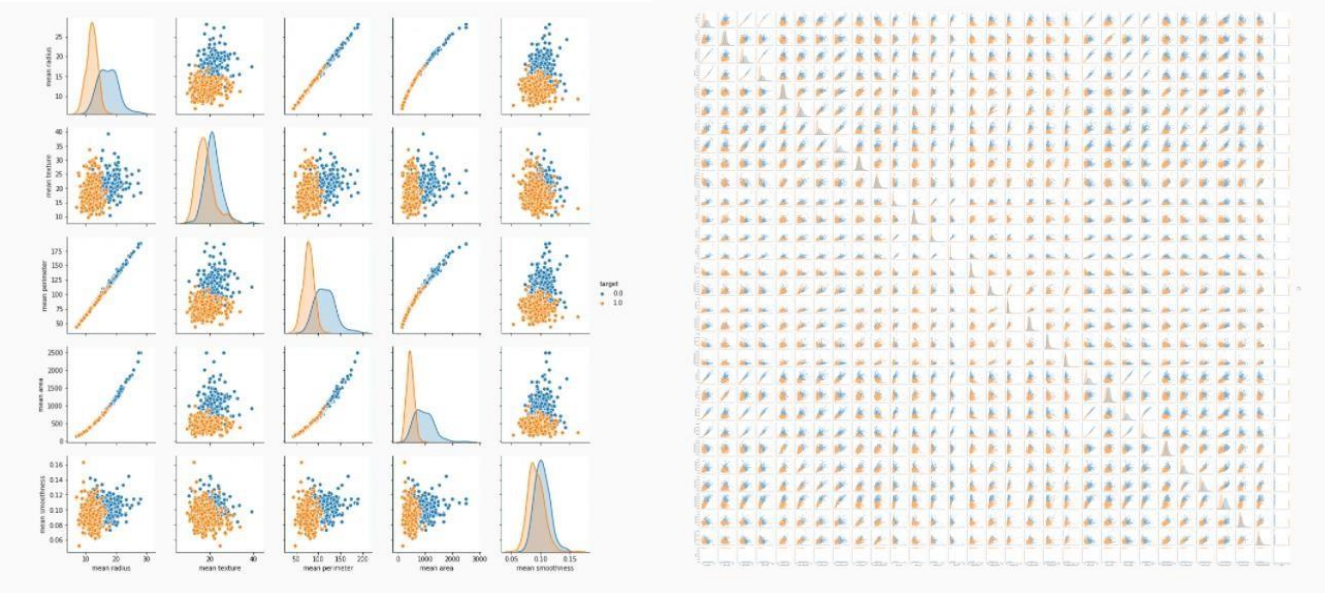
Creating DataFrame and Data Visualization

Now, we are creating Data Frame by concrete 'data' and 'target' together and gives columns names. and we are getting information of cancer Data Frame using. 'info()' method and we will be having a total of non-null 569 patients information with 31 features. All features data types in the float. Numerical distribution of data. We can know to mean, standard deviation, min, max, 25%, 50%, and 75% value of each feature. We have a clean and well-formatted Data Frame, so the data frame is ready to visualize.

```
Data columns (total 31 columns):
 #    Column                   Non-Null Count   Dtype
---   ------                   --------------   -----
 0    mean radius              569 non-null     float64
 1    mean texture             569 non-null     float64
 2    mean perimeter           569 non-null     float64
 3    mean area                569 non-null     float64
 4    mean smoothness          569 non-null     float64
 5    mean compactness         569 non-null     float64
 6    mean concavity           569 non-null     float64
 7    mean concave points      569 non-null     float64
 8    mean symmetry            569 non-null     float64
 9    mean fractal dimension   569 non-null     float64
 10   radius error             569 non-null     float64
 11   texture error            569 non-null     float64
 12   perimeter error          569 non-null     float64
 13   area error               569 non-null     float64
 14   smoothness error         569 non-null     float64
 15   compactness error        569 non-null     float64
 16   concavity error          569 non-null     float64
 17   concave points error     569 non-null     float64
 18   symmetry error           569 non-null     float64
 19   fractal dimension error  569 non-null     float64
 20   worst radius             569 non-null     float64
 21   worst texture            569 non-null     float64
 22   worst perimeter          569 non-null     float64
 23   worst area               569 non-null     float64
 24   worst smoothness         569 non-null     float64
 25   worst compactness        569 non-null     float64
 26   worst concavity          569 non-null     float64
 27   worst concave points     569 non-null     float64
 28   worst symmetry           569 non-null     float64
 29   worst fractal dimension  569 non-null     float64
 30   target                   569 non-null     float64
```

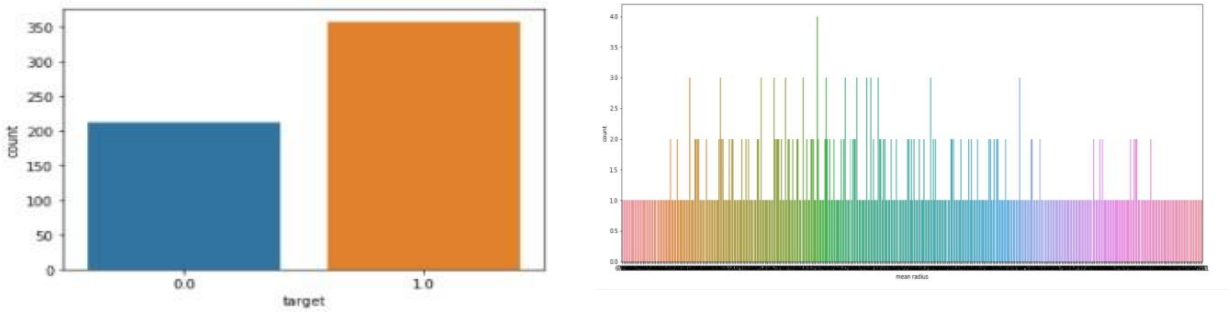
Data Visualization

Pair plot of breast cancer data. Basically the pair plot is used to show the numeric distribution in the scatter plot. The pair plot will show malignant and benign tumor data distributed in two classes. It is easy to differentiate in the pair plot.

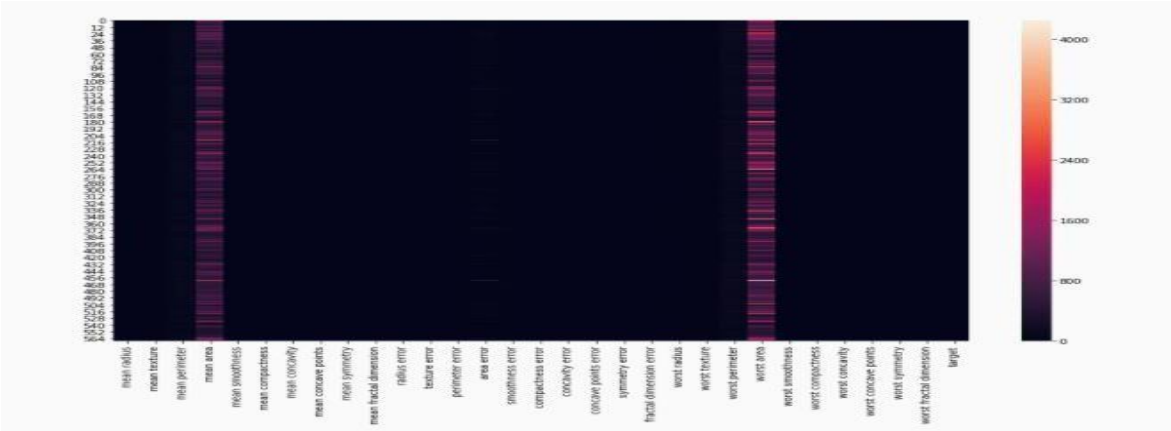


Counter plot of breast cancer data

It will show the total count of malignant and benign tumor patients in counterplot. The counter plot max samples mean radius is equal to 1

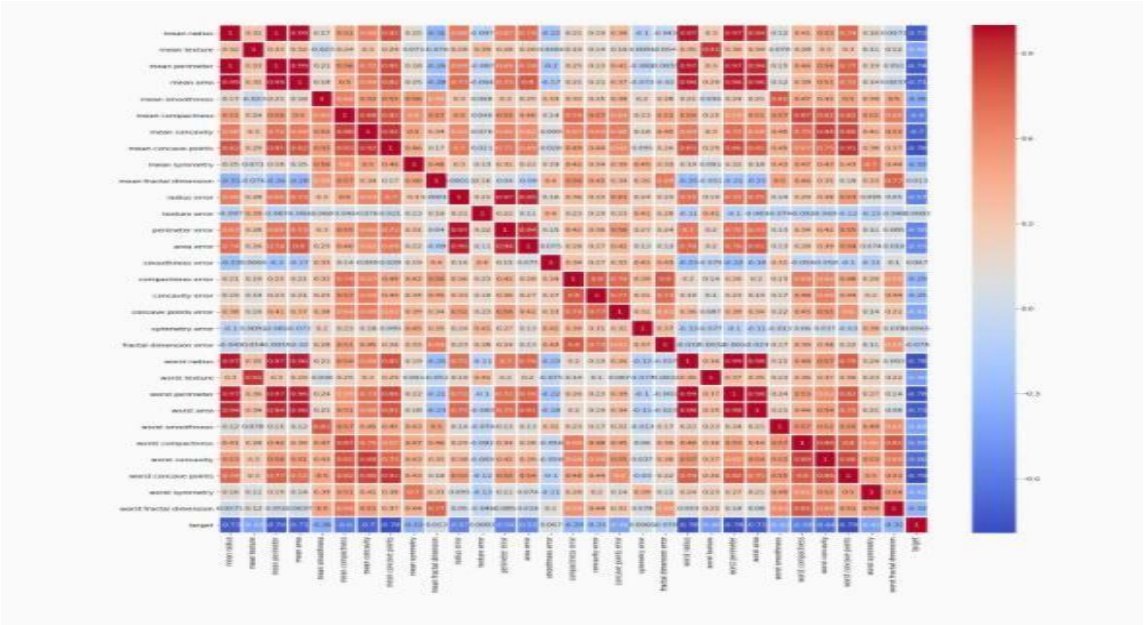


In heat map we can see the variety of different feature's value. The value of feature 'mean' 'area' and 'worst area' are greater than other and 'mean perimeter', 'area error', and 'worst perimeter' value slightly less but greater than remaining features.



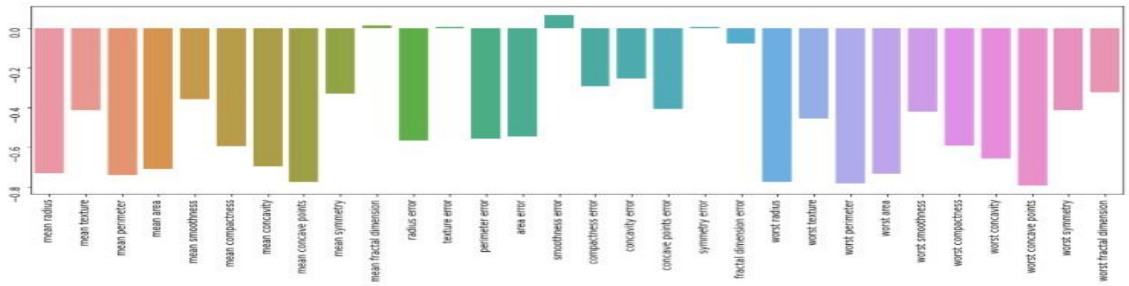
Heatmap of a correlation matrix

To find a correlation between each feature and target we visualize heatmap using the correlation matrix



in this heat map we can see how much one column influences all the other columns (e.g radius mean has 32% influence on texture mean) Training and Testing

Correlation bar plot



In the above correlation barplot only feature 'smoothness error' is strong postively coorelated with the target than others, The features 'mean factor dimension' , 'texture error', and 'symmetry error' are very less positive coorelated and others remaining are strongly negatively correlated.

Breast Cancer Detection Machine Learning Model Building

We have clean data to build the ML model. But which Machine learning algorithm is best for the data we have to find. The output is a categorical format so we will use supervised classification machine learning algorithms, To build the model, we have to train and test the dataset with multiple Machine Learning algorithms then we can find the best ML model.

Support Vector Classifier(SVM)

It is a supervised learning method derived from statistical learning theory for the classification of both linear and nonlinear data. SVM classifies data into two classes over a hyperplane at the same time avoiding over-fitting the data by maximizing the margin of hyperplane separating.

```
0.9649122807017544
```

Logistic Regression

In statistics, the logistic model (or logit model) is used to model the probability of a certain class or event existing such as pass/fail, win/lose. This can be extended to model several classes of events such as determining whether an image contains a cat, dog, lion, etc. Each object is detected in the image would be assigned a probability between 0 and 1 and the sum adding to one. Logistic Regression is used when the dependent variable (target) is categorical.

```
0.9736842105263158
```

K – Nearest Neighbor Classifier

It is a simple supervised learning algorithm in pattern recognition. It is one of the most popular neighborhood classifiers due to its simplicity and efficiency in the field of machine learning. KNN algorithm stores all cases and classifies new cases based on similarity measures; it searches the pattern space for the k training tuples that are closest to the unknown tuples. The performance depends on the optimal number of neighbors (k) chosen, which is different from one data sample to another.

```
0.9385964912280702
```

Naive Bayes Classifier

It is one of the most efficient classification algorithms based on applying Bayes' theorem with strong (naïve) independent assumptions. It assumes the value of the feature is independent of the value of any other features, 4 given the class variable. Based on the maximum probability. It detects the class membership for the given tuple to a particular class.

```
0.9473684210526315
```

Decision Tree Classifier

These Decision Tree are a type of supervised Machine Learning (that is you explain the input is and what the corresponding output is in the training data) where the data is continuously split according to a certain parameter. The tree can be explained by two entities, namely decision nodes and leaves.

```
0.9473684210526315
```

Random Forest Classifier

A random forest is a machine learning technique that's used to solve regression and classification problems. It utilizes ensemble learning, which is a technique that combines many classifies to provide solutions to complex problems. A random forest algorithm consists of many decision trees.

```
0.9736842105263158
```

AdaBoost Classifier

AdaBoost is short for Adaptive Boosting and is a very popular boosting technique that combines multiple "week classifiers" into a single "strong classifier"

```
0.9473684210526315
```

XGBoost Classifier

It's a decision-tree-based ensemble Machine Learning algorithm that uses a gradient boosting framework. In prediction involving unstructured data. A wide range of applications can be used to solve regression, classification, ranking, and user-defined prediction problems

```
0.9824561403508771
```

Confusion Matrix

A Confusion matrix is an N X N matrix used for evaluating the performance of a classification model, where N is the number of target classes. The matrix compares the actual target values with those predicted by the machine learning model. The rows represent the predicted values of the target variable.

Here the matrices are of form

[TP FP]

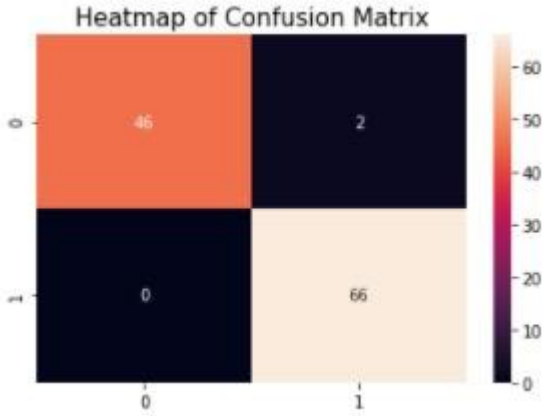
[FN TP]

TP is true positive: A true positive is an outcome where the model correctly predicts the positive class

TN is true negative: A true negative is an outcome where the model correctly predicts the negative class.

FN is false negative: A false negative is an outcome where the model incorrectly predicts the negative class.

FP is false positive: A false positive is an outcome where the model incorrectly predicts the positive class.



Classification Report of Model

	precision	recall	f1-score	support
0.0	1.00	0.96	0.98	48
1.0	0.97	1.00	0.99	66
accuracy			0.98	114
macro avg	0.99	0.98	0.98	114
weighted avg	0.98	0.98	0.98	114

Cross-validation of the ML model

The mean accuracy value of cross-validation is 96.24% and XGBoost model accuracy is 98.24%. It showing XGBoost is slightly overfitted but when training data will more it will generalized model.

Prediction of Model

which is capable of performing the analysis of cytological features based on a digital scan. The program uses a curvefitting algorithm, to compute ten features from each one of the cells in the sample, then it calculates the mean value, extreme value, and standard error of each feature for the image, returning a 30 real-valuated vector Attribute Information.

The Prediction of Model is being used by Gradio an opensource python library that permits you to rapidly make simple to utilize adjustable UI parts for the ML model, any API. The API will give the output of whether the given data is benign or malignant

CONCLUSION

To get more accuracy, we trained all supervised classification but you can try out a few of them which are always popular. After training algorithms, we found that Logistic Regression, Random Forest, and XGBoost classifiers are given high accuracy than remain but we have chosen XGBoost. As ML, we always retrain the deployed model after some time to sustain the accuracy of the model. We hope efforts will save the life of breast cancer patients. In this project in python, we learned to build a breast cancer tumor predictor on the dataset and created graphs and results for the same. It has been observed that a good dataset provides better accuracy. The selection of appropriate algorithms with a good home dataset will lead to the development of a prediction system. These systems can assist in proper treatment methods for patients diagnosed with breast cancer. There are many treatments for a patient based on breast cancer be a very good help in deciding the line of treatments to followed by extracting knowledge from such a suitable database

REFERENCE

[1] University of Engineering and Management, Kolkata Anoy Chowdhury Breast Cancer Detection and Prediction Using Machine Learning

[2] Indian AI production, artificial intelligence education Website.

[3] Sharma, S.V., Haber, D. A. & Dettleman, J. Cell Linebased platforms to evaluate the therapeutic agents. Nat. Rev. Cancer 10(4),241-253 (2010).

[4] Masters, J. R. W. Cell line misidentification: the beginning of the end. Nat. Rev. Cancer 10(6), 441- 448 (2010).

[5] Michaelis, M., Wass, M. N. & Cinatl, J. Drug-adapted cancer cell lines as preclinical models of acquired resistance. Cancer Drug Resist. 2, 447-456 (2019).

[6] Engelman, J. A. et al. Met amplification leads to gefitinib resistance in lung cancer by activating ERBB3 signaling. Science (80-) 316(5827), 1039- 1043 (2007)

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COVID PREDICTION USING DEEP LEARNING

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Abstract

The outbreak of the Coronavirus disease 2019 (COVID-19) caused the death of a large number of people and was declared as a pandemic by the World Health Organization. Millions of people are infected by this virus and are still getting infected every day. As the cost and required time of conventional Reverse Transcription Polymerase Chain Reaction (RT-PCR) tests to detect COVID-19 is uneconomical and excessive, researchers are trying to use medical images like X-Ray and Computed Tomography (CT) images to detect this disease with the help of Artificial Intelligence (AI) based systems, to assist in automating the scanning procedure.

Keywords: COVID-19, Deep Learning, Medical Image

INTRODUCTION

Coronaviruses represent an extended family of respiratory viruses that can cause mild to moderate diseases, from the common cold to respiratory syndromes such as MERS (Middle East respiratory syndrome) and SARS (Severe acute respiratory syndrome). They are so called because of the crown-shaped tips that are present on their surface. These kind of viruses are common in many animal species (such as camels and bats) but in some cases, though rarely, they can evolve and infect humans and then spread to the population. A new coronavirus strain that has never previously been identified in humans is the one appeared at the end of 2019 i.e., the 2019 novel coronavirus (COVID-19, acronym of Corona Virus Disease 19). The first cases were found during the COVID19 pandemic of 2019-2020, which probably started around the end of December 2019 in the city of Wuhan, the capital of the Chinese province of Hubei, and subsequently spread to various countries of the world.

METHODOLOGY

Covid-19 Diagnosis from Images Using DenseNet121

DenseNet121-COVID-19 based on a hybrid convolutional neural network (CNN) architecture is proposed using an optimization algorithm. The CNN architecture that was used is called DenseNet121 and the optimization algorithm that was used is called the gravitational search algorithm (GSA). The GSA is adapted to determine the best values for the hyper parameters of the DenseNet121 architecture, and to achieve a high level of accuracy in diagnosing COVID-19 disease through chest x-ray image analysis. The obtained results showed that the proposed approach was able to correctly classify 98% of the test set. To test the efficacy of the GSA in setting the optimum values for the hyper parameters of DenseNet121, it was compared to another optimization algorithm called social ski driver (SSD). The comparison results demonstrated the efficacy of the proposed GSA-DenseNet121-COVID19 and its ability to better diagnose COVID-19 disease than the SSD-DenseNet121 as the second was able to diagnose only 94% of the test set. As well as, the proposed approach was compared to an approach based on a CNN architecture called Inception-v3 and the manual search method for determining the values of the hyper parameters. The results of the comparison showed that the GSA-DenseNet121 was able to beat the other approach, as the second was able to classify only 95% of the test set samples.

Convolution Neural Network(CNN)

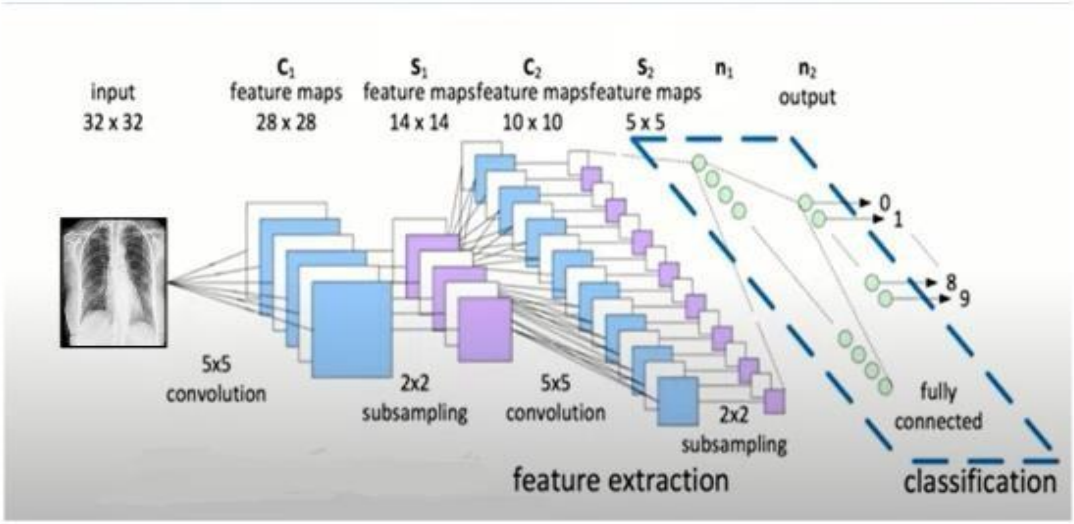


Fig 1.1: Feature extraction

A convolution neural network is a Deep Learning Algorithm that takes in images as input and assigns importance to various aspects or objects in an image and it can create a differentiation between one image or one aspect from the other pre-processing required in a convolution neural network is much lower as compared to another classification algorithm. As compared to another classification algorithm the architecture of convolution neural network is similar to that connectivity pattern in the neurons of a human brain and this was inspired by the visual cortex of a human being here individual neurons respond to the stimuli only so here the neurons respond only if the specific features are present so this what exactly is convolution neural network. Here the images have been taken through as input and then pass it through various filters and each of these filters is responsible for taking one or the other features and now once these features are formed we can reduce the size by using some meshes and then we perform the similar task again and again once we sample the images to a certain level we flatten these images and we pass artificial neural network over it.

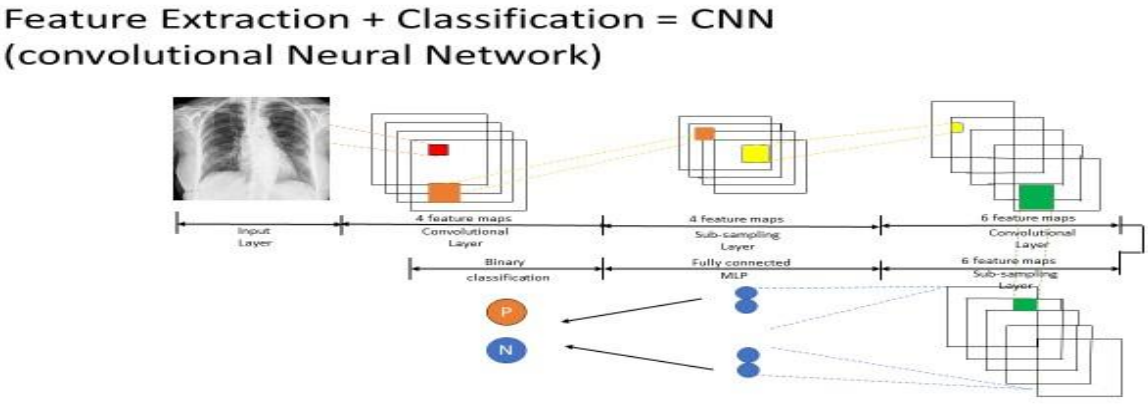


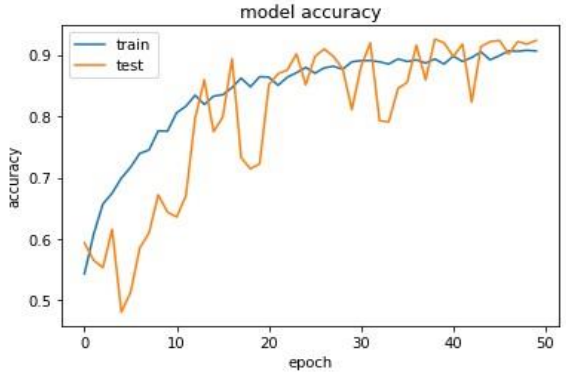
Fig 1.2: convolutional neural network

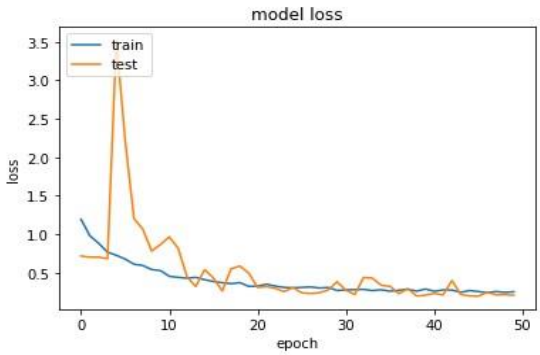
Let us move ahead and see what are the basic components required for processing images using CNN. First off we have something called the convolution layer. What is the convolution layer? It is a set of filters and these filters when passed through or image data set it is capable of extracting a specific set of characteristics. for example, if we have an image of covid x-ray so the infected lungs will differ from the normal healthy lungs x-ray now when we have this convolution layer this is basically here is an image and this filters we can have not one but have n number of filters and the filter size is usually three cross three and each of these filters is responsible for extracting one specific feature from the x-ray and let's say this filter over here is responsible for detecting the covid x-ray image so this is what this filter does and the next filter might be responsible for detecting the difference of infected lungs and the normal healthy lungs and third filter might be

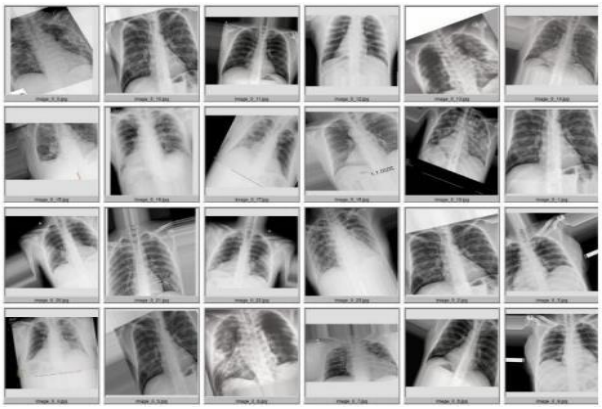
responsible for detecting the shape overall outer shape of the lungs. This is practically what we do in the convolutional layer and this is the way it works. How exactly does this work? As you can see we have the image of the covid and then there would be a slider which goes through all the pixel value and if you say slider is of 3 cross 3 pixels at a time and goes through every pixel over here or the grid of pixels over her and then we pass out a convolution and a relu which is an activation function the reason why we do this multiple number of times is because we want to increase the non-linearity and basically we have been trying to extract different feature of the airplane and once we have enough number of feature what we do is flatten these feature into a single strip of images and then we pass them through a fully connected layer and out of which we can classify whether a image is covid are not and depending upon the type of classification we can use the activation function if the type of classification is binary for something called a sigmoid and if it's a multiclass classification we can use both soft max.

COVID-19 Prediction and Detection

Special attention must be paid to the avoidance of overfitting in the un-augmented dataset, especially when increasing the epochs as the validation slowly improves in the beginning and then stops improving when the epochs are increased, as shown in Figure 2.1. When the augmented dataset is used, the gap between the training and validation becomes smaller after a few epochs, as shown in Figure 2.2. Thus, a greater improvement is achieved in the training process, and a more generalized and robust COVID-19 detector is achieved using the CNN models when implementing data augmentation on the dataset. Figures 3.1 and 3.2 show the augmented chest X-ray images of COVID-19 patients and healthy persons, respectively. Special attention must be paid to the avoidance of overfitting in the un-augmented dataset, especially when increasing the epochs as the validation slowly improves in the beginning and then stops improving when the epochs are increased, as shown in Figure 2.1. When the augmented dataset is used, the gap between the training and validation becomes smaller after a few epochs, as shown in Figure 2.2. Thus, a greater improvement is achieved in the training process, and a more generalized and robust COVID-19 detector is achieved using the CNN models when implementing data augmentation on the dataset. Figures 3.1 and 3.2 show the augmented chest Xray images of COVID-19 patients and healthy persons, respectively.



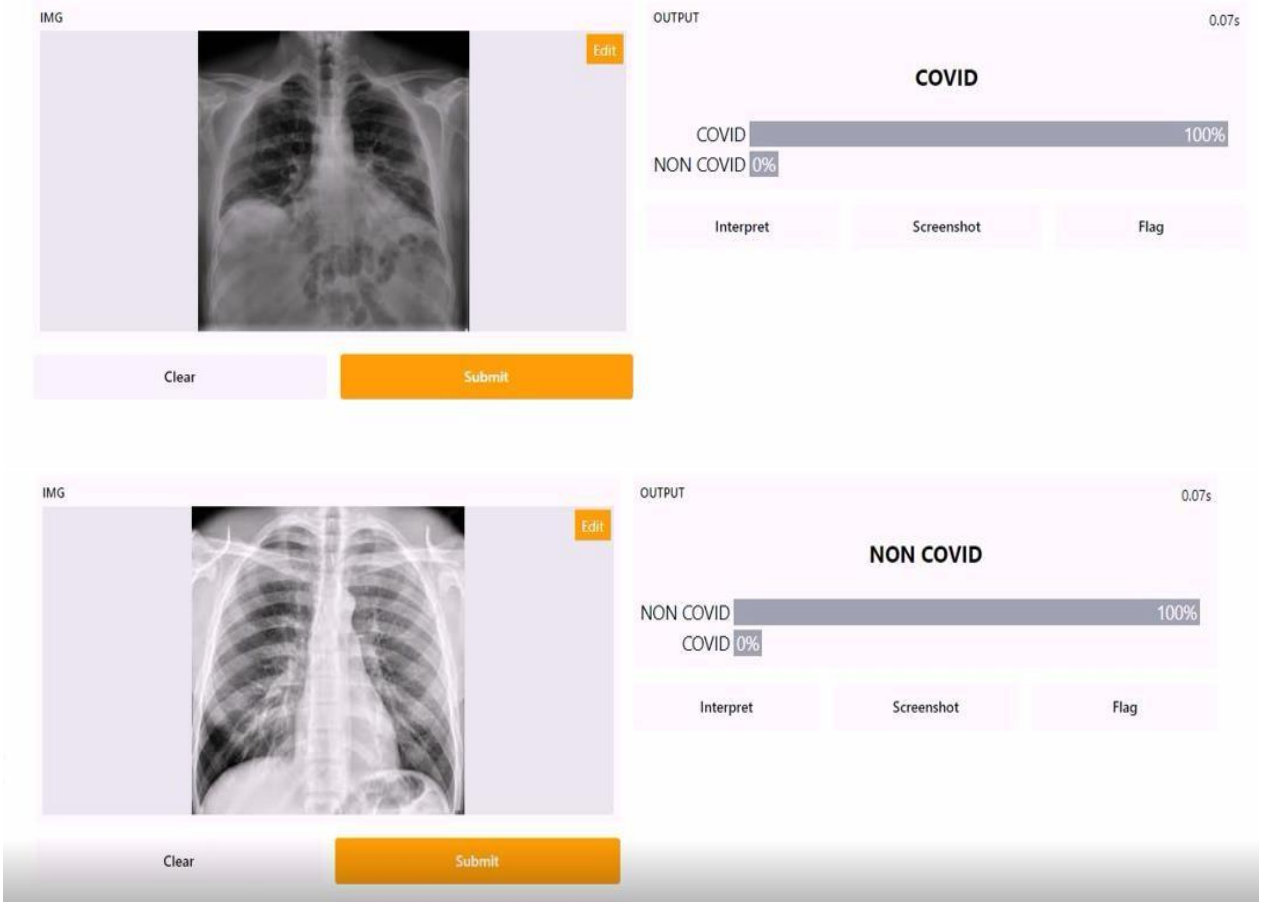




RESULTS AND DISCUSSION

Gradio is an open-source python library that allows you to build a user interface for machine learning models and deploy it in a few lines of code. We have worked with dash and streamlit in python so it's similar and it is integrated directly with notebooks and doesn't require a python script.

By data augmentation and filtering the dataset haven been founded the Accuracy and Loss curve. By the prediction of the model. The data is considered to be given respected Prediction.



CONCLUSION

Once we get to know from the machine that these images are the images of the corona infected lungs and the model is 97% accurate, what are the consequences of leaving 3 corona positive cases out of 100 covid positive cases? The question arises what exactly did the model detect in the image to show it is corona positive, well that is detected using some techniques like cultivation maps which are done by using an algorithm called gradcam. that'll show us what is the region or why the model detected it as corona positive by making some visualizations later by which radiologists confirm seeing that x-ray. as it is very important to see the reasoning part when we are dealing with the medical data. whatever the images which get uploaded to the model the first thing it does is the features of the image get extracted and they are classified as lower layers and higher layers where lower layers give the low-level details and the higher layers give the high-level features.

NOTE: There are newer publication that suggest CT scan are better for diagnosing, COVID-19, but we have to worked with the project for x-ray images dataset, Secondly, I am not a medical expert and I presume there are other, more reliable, methods that doctors and medical professionals will use to detect COVID-19 outside of the dedicated test kits.

This is a learning project, not a research results but we still got around 97% accuracy on available datasets.

REFERENCE

[1] World Health Organization, "Laboratory testing for coronavirus disease 2019 (COVID-19) in suspected human cases: interim guidance, 2 March 2020," World Health Organization, World Health Organization2020.

[2] [M. Alazab, S. Venkatraman, P. Watters, M. Alazab, and A. Alazab, "Cybercrime: The Case of Obfuscated Malware," in Global Security, Safety and Sustainability & e-Democracy. vol. 99, C. Georgiadis, H. Jahankhani, E. Pimenidis, R. Bashroush, and A. Al-Nemrat, Eds., e

[3] International journal of computer information system and industrial management Application.

[4] F. Jiang, L. Deng, L. Zhang, Y. Cai, C. W. Cheung, and Z. Xia, "Review of the clinical characteristics of coronavirus disease 2019 (COVID-19)," Journal of General Internal Medicine, pp. 1-5, 2020.

[5] Z. Wu and J. M. McGoogan, "Characteristics of and important lessons from the coronavirus disease 2019 (COVID-19) outbreak in China: summary of a report of 72 314 cases from the Chinese Center for Disease Control and Prevention," Jama, 2020.

[6] T. Ai, Z. Yang, H. Hou, C. Zhan, C. Chen, W. Lv, et al., "Correlation of chest CT and RT-PCR testing in coronavirus disease 2019 (COVID-19) in China: a report of 1014 cases," Radiology, p. 200642, 2020.

[7] COVID-19 prediction and detection using deep learning techniques. Electronic Tech. Department AIHawija Technical Institute

[8] Machine Learning-based prediction of COVID-19 diagnosis based on symptom. Digital Medicine

[9]Radiology Using Artificial intelligence to detect COVID-19 and community-acquired pneumonia based on pulmonary CT

[10] Covid prediction using machine learning. International journal of Engineering and technology

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"Sustainable Growth through Nano Science and Artificial Intelligence for Safeguard of Environment"

NEED OF ROBOTIC TECHNOLOGY IN MEDICAL ASSISTANCE

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ABSTRACT:

In this paper we tried to review the demands for the robot which induced with the humans in the area of military, medicine, rehabilitation, assistive technology The review paper has covered the wide range of robots being developed over the past decades and could develop a robots which are less expensive and more helpful to medical system and mankind.

INTRODUCTION:

Robotics it's a arm of applied science that comprises of design, building, functioning and implementation of robots [1].

To perform easy recurring duties in factories such as automobiles manufacture robots are extensively employed and in factories where environment is hazardous to human the robots are used in place of human to perform work many types of industry. Robots are manufactured in such a way that they could sense, touch and vision and ability to sense temperature [2-3].

The first digitally operated and programmable robot was invented by George Devol in 1954. Robot is a machine especially one programmable by computer. Capable of carrying out complex series of action automatically. A robot can be guided by an exterior commanding gadget or the commanding can be

embedded within robots maybe constructed to evoke human form, but most robots with an importance on a sharp performance instead expressive aesthetics [4].

Modern robotics not any more involves only industrial application but also utlisation of robotics in a more compound and unshaped exterior world, the automation of several human occupations looking after over the unwell, riding car, military sector. The car industry looked up with the introduction of the industrial robot also with the robotisation of cars. The military first and foremostly in the United states positioned at the base front of artificial intelligence expansion and now information technology. Modern robotics put forward numerous possibilities for fomulating human life more pleasant but at the same also evolves countless difficult societal and ethical issues, implementation of care robots is just taking shape on the horizon [5,15].

This paper provides an overview on medical robotics like a robot system, medical robots fundamentally couple information to physical action to significantly enhance tasks in this case surgical instrumentation, rehabilitation, simply helping physically challenged people in daily tasks. This article is focusing to come up with an overview to the evolution research areas in robotics from classical motion control for industrial robots to modern advanced commanding techniques [6].

With the assistance of robots we can treat the patients without the need of doctors and preventing taking risk from infectious disease and easily transformable such as covid-19 and some kind of cancers etc [14].

[DISCUSSION]

ROBOTIC CAR:

Advanced driver assistance system (ADAS) is technology which does not require the driver to run the car it is completely auto operated car even it could follow the rules and regulations of traffic.

The usage of this technology indicates that development in the industry and research institutions and even governments. The current driver assistance system usually indicates the extreme growth and development automation of the driving task. These cars are in use in Germany is driven all around Berlin to this day it played a part while being renowned as the success. The innovators are been guaranteed with a license to excute car tests on a road. The following objective of the innovators must follow while running the robotic car or bus, whether to pickup a person it comes across with a parallel direction on the pre-decided route. Robotic cars could sense and slow down the speed. It could also lead to terrorist and criminal related activities, it is more expensive and it can’t be afforded by our country even it causes the loss of driving related jobs, more the one million drivers lost there jobs annually due to robotic cars.

MILITARY ROBOT:

The use of robots in military is very lifesaving, even robots won't hesitate to kill the enemy, they won't get scared. They can even survive in very hot and very cold weather conditions, they take decision as fast as possible , they are unaffected by hunger, fear, stress, fatigue, anger, revenge, they didn't have family emotions. There parts of the body can be replaced its only cost effective but not life. Robots can see and looks better than human, they won't get bored, they reduces the risk on human life. They don't have any physiological and mental pressure. Even though army robots have all these advantages it can't be used in war because it leads to technical war between countries which would destroy large amount of human life. All countries couldn't afford robotic armed forces in it's army. They can collapse and turn against, it leads to loss of the job of human.

ROBOT IN MEDICAL FIELD:

A number of operating rooms across the globe are been installed with surgical robots. In upcoming days the utilization of robots will be an usual view which has made evident from the large scale usage of robots in providing health care facility. Robotics being the good healthcare providers get a potential to be the revolutionary in the medical sector with the unique applications and advantages. With the help of Artificial Intelligence we can see rising up in the standard, preciseness, effectiveness in healthcare service delivery. The progress in Artificial Intelligence will give a new extend to robotics. As the blend of AI and robotics will make operation quick and much secured.

CONCLUSION:

The demand for the robots which introducing with human in the areas of military, medicine, rehabilitation, assistive technology etc will continue to grow and robots could possibly answer there demands in future. Robots with embedded artificial intelligence could be developed into self encounter navigating and manipulating system.

This review paper has covered a wide range of robots being developed over the past decades and could develop a robots which are of less expensive and more helpful to medical system and mankind.

REFRENCES:

1. Alex Owen-Hill, blog-robotia.com, ampproject.org

2. https://www.medicaldevice-network.com , Robotics in healthcare thermatic research.

3. National Robotics Initiative. https://doi.org/www.nasa.gov/robotics/index.html.

4. A Roadmap for US Robotics-From Internet to Robotics. https://doi.org/jacobsschool.ucsd.edu/contextualrobotics/docs/rm3-final-rs.pdf.

5. National Robotics Initiative 2.0: Ubiquitous Collaborative Robots (NRI-2.0). https://doi.org/www.nsf.gov/pubs/2017/nsf17518/nsf17518.htm.

6. https://doi.org/www.dccae.gov.ie/en-ie/communications/topics/Digital-Agenda-for_Europe_/Pages/default.aspx.

7. https://en.m.wikipedia.org

8. www.analyticsinsight.net

9. https://www.automate.org

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Revisiting Fabrication of Nanoparticles Using Marine Microbes

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Abstract

The development of reliable and sustainable synthesis of nanomaterials is an important aspect of current nanotechnology research and one of the most in demand technology in various fields of science. Synthesis of nanoparticle by traditional chemical and physical methods have their own constraints as laborious process, economically expensive and causing environmental defects. However green nanotechnology is safe, time saving, eco-friendly, economical. The ability of bacteria to reduce metals at nanoscale can be effectively used as strategy for remediation of metal contaminations and wastes. These nanoparticles are potentially active in broad spectrum areas like gene therapy, cancer treatment, DNA analysis, antibacterial agents, separation techniques, targeted drug delivery, biosensors and magnetic resonance imaging. Use of marine microorganisms for the synthesis of nanoparticles has grabbed global attention not only being eco-friendly but applications in wide range of parameters. The present study focuses on the biosynthesis of nanoparticles from marine microorganisms, optimization of process for the designed morphology and controlled size with scaling up process and applications of bacterial pigment derived nanoparticles.

Keywords: Nanoparticles, Marine microorganisms, Bacterial pigments, Applications

Introduction:

An emerging field of technology in the field of science- nanotechnology, potentially impacting over various scientific areas such as medicine, pharmaceutical industries, energy, electronics and space industries has attracted enormous interest in last few years. This emerging technology plays with smallest structures of different materials with a range of nanometres to less than 100 nanometres, commonly called as nanoparticles (NPs). These particles are unique not only in their size but also in physical, chemical and biological properties compared to large size of its same composition. Thus the high surface-to-volume ratio of NPs, properties exhibited are size and shape dependent with applications ranging from wireless

electronic logic, memory schemes, computer transistors, electrometers, nanocomposites, filters, chemical sensors, biosensors and catalysts to optics, antimicrobial, anticancer activity, medical imaging, drug delivery, and hyperthermia of tumours (Salata et al., 2004, Bhattacharya et al., 2005).

Owing to the versatile usage of nanoparticles in various fields there is a great interest in synthesising well dispersed, uniform and ultrafine nanoparticles to exploit their distinct properties. Nanoparticles can be synthesized by various materials by methods like physical, chemical and biological (Salunke *et al.*, 2016). Nanoparticles synthesized by physical and chemical methods are quite popular for their huge production in short time with defined size and shape. However, the chemicals used in the synthesis are toxic with hazardous effects on human health as well as on environment. Therefore, when there is need of use of nanoparticles in medical fields, an alternate method has to be thought of, which is non-toxic, eco-friendly, reliable i.e, biological synthesis. Amongst the natural resources microorganisms are one of the most acceptable options to synthesize the nanoparticles.

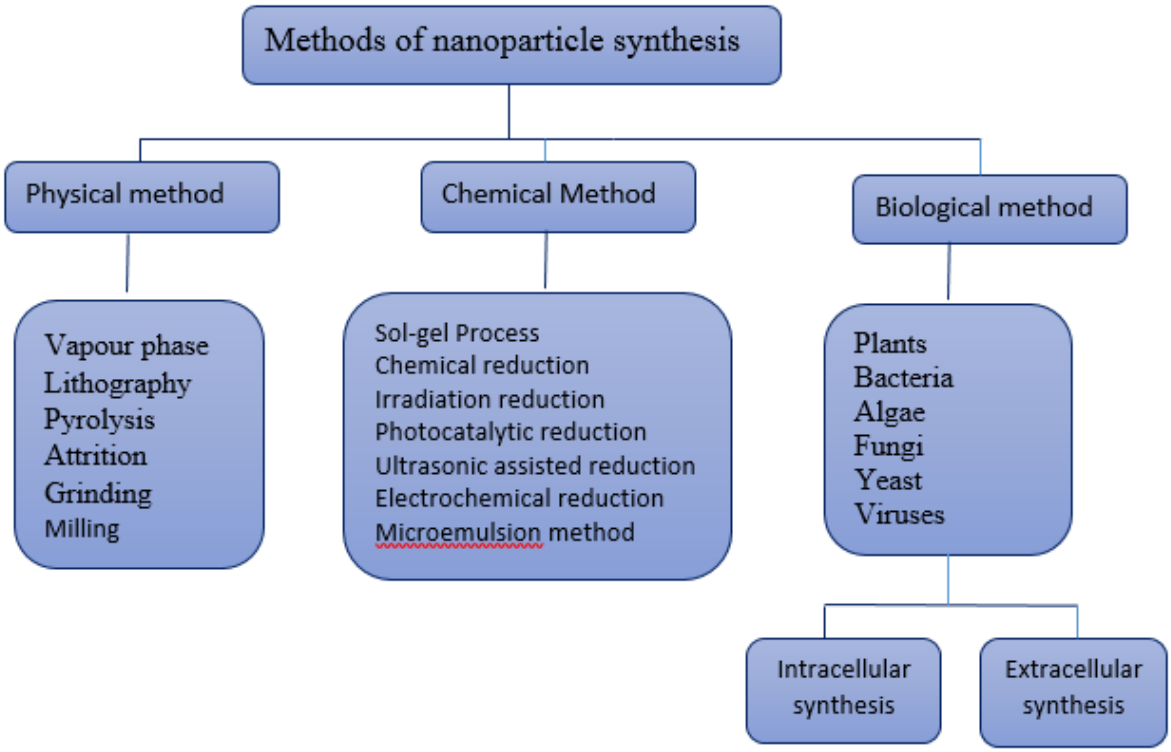

Fig. 1. Methods of nanoparticle synthesis

Various types of physical techniques are available for the synthesis of nanoparticles but are feasible for small scale production, as the yield is very low at large scale level and expensive (Shedbalkar *et al.*, 2014). To overcome the difficulties of physical methods many chemical methods are routinely followed which consumes less energy with homogenous production of NPs (Albanese *et al.*, 2012). Nanoparticles synthesized by the physical and chemical methods have their own constrains as they are unstable, time consuming, laborious, unsafe for human as well well as for environment and inconvenient for biomedical applications (Yang, *et al.*, 2013, Shah *et al.*, 2015, Kharisov *et al.*, 2016, Arshad *et al.*,2017). Therefore

it was necessary to develop cost effective, quicker, reliable, stable, non-toxic, eco-friendly technique of synthesizing NPs from natural resources as microorganisms.

Green method is vital to minimize waste and guard surroundings. The use of marine microbes for metallic nanoparticles synthesis is not only eco-friendly, time saving, and inexpensive but unique and diverse metabolites. Due to amazing adaptability of marine microbes, the metabolites extracted also have extraordinary range of applications. This green synthesis of nanoparticles is accepted by the fact that the microorganisms dwelling in the diverse climatic conditions of temperature, pH, salinity, salt conditions, heavy metal and pressure making them catalytically active and wide specific area (Simkiss *et al.,* 1989, Bhattacharya *et al*., 2008). Recently, organic nanoparticles have been located to be greater pharmacologically active than physicochemically synthesized nanoparticles. The ability of bacteria to thrive in many such adverse physical parameters makes them the most reliable candidate for the synthesis of not only nanoparticles but also various other metabolites for human applications. Bacteria due to their comparative small generation time, easy methods of cultivation, mass production can be preferred over other microorganisms and thus can be considered as potential "bio-nano-factories" for the synthesis of various metal nanoparticles. The entire cell biomass or the cell extracts are explored for the engineering of nanoparticles like iron, magnetite, cadmium sulphide, titanium, titanium dioxide, silver, gold, platinum, palladium (Joerger et al., 2001, Lengke et al., 2011).

Bacterial nanoparticles

Biological entities and inorganic substances were in steady contact with every other since inception of life on the earth. Sustenance of life with well-organized deposit of minerals was found mere due to this regular interaction. Many intracellular and extracellular metabolites contribute naturally for the reduction of metal ions and thus making survival more effective in the extreme environments. The observation of microbes interacting regularly with inorganic compounds was more interesting area of research for recent scientists.

Bacteria are found to be growing in wide environmental conditions from extreme cold to severe hot temperatures, low to high pH, various pressure range, high salt concentrations and also heavy metal contaminated areas. They are able to adapt themselves with such adverse conditions due to the presence of magical molecules-enzymes which are metabolically active at such extreme parameters. Bacteria possess excellent ability to lessen heavy metallic ions and are one of the nice applicants for nanoparticle synthesis. *Pseudomonas stutzeri* and *Pseudomonas aeruginosa*- superbug are seen thriving considerable high concentrations of metal ions (Bridges *et al.,* 1979, Haefeli *at el.,* 1984). Iron and sulphur oxidising bacteria like *Thiobacillus ferrooxidants, T. thiooxidants* and *Sulfolobus acidocaldarius* are the notably excellent examples of metal chelating bacteria naturally present in extreme environments and can be considered for the synthesis of metal nanoparticles (Gustafson *et al*., 1976). The presence of magnetosomes in the cell membrane of bacteria helping them to align themselves and navigate along the earth magnetic field are the naturally gifted membrane enclosed magnetic nanoparticles. Experimental evidences showed the removal of metals like Ag+, Cd2+, Cu2+, and La3+ from solution by *Bacillus*

cereus, B. subtilis, E. coli, and *P. aeruginosa* (Mullen *et al.,* 1989). Biomineralization of tellurium by Escherichia coli K12 (Taylor *et al.,* 1999), technetium (VII) by *Shewanella putrefaciens* and *Geobacter metallireducens* (Lloyd *et al.,* 1999) and selenite to selenium by Enterobacter cloacae, Desulfovibrio desulfuricans, and Rhodospirillum rubrum (Kessi *et al*., 1999) is already reported. Biosynthesis of nanoparticles is a booming bionanotechnology drawing a great attention to develop environment-pleasant technologies in materials synthesis. Many bacterial species like *Pseudomonas aeruginosa, Pseudomonas deceptionensis, Bacillus licheniformis , Pyrobaculum islandicum, Pyrococcusfuriosus* are explored to synthesize silver (Ag), gold (Au), iron (Fe), nickel (Ni), zinc (Zn) and other important NPs(Shivaji *et al.*, 2011, Castro, *et al.*, 2014, Jang *et al*.,2015, Singh *et al*., 2016, Saravanan *et al.*, and Sanaeimehr *et al*., 2018, Salem *et al*., 2021). Besides their natural ability to reduce metals (synthesize nanoparticles) their metabolic pathways can also be altered by genetically engineering for the synthesis of desired composition, size and shape of the nanoparticle with specific physical, chemical and biological properties (Kang *et al.*, 2008). This century's outbreak COVID-19 has posed a great challenge in the field of medicine by developing effective modes of diagnosis and treatment. Advance strategies can be developed using nanotechnology base to cope up with such pandemic situations.

Gold Nanoparticles

Historical evidences of ancient Roman times reveal the use of gold to decorate glasses, gold nanoparticles to cure various diseases. Lactobacillus, gut bacteria not only beneficial as probiotic but also effectively used for the production of nanocrystals and nanoalloys (Nair *et al.*, 2002). As the size and shape of nanoparticles decides the effectiveness of the particle, this becomes challenge to produce nano structures in different shapes (spherical, cubic, and octahedral) and size, so was reported in studies using filamentous *cyanobacteria* (Lengke *et al.*, 2006). Conditions like Alkalinity and high temperatures are the features of marine environment and bacteria adapt quite efficiently to these conditions, gold nanoparticles were synthesized using Rhodococcus sp by from such conditons (Ahmad *et al.*, 2003). Synthesis of both extracellular gold nanoparticles by fungus Fusarium oxysporum and actinomycete Thermomonospora sp (. Mukherjee et al., 2002, Ahmadet al., 2003) and intracellular by fungus Verticillium sp was reported (Mukherjee et al., 2001).

Silver nanoparticle

Ancient Indian tradition shows high inclination towards use of silver articles not only as royal mark but even as culture. Knowing the beneficial effects of silver, utensils and ornaments are quite commonly used in day to day life. Understanding the antiseptic and antibacterial activity of silver, synthesis of silver nanoparticles synergistically enhances its activity in various other ways. Silver nanoparticles are effective antimicrobial against gram positive and Gram negative bacteria including emerging multiresistant strains of methicillin resistant *Staphylococcus aureus* (Pana´cek *et al.,* 2006). Various microorganisms are seen to reduce silver to produce silver nanoparticles naturally and the same is observed by *Pseudomonas*

stutzeri AG259 isolated from silver mines producing AgNPs of well-defined size and distinct topography within the periplasmic space (Klaus *et al*., 19990). Fungi *Verticillium*, *Fusarium oxysporum, or Aspergillus flavus* found to form silver nanoparticles in the form of film, in solution or accumulated on the surface of its cells (Senapati *et al.*, 2004, Jain *et al*., 2011). Besides being antibacterial AgNPs are also found to be potential antitumor properties which was evident from the invitro studies carried in dentistry. AgNPs in association with dental materials as implant coatings, acrylic resins, resinco-monomers, nanocomposites, adhesives and intracanal medications were excellent antimicrobial activity, and thus an interesting tool in the treatment of oral cancer (Noronha et al., 2017).

Alloy nanoparticle

Single metal nanoparticles are efficient enough to exhibit various biological activities, but alloy nanoparticles also are of great interest for researchers due to their applications other than biomedical field as in coatings materials, as optical materials, electronics and as catalysts (Senapati et al., 2005, Zheng et al., 2010). There was an argument for the secreted cofactor NADH during the synthesis of bimetallic Au-Ag alloy *F. oxysporum* had important role in defining the composition of Au-Ag alloy nanoparticles (Senapati et al., 2005, Zheng et al). demonstrated the synthesis of Au-Ag alloy nanoparticles by yeast cells (Zheng et al., 2010).

Synthesis of stable nanoparticles is very important for its application and was seen in *Fusarium semitectum* mediated synthesis of Au-Ag alloy nanoparticles in suspension was found to be stable for many weeks (Sawle et al., 2008). Other than direct applications of metal nanoparticles, they also exhibit regulate certain metabolic processes. Regulation of membrane receptor internalization was observed by Au-Ag NPs coated with antibodies. In the process the binding and activation of membrane receptors with the nanoparticles followed by protein expression entirely depends upon the size of nanoparticles. The biological effects of basic cell functioning including cell death was effectively observed with NPs ranging form 40- and 50-nm, although the standard size being 2-100 nm (Jiang et al., 2008).

Other metallic nanoparticles

Heavy metals contamination in the environment not only effects human life upon but on accumulation in food webs but inhibit the growth of microorganisms even. However, microbes resists the toxic effects of heavy metals either by detoxifying them or by utilising them as electron donor to get energy. 5nm size of platinum nanoparticle was synthesized in the periplasmic space of bacterium Shewanella algae at room temperature and neutral pH in 60 min using lactate as electron donar (Konishi et al., 2007). Sulphtae reducing bacterium *Desulfovibrio desulfuricans* and metal non reducing bacterium *Shewanella oneidensis* – were employed for the synthesis of palladium nanoparticles (Lloyd et al., 1998, Windt et al., 2005). Lower concentrations of mercury at pH 8 could promote the production of uniform size, spherical, monodispersed intracellular mercury nanparticls by *Enterobacter sp* (Sinha. Et al., 2011). Studies showed

that Anaerobic hyperthermophilic Pyrobaculum islandicum using hydrogen as the electron donor reduce many heavy metals together with U(VI), Tc(VII), Cr(VI), Co(III), and Mn(IV) (Kashefi *et al*., 2000).

Oxide Nanoparticles

Presence of magnetosomes in the periplasmic space directs the bacterium towards the earth's magnetic field- magnetotactic movement. These bacteria can also be employed for the synthesis of magnetic nanoparticles. However, to differentiate between the artificially synthesized magnetic particles (AMPs), from that of present naturally in the cell membranes, they are referred to as bacterial magnetic particles (BacMPs) (Arakaki *et al*., 2008). These bacteria can be best used for the synthesis of microconfigurated magnetic oxide nanoparticles like super paramagnetic and high coercive force for biological separation and biomedicine fields. Biocompatible Fe3O4 (magnetite) and Fe2O3 (maghemite) magnetic nanoparticles are interestingly focused for targeted cancer treatment, stem cell sorting and manipulation, guided drug delivery, gene therapy, DNA analysis, and magnetic resonance imaging (MRI) (Fan *et al*., 2009).

Mechanisms of synthesis of nanoparticles by bacteria

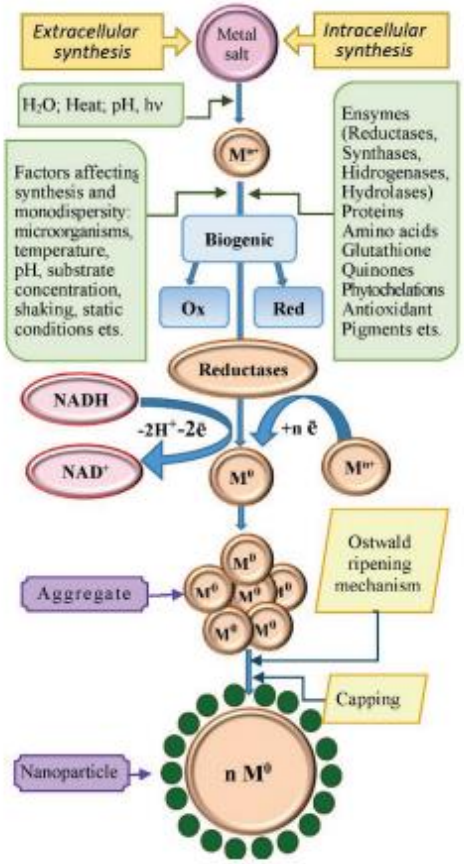

Fig. 2. General mechanism of synthesis of nanoparticles of metals by microorganisms (Tsekhmistrenko et al., 2020).

For the synthesis of nanoparticles microbes are cultured in suitable culture media (depending upon the culture whether bacteria or fungi)supplemented with ions. As the microbial metabolites produced remain inside the cell or can be extracted out from the cell in the media referred as intracellular or extracellular respectively (Shankar et al.,2016).

Metal ions from the media enters the cellvia active transport or endocytosis through semipermeable cell lipid bilayer membrane (Grzelczak & Liz-Marzán, 2014). The difference in the synthesis of intracellular and extracellular synthesis of nanoparticles is-

trapping, bioreduction, and capping of various nanoparticles (Li et al., 2011a), enzyme secretion, bioreduction and particle capping (Singh & Singh,2019) respectively. Although both these processes produce nanoparticles but extracellular particles are preferred over intracellular for easier extraction process- downstream process which itself is a cost effective process, in turn increasing the final cost of the product(Singh, 2015; Banerjee & Rai, 2018). One typically used enzyme is nitrate reductase, which can be chargeable for the synthesis of nanoparticles, such as silver and gold nanoparticles. In the process of bioreduction individual enzymes play an crucial position inside the delivery of electrons from donors to the wonderful metallic ion (Siddiqi et al., 2018).

Process Optimization

Size and morphology of nanoparticle plays dramatic role in the efficacy and application. Production of controlled size and morphology of nanoparticles is of great challenge and area of interest to the researchers. The size of particle can be in the range of few nanometers to approximately 100 nm in diameter with morphology like spherical, triangular, hexagonal, and other shapes. The desired size and morphology of nanoparticle can be achieved by manipulating the physical conditions as temperature, pH, salt concentration of metal and exposure time.

Response surface methodology was applied to establish the relation between the physical parameters (pH, temperature and ZnSO4.7H2O concentration) affecting the size and dimensions of Alk-ZnO NPs (Kordy *et al.*, 2021). Multiwalled carbon nanotubes (MWCNTs) magnetized with Fe3O4 nanoparticles and coated by vinyl end groups were used as support for a new morphine molecularly imprinted polymer by surface imprinting polymerization method (Kolaei *et al.*, 2016). Light yellow color pigment mediated nanoparticle synthesis by diatom revealed the fact that SNP formation occurred only in the presence of light. An increase in intensity of the color was observed which ultimately became red–brown within 30 min.Instead there was no change in color control flasks as well as in the mixture of diatom extract and silver nitrate kept in dark. This indicated that the formation of SNPs in the present case was light dependent (Jena *et al.*, 2015).

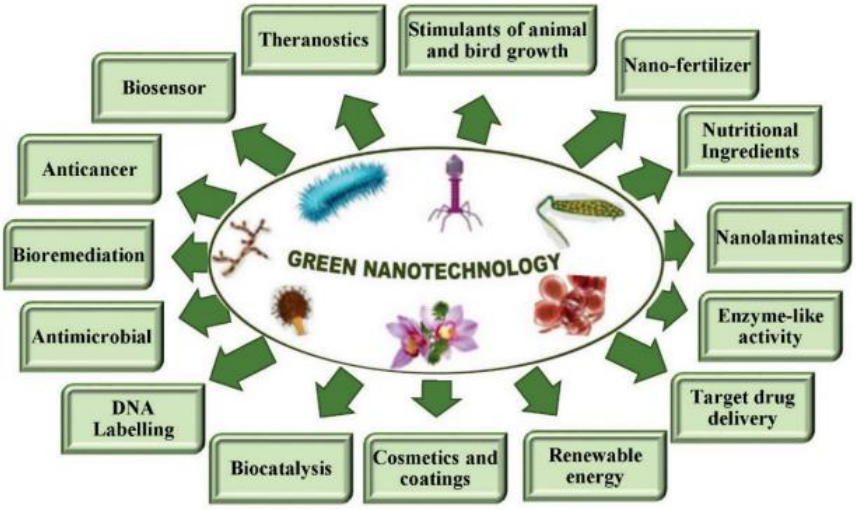

Fig. 3. Applications of biosynthesized nanoparticles

Conclusion

Nanoscience technology is an emerging field of science with wide range of applications specifically in medicine. Physical and chemical methods of synthesis of nanoparticles though are economical, quicker but have its own limitations. Therefor biological synthesis of nanoparticles overcomes the challenges faced by the above said methods. Microorganisms are versatile in their adaptations and so are marine microbes. Due to their unique and fascinating adaptability, their metabolites can be exploited at wider range of parameters. Moreover, the cultivation and scale up of the microbes is much easier and faster due to their small generation time. Biobased approaches of nanoparticle synthesis are still under developing stage and optimization of parameters to produce the desired size, morphology, stability, and aggregation

are challenges. Mechanism of action of synthesis of nanoparticles are yet to be properly understood. So elaborative studies have to be carried out to understand the mechanistics. Marine microbes like Bacteria, fungi, yeast, actinomycetes can be further explored for the synthesis of effective nanoparticle.Thus this small, invisible world of microbes can be developed as "nanobiofactories". Applications of Bionanoparticles have to be explored for the betterment of society in terms of early diagnosis and treatment of new emerging diseases and unexpected pandemic situations. With the latest development and the continuing efforts in enhancing particle synthesis performance and exploring their biomedical applications, it is hopeful that the implementation of those approaches on a big scale and their commercial programs in medication and health care will take region inside the coming years.

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Liposome: Nano-carrier for cancer-targeted drug delivery

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Abstract

This is an overview of nano carrier-drug delivery system (DDS) in cancer therapy. It is very important to design drug related to cancer because in developing world cancer is one of the most prone disease. There are various routs to administrate drug with various formulation, as well as devices used for drug delivery and targeted drug delivery. Nano carrier is a nano sized material used to transport a module to treat one of the substances such as cancer. Liposome, Carbone based material, polymers; micelles etc have been used as nano carrier or particle to treat the various diseases. Research in nano medicine in order to efficiently deliver anticancer agents to tumors, biocompatible nanoparticles including antibody−drug conjugates (ADCs), Liposome's mediated or lipid based nano carriers have recently been designed, synthesized, and tested, some even in clinical trials. Here we reviewed the current status in development of nanomedicine lipid-based nanoparticles research, including the development of liposomal encapsulated anti cancer drug for tumor targeting, their commercial availability, recent progress in liposome technology for the treatment of cancer, and the next generation of lipid based nano carrier development.

Key words- Cancer, Nano carrier, Anticancer, DDS, Liposome, Lipid based nano carrier.

1. INTRPODUCTION-

Cancer is the largest group of disease, start in any part of the organ or tissue when abnormal cells are growing unconditionally by invading adjoining parts of body. WHOs report of 2014 stats that, cancer caused 8.2 million deaths worldwide in 2012, and by 2035 it would be rise upto 22 million (Zen *et al.*, 2017). Metastasizing is a major cause of death from cancer, followed by neoplasm and malignant tumor are other common names for cancer. Followed by diabetes Cancer is the second leading cause of death globally. It has been estimated that around 9.6 million deaths, or one in six deaths, in 2018 are caused by any type of cancer. Lung, prostate, colorectal, stomach and liver cancer are the most common types of cancer in men, while breast, colorectal, lung, cervical and thyroid cancer are the most common among women (*WHO*).

Females are more prone to cancer as compared with that of male cases. Studies show that in female breast cancer has surpassed, and lung cancer as the most commonly diagnosed cancer, with an estimated 2.3 million new cases (11.7%), followed by lung (11.4%), colorectal (10.0 %), prostate (7.3%), and stomach

(5.6%) cancers now a days (Sung *et al.,* 2020). Overall incidence was from 2-fold to 3-fold higher in transitioned versus transitioning countries for both sexes, whereas mortality varied <2-fold for men and little for women. The burden of cancer grow continues to globally, followed by tremendous physical, emotional and financial strain on individuals, families, communities and health systems. Many health systems in low- and middle-income countries are least prepared to manage this burden, and large numbers of cancer patients globally do not have access to timely quality diagnosis and treatment (*WHO*).

Chemotherapy is the most commonly used treatment for cancer which suppresses disease proliferation, progression and metastasis along with surgery and radiotherapy. But chemotherapy has some disadvantages like it not only kills the cancer cell but invade the development of normal cells also (Zen *et al.,* 2017).

To diversify the effect of chemotherapy some anti tumor nanoparticles have been clinical tested and showed promising effect against cancer and other setting also. Nano technology is one of the most developing and diversely used methods now days for treating so many diseases. Approximately 12,000 reports have been published on the topic of Nanomaterials. However, there remains a gap between technological advances and clinical applications (Kumari *et al.,* 2015). However some physicho chemical plays crucial role in development of nanoparticles, in regulating the nano-biointeraction, for designing one of the nano material particle size, shape and surface charges of nanoparticles on their biological performance have been taken under consideration (Hui *et al.,* 2019).

The current review knowledge's innovations in nanotechnology for development of liposome and nanoparticles for drug delivery system (DDS) in cancer treatment. A DDS is said to be a formulation or a device that enables the introduction of a therapeutic substance in the body and improves its efficacy and safety by controlling the rate, time, and place of release of drugs in the body. This process includes the administration of the therapeutic product, the release of the active ingredients by the product, and the subsequent transport of the active ingredients across the biological membranes to the site of action (Jain *et al.,* 2014). In order to efficiently deliver anticancer agent to tumors, it is very important to understand biocompatibility or bioconjugates of nanoparticles, including antibody-drug conjugates (ADCs) have recently been designed, synthesized and tested some even in clinical trials (Kobayashi *et al.,* 2014). To overcome or lower the chemotherapeutic toxicity it is very important to understand these new technologies.

1.2. LIMITATIONS OF CONVENTIONAL CHEMOTHERAPY

In developing world, Cancer is one of the major causes of the death. The rate of prevalence in India was estimated around 2.5 million with a growth of 8,00,000 new cancer cases followed by 5,50,000 cancer deaths every year (Moorthi *et al.,* 2011). In developing world technologies also developed as to overcome the problems behind Conventional chemotherapy some nanobiotechnological treatments have been established now a day. To treat cancer like diseases, by the use of chemical substances and regimens by means of conventional chemotherapy have been in use for the past fifty years (*WHO*).

However there are some limitations by means of using conventional chemotherapy **a) Limited aqueous solubility**: To dissolve chemotherapeutic drugs derived either from plants or synthetic some solvent formulations are needed on other hand this one was risky and toxic also, **b) Lack of selectivity of anticancer drug:** Most chemo treatments invade the development and proliferations of normal cells followed by cancerous cells which was harmful, **c) Multidrug resistance (MDR):** Increase in the synthesis of P-glycoprotein (Pgp) by the use of MDR in the cell membrane causes some severe damages in cell membrane (Moorthi *et al.,* 2011).

To overcome these problems nanotechnology plays important role now a days. Some antitumor nano drugs are currently being tested in preclinical and clinical trials and showed promising effect against cancer (Zhen *et al.,* 2017).

1.3. ADVANTAGES OF NANOTECHNOLOGICAL DRUG DELIVERY SYSTEM (NDDS)

Approximately 1200 reports have been published on the topic of nonmaterial as drug carrier in case of cancer in past few decades (Zen *et al.,* 2017). Nano scale based technology is nothing but nanotechnology; nanoparticles are ultrafine particles by means of nanometer based size from 1 nm to 1000 nm (Moorthi *et al.,* 2014). Nanotechnology literally means of Nanomedicine is a highly specific medical intervention at the molecular scale for diagnosis, prevention and treatment of diseases. In past decades over the many nano drugs have been developed but there remains gape in between technological advantages and clinical applications (Zhen *et al.,* 2017)

However, Nanotherapeutics are rapidly growing field which are utilized to solve several limitations of conventional drug delivery system such as nonspecific biodistribution, lack of targeting, lack of aqueous solubility, poor oral bioavailability, and low therapeutic indices(Moorthi *et al.,* 2014).

Nanomaterials have plenty of advantages as drug carrier or in DDS. Nano carriers can :

a) To improve solubility of drugs in water and to dissolved it in bloodstreams by improving pharmacokinetic and pharmacological properties of drug; b)Does not invade in any cell proliferation only tissue or cell specific drug delivery will follow, thereby limiting the accumulation of drug in kidney, liver, spleen and other non targeted organs ; c) It provides combinations of imagine and therapeutic agents for real-time monitoring of therapeutic efficacy; d) NDDS provides longer shelf life; e) We can incorporate both hydrophilic and hydrophobic substances in NDDS; f) Nanodrugs can be administrated via oral, nasal, prenatal, intraocular etc; g) NDDS provides control and sustain release of the drug both during the transportation and at the site of action; h) NDDS increases the intercellular concentration of drug either by enhanced permeability and retention effect (EPR) or by endocytosis mechanism (Zhen *et al.,* 2017).

1.4. NANOSCALE DDS

Present review is mainly focused on what are nanoparticles formulations to be used in chemotherapeutics drug delivery system for the treatment of cancer. Use of liposome, polymeric nanoparticles, Dendrimers and Micellar nanoparticles have been recently discovered (Kumari *et al.,* 2015).

Bangham et al., discovered the liposome based nanoparticles. US FDA in 1995 approved Liposomal formulation of doxorubicin (Doxil), for treatment of AIDS-related Kaposi sarcoma. More recently in 2005 and 2013, protein bound paclitaxel (Abraxane) and ado-trastuzumab emtansine (DM1)(Kadcyla) have been successfully discovered in treatment of breast cancer and patient with epidermal growth factor receptor 2- positive breast cancer(Zhen *et al.,* 2017).Each nanocarrier has different strength and their limitations; but in the present review we focused emerging possibilities of nanovectors for different therapeutic applications, their targets and advantages and disadvantages (*WHO*).

1.4.1. LIPOSOME'S

Cholesterol and natural non toxic-phospholipids combination made liposome. Liposome's are spherical in shape with hydrophobic and hydrophilic character, due to this characteristic it is most commonly used in nanodrug discovery system (Akbarzadeh *et al.,* 2013). In aqueous compartment also liposome can load and hold hydrophilic agent followed while hydrophobic agents in the lipid space (Zhen *et al.,* 2017). Liposome's and cell membrane shares same composition and that's why it is more biocompatible than

any other synthetic material. Moreover, for specific drug delivery liposome can coat with polyethylene glycol (PEG) for binding of proper functional ligands and also to confirm its shape and charge (Gulati *et al.*, 1998).

Apart from this also liposome's have advantages as a nanocarrier for drug delivery in cancer therapy (Table No.1). Liposome show slow degradation capacity because liposome can protect the loaded drug from degradation and prevent undesirable exposure of drug to the environment (Scherphof *et al.,* 1978). From attack of plasma protein and reduce drug leakage, lipid species like cholesterol and rigid saturated lipids stabilizes the lipid bilayer (TM *et al.,* 1980). Liposome's can not only use as to increase intracellular uptake of drug but also can used as to modify anticancer agent, as antibiotic etc. However, the present challenge is that how to control its distribution and removal in vivo.

In past decades some researchers have been developed the modifying liposome drug releasing mechanism. For example: Use of ultrasound, enzymes, light, magnetism or hyperthermia are used to trigger liposome's. Several multicomponent and multifunctional formulations have been designed to develop enhanced localization, selectivity, to deliver liposome at their targeted site. Liu et al., discovered a doxorubicin with the combination of AAN-TAT-liposome for enhancement of tumorocidal effect and to reduce systematic adverse effects (Liu *et al.*, 2014).

Now a day new protocell have been designed to achieve comprehensive nanodrug delivery system like use of RNA liposome which helps in boosting therapeutic efficacy (Tari *et al.*, 2007). Short interferon RNA are the most commonly used chemotherapy agents can also be combine with nanoparticles or encapsulated in a nanoporous silica core for stimulating chemotherapy treatment with site –specific drug delivery. Lipid bilayer of liposome can also be coated with fusogenic peptide and polyethylene glycol, for more site directed delivery system or on the basis of invasion of tumor or vasculature coating can be done (Fig.no.1). (*WHO*).

Table No. 1. Liposome formulations in clinical trials or clinical use

Drug	Product name	Lipid composition	Route of administration	Treatment under investigation	Trial phase
Paclitaxel	LEP-ETU	DOPC, cholesterol and cardiolipin	Intravenous	Ovarian, breast and lung cancers	I
	EndoTAG-1	DOTAP and DOPC	Intravenous	Anti-angiogenesis, breast and pancreatic caners	II
Doxorubicin	ThermoDox	DPPC, MSPC and DSPE-PEG_{2000}	Intravenous	Non-resectable hepatocellular carcinoma	III
Cisplatin and its analog	SPI-077	HSPC, cholesterol and DSPE-mPEG	Intravenous	Lung, head and neck cancers	I/II
	Lipoplatin	SPC, DPPG, cholesterol and DSPE-mPEG	Intravenous	Pancreatic cancer, head and neck cancer, mesothelioma, breast cancer, gastric cancer and non-small-cell lung cancer.	III
	Aroplatin	DMPC and DMPG	Intrapleural/ intravenous	Malignant pleural mesothelioma and advanced colorectal carcinoma	II
Mitoxantrone	LEM-ETU	DOPC, cholesterol and cardiolipin	Intravenous	Leukemia, breast, stomach, liver and ovarian cancers	I
Topotecan	INX-0076	Egg sphingomyelin and cholesterol	Intravenous	Advanced solid tumors	I
Vinorelbine	INX-0125	Egg sphingomyelin and cholesterol	Intravenous	Breast, colon and lung cancers	I
Lurtotecan	OSI-211	HSPC and cholesterol	Intravenous	Ovarian, head and neck cancers	II
Amikacin	Arikace	DPPC and cholesterol	Inhaled as aerosol	Lung infection	III
BLP25 lipopeptide	Stimuvax	Monophosphoryl lipid A, cholesterol, DMPG and DPPC	Subcutaneous	Non-small-cell lung carcinoma	III
All-trans retinoic acid	Atragen	DMPC and soybean oil	Intravenous	Advanced renal cell carcinoma	I/II
Annamycin	Liposome-annamycin	DSPC, DSPG and tween	Intravenous	Breast cancer	I/II
Cytarabine and daunorubicin	CPX-351	DSPC, DSPG and cholesterol	Intravenous	Acute myeloid leukemia	II
Irinotecan HCL and floxuridine	CPX-1	DSPC, DSPG and cholesterol	Intravenous	Colorectal cancer	II

In terms of nanoviral vector liposome have crucial role as we can make liposome/DNA complex for treatment of cancer gene therapy. Example; cation mediated gene delivery have been developed by Felgner and colleagues, in which antisense oligodeoxynucleiotide specific growth factor receptor-bound protein 2 (Grb2) mRNA (l-Grb2) are used for incorporation of liposome. After incorporation of liposome

into Grb2 it inhibits Grb2 protein expression, reduce proliferation of bcr-abl-positive leukemia cells and increase survival rate of mice bearing bcr-abl-positive leukemia zenograft (Tari *et al.,* 2007).

1.4.2. POLYMERS

Liposomes, Dendrimers and micelles are the nanoparticles which are synthesized from polymers. As we know that polymers are categorized in three different group as: 1)Natural polymers, such as glycan, starch, peptides, proteins cellulose; 2)Synthetic polymers, natural polymers are the main source from where we can synthesize synthetic polymers such as polylactic acid (PLA) and poly lactic-co-glycolic acid (PLGA); 3)Microbial fermentation polymer, such as polyhydroxybutyrate (L *et al.,* 2006).

As compared with synthetic polymers natural polymers most commonly used due to its ease in availability, less toxicity and so on. Natural polymer can be most commonly used to deliver protein to their pr-requisite position in active form such polymer include Chitosan-coated PLGA nanoparticles and Chitosan, dextran, albumin, heparin gelatin etc (Table No.2)(SM *et al.,* 2010; JH *et al.,* 2012). Not only the polymers plays important role in nanodrug deliver system but also the micelles, nanosponges, nanogels and nanofibers can also have some role in drug delivery followed in wound healing also (Fig.no.1) (Zhang *et al.,* 2013).

Table No.2. List of Drug-loaded Polymers Nanoparticle in clinical trial or clinical use

Composition	Trade name	Indications	Admin	Status	Company
PEG-L-asparaginase	Oncaspar	Acute lymphoblastic leukemia	IV, IM	Approved	Enzon
PEG-GCSF	Neulasta	Neutropenia associated with cancer therapy	SC	Approved	Amgen
HPMA copolymer-DACH-platinate	ProLindac	Ovarian cancers	IV	Phase II	Access Pharmaceuticals
Methoxy-PEG-poly(D,L-lactide) paclitaxel	Genexol-PM	Metastatic breast cancer	IV	Approve in Korea	Samyang Corp
PEG-arginine deaminase	Hepacid	Hepatocellular carcinoma	IV	Phase I/II	Phoenix
PEG-camptothecin	Prothecan	Various cancers	IV	Phase I/II	Enzon
Pluronic block-copolymer	SP1049C	Oesophageal carcinoma	IV	Phase II	Supratek Pharma

Biocompatible and biodegradable polymer nanoparticles used in synthesis of Nanosponges. Nanosponges are prepared by fusion of erythrocyte members on to PLGA nanoparticles by mean of extrusion. Considering all other polymer-based delivery system only one albumin-based nanoparticles, protein-bound paclitaxel (Abraxane) has been approved by FDA for treatment of breast cancer, lung cancer and for pancreatic cancer (E *et al.,* 2009). Drugs like BIND-014 and KRAS-positive are most commonly used in metastatic cancer and in lung cancer respectively. Also to reduce the size of tumor cyclodextrin-polyner hybrid nanoparticles (CALAA-01) have been used. However, due to lack of knowledge such as their mechanism of action, environmental responses, active targeting their diagnostic and therapeutic platform are still under constructed and evaluated.

1.4.3. DENDRIMERS

The globular, nanosized (1-100nm) macromolecules with spherical complex structure having unique class of polymer are called as Dendrimers. Now a day's Dendrimers are widely used in gene delivery system due to its unique characters as; a) a central core; b) branched called 'generations', emanating from core; c) repeat unit with at least one branch junction; and d)many terminal functional groups. For proper deposition of drug and passive entrapment, the branches of Dendrimers can widely be used. Unlike Liposomes, Dendrimers also self assembled and stabilized by forming organic and inorganic hybrid nanoparticles (Fig.no.1).. Dendrimers have capacity to bind liposomal nanoparticles and carbon nano tubes, to modulated their stability for use as drug carrier to deliver target specific drug carriers, to detect agent, affinity ligands, radioligands, imagine agents or pharmaceutically active anti cancer compound (Table no.3) (E *et al.*, 2009).

In transfection, Dendrimers such as polyamidpamine (PAMAM) are most commonly used. Dendrimers are more biocompatible and easily flushes out from the body via kidney. However due to some Cytotoxin effect on normal cells and their end group presence on the peripheries such as PPI, PAMAN and PLL are not to be accepted as in nanodrug delivery system (Chen *et al.*, 2004).

1.4.4. MICELLAR NANOPARTICLES

Micellar nanoparticles have shown increasing importance for passive targeted drug delivery in cancer treatments. It possesses a core and shell structure. Core plays central role in dissolution of drug and is act as a reservoir and for aqueous solubility and steric stability hydrophilic shell has main role. Like polymers micelles also having biocompatibility and biodegradability ability. FDA approved most common micellars nanoparticles are Doxorubicin encapsulated with PNINAM (poly-N-isopropylacrylamide) have been used for treatment of hepatocellular carcinoma (Table no.3). Due to its easy biodegradability capacity it can also be easily removed from body via metabolic pathways. For cancer diagnosis now a day's PEG –grafted PLGA-PLL, pluronic polythylenimine (PEI), polyphosphoric acid and phosphate micellear are most commonly used. However there has been limitation for the use of Micellar nanoparticles due to its polymeric interaction with cell membrane it produces some toxic compound (Fig.no.1) (ER *et al.*, 2014).

1.4.5. INORGANIC NANOMATERIALS

Quantum dots, superparamangetic iron oxide, gold nanoparticles, carbon nanotubes and other nanoclusters are shows enhanced effects for radiotherapy and image formation in tumor. Compared with other materials gold nanoparticles and quantum dots shows beneficial effect for Intracellular localization and trafficking of multifunctional carrier (Fig.no.1). However due to toxic effect and lack of stability gold nanoparticles and some inorganic nanoparticles are not accepted. Apart from these obstacles NanoTherms are most commonly used in treatment of glioblastoma and is one of the approved techniques for clinical trials (SK *et al.*, 2010).

Figure No.1 Nanomaterials used as drug carriers for cancer therapy.

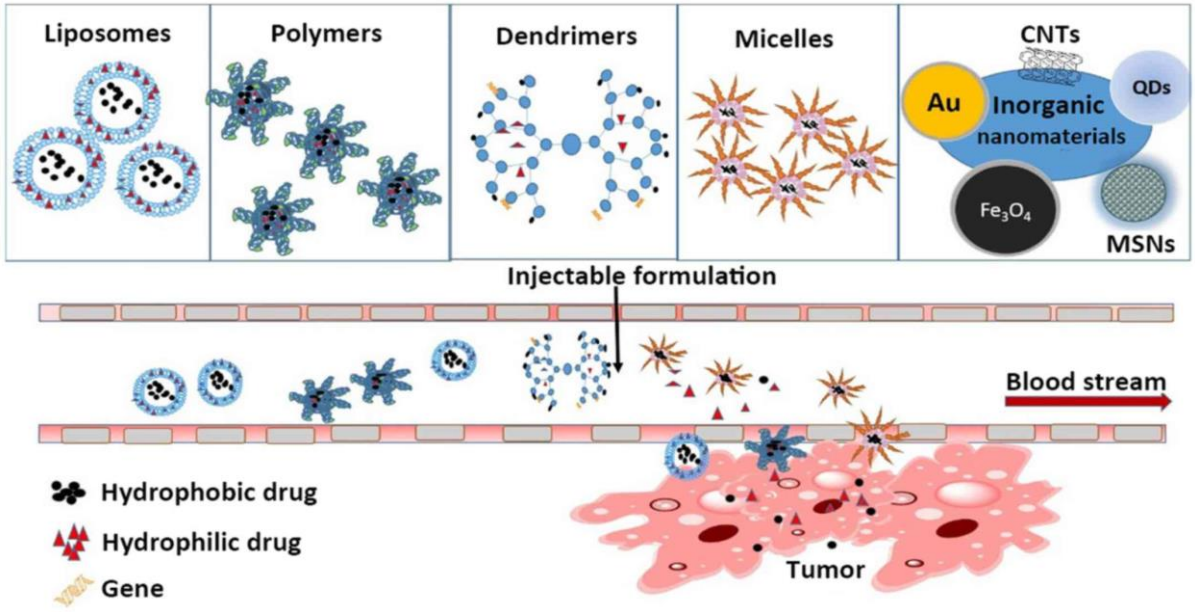

Table No 3. List of Drug-loaded Dendrimers Nanoparticle in clinical trial or clinical use

Product	Company/Developer	Coating Agent	Application	Targeting Moiety	Use
Feridex/ Endorem	AMAG Pharma, Inc.	Dextran	Liver tumors	None	Imaging
Ferumoxytol	AMAG Pharma, Inc.	Polysorbito carboxy methyl ether	CNS tumors	None	Imaging
Resovist®	Bayer Schering Pharma AG	Carboxydextran	Liver metastasis; colon cancer	None	Imaging
SPION	Sun , Ranganathan, Feng 2008	PEG/Dextran	Breast cancer	Folic Acid	Imaging
SPION	Kohler *et al.*, 2005	3-(aminopropyl) trimethoxysilane	Brain tumors	Methotrexate	Imaging and treatment
SPION	Sun, Lee, Zhang, 2008	PEG	Brain tumors	Chlorotoxin	Imaging and treatment
SPION	Wang *et al.*, 2008	PEG	Prostate cancer	A10 RNA aptamer	Imaging and treatment
SPION	Leuschner *et al.*, 2006	Chorionic gonadotropin	Breast cancer	LHRH	Imaging
SPION	Kikumori *et al.*, 2009	Liposome	Breast cancer	Anti-HER2 antibody	Imaging
SPION	Chen *et al.*, 2009	Dextran	Breast cancer	Herceptin	Imaging
USPION	Jiang *et al.*, 2009	3-(aminopropyl) trimethoxysilane	Lung cancer	RGD	Imaging

2. NANO-CARRIERS AS DRUG: CHALLENGES VS REALITY FOR EXTENDING PATIENTS SURVIVAL

Development of tumor will affects the size, shape and biological features of normal cell. There are difference in development of abnormal tumor to those of vascular, abnormal extracellular matrix (ECM), and high interstitial fluid pressure (IFP) and also create constraints that compromise efficient liberation of nanoparticles (SK *et al.*, 2010). Nanoparticles having only penetrate on to normal cell it does not allow to penetrate into ECM of the tumor but can extravasate. Due to presence tumor, cell possesses irregular development and abnormal flow of blood followed the impaired venous and also creates the lymphatic drainage which later affects on interstitial flow of fluid. Overall, nano-carriers creates many difficulties in chemotherapeutics and also in diffusion of nutrients, thus presenting what are the actual challenges vs reality are there for using nano-carriers as drug in case of cancer (Table No.4)(KY *et al.*, 2007).

Comparing with all other nanoparticles Liposomes and polymers are mostly used because it possesses biodegradability, biocompatibility properties. In case of liposomal as a nano-carrier it reduces the systematic toxicity relatively than increasing efficacy. To reduce internal toxicity Liposomes are either coated with hydrophilic bilayer such as cisplatin (KY *et al.,* 2007). For instance it requires much time to degrade liposome and also needs long systematic circulation could result in poor efficacy in vivo. However, there is still-unclear mechanism behind the use of liposome as nano-carrier also its very challenging to accomplish optional balance between specificity of drug and bioavailability in tumor tissue in systematic circulations (*WHO*).

In case of polymeric nanoparticles, they are more stable, efficient and same biopolymers but having some shows polymeric cytotoxicity themselves. For example, PEI destabilizes the plasma membrane and instantly activates effectors caspes-3 which allows PEI appears to be an proapoptic agent. By considering overall study PLGA formulated with acidic products show minimal toxicity and shows best biocompatibility in both in vivo and in vitro (SK *et al.,* 2010). However it remains controversial, thus promising also that polymeric nano-carrier shows potential biodegradability which is very beneficial.

Dendrimers shows more promising effect as well having more opportunities for designing and adaption of drug apart from their end group presence on their periphery. Cationic Dendrimers, such as PAMAM, PPI, and PLL are more stable and also show high charge density and molecular weight. Due to more stability cations Dendrimers shows more cytotoxic activity and also causes some adverse effect. Apart from this sulfonate, carboxylate and phosphonate groups comes under neutral or anionic group have less toxic effect compared with other Dendrimers. However, Dendrimers are more prone in treatment when modifications have done on their surface group which makes it less toxic in order to acclimatize them to physiological conditions (Sung *et al.,* 2020).

Lastly, Micelles and inorganic Nanomaterials, shows great challenges with potential toxicity, cytotoxicity. less stability and less immunogenic response that's why it can use only in urgent concerns. Due to its poor penetration ability there has been a limited application for the use of micelles and inorganic Nanomaterials (NM *et al.,* 2012).

Overall, study shows that researchers are aimed to overcome these drawbacks of use of Nanomaterials and improving the activity of such Nanomaterials. The main focus behind the development of Nanomaterials is that. not only improves patients survival rate but also it can easily be penetrate, dissolve, less toxic and without any systematic loss it reaches to the core part of tumor heap, cells where there target molecules can reside and make complete suppression of that tumor.

Table No.4 Nanomaterials as drug carriers: advantages and disadvantages

Nanomaterials	Advantages	Disadvantages
Liposomes	Controlled release, reduced toxicity, improved stability	Distribution and removal mechanism, breakage *in vivo*
Polymers	Variety, controllable molecular weight	Inflammatory response, degradation pathway
Dendrimers	Nanosized cavity, controlled release, self-assembly	Immunoreaction, hematological toxicity
Micellar nanoparticles	Simple prescription, passive targeting	Scale-up production, cytotoxicity
Inorganic nanomaterials	Multifunctional, modifiable, ability to combine diagnosis and treatment	Metal toxicity, stability, storage

3. DISSCUSION

Considering the overall present review of article it is clear that Nanotechnology should get more attention in development of Nanomaterials in case of cancer or any other disease treatment. Nonetheless, Nanotechnology shows promising effect in case of development in cancer treatment and also has relatively new and evolving techniques. Considering the several Nanomaterials it is clear that there have been some critical issues behind the use and success in treating them as cancer nanomaterial.

As we know that in developing world along with population cancer is one of the growing disease considering other disease. Moreover some critical issues need to be taken under consideration like modification in the end groups present on their peripheries, toxicity, less penetration, more targeted mechanisms like modulated functional proteins etc. In case of more stable particles they ultimately shows more cytotoxic effect so it is very important to show modify or develop multidrug resistance and dysregulated accumulation of cancer cells.

Coating of nanomaterial with its suitable substrate like any chemical or physical compound permits more accurate target specific delivery system. So there should be necessary that nanomaterial should organize and optimized for more site specific thermotherapy, photodynamic therapy, chemotherapy, and in radiotherapy. Its still more challenging that the use of nanomaterial is safe or harm. Because of toxicity there should be remark that Is nanomaterial safe for cancer? Although metal based nanomaterial have beneficial effects but here agains the toxicity issues are there. So its remain controversial the combination of therapeutic regimens for different cancer types are have any use?

However, liposome's and NPs shows promising effect as compared with other nanoparticles. Liposomes like Abraxane and Doxil have numerous advantages over conventional chemotherapy. Both shows potential pharmacokinetics properties and also have less systematic toxicity. Still it's just beginning in study that liposome and NP use in chemotherapy to reduce side effect of existing treatments and increase efficacy by selective targeting of tumors.

It is very important to develop one of compound which should have all the necessary properties and also shows diverse mechanism for developing cancer disease. Other challenges like improvement in localoization, biodistribution, biocompatility, and efficacy system are need to taken under consideration to meet precise cancer diagnosis and therapy.

However, still there is no potential technology has been developed and realized in case of cancer treatment.

4. REFERENCES

1. Zhen LI1,2, Shirui TAN3, Shuan LI1, Qiang SHEN4 and Kunhua WANG "Cancer drug delivery in the nano era: An overview and perspectives (Review)" Received December 2, 2016; Accepted May 29, 2017 DOI: 10.3892/or.2017.5718ONCOLOGY REPORTS 38: 611-624, 2017.

2. Hyuna Sung PhD,Jacques Ferlay MSc, ME,Rebecca L. Siegel MPH,Mathieu Laversanne MSc,Isabelle Soerjomataram MD, MSc, PhD,Ahmedin Jemal DMV, PhD,Freddie Bray BSc, MSc, PhD Global Cancer Statistics 2020: GLOBOCAN "Estimates of Incidence and Mortality Worldwide for 36 Cancers in 185 Countries".

3. Preeti Kumari, Balaram Ghosh, and Swati Biswas Department of Pharmacy, Birla Institute of Technology and Science – Pilani, Hyderabad Campus, Hyderabad, Andhra Pradesh, India "Nanocarriers for cancer-targeted drug delivery Article *in* Journal of Drug Targeting" · June 2015 DOI: 10.3109/1061186X.2015.1051049 · Source: PubMed.

4. Yue Hui, Xin Yi, Fei Hou, David Wibowo, Fan Zhang, Dongyuan Zhao, Huajian Gao and Chun-Xia Zhao, "Role of Nanoparticle Mechanical Properties in Cancer Drug Delivery" Cite This: ACS Nano 2019, 13, 7410−7424.

5. Hisataka Kobayashi,* Baris Turkbey, Rira Watanabe, and Peter L. Choyke Molecular Imaging Program, Center for Cancer Research, National Cancer Institute, National Institutes of Health, Bethesda, Maryland 20892, United States "Cancer Drug Delivery: Considerations in the Rational Design of Nano sized Bioconjugates". This article not subject to U.S. Copyright. Published 2014 by the American Chemical Society.

6. Kewal K. Jain Pharma Biotech Basel , Switzerland Drug Delivery System Second Edition. ISSN 1064-3745 ISSN 1940-6029 (electronic) ISBN 978-1-4939-0362 Springer New York Heidelberg Dordrecht London 2014.

7. C. Moorthi*1 , R. Manavalan1 , K. Kathiresan1 1 Department of Pharmacy, Annamalai University, Annamalai Nagar, Chidambaram, Tamil Nadu, India "Nanotherapeutics to Overcome Conventional Cancer Chemotherapy Limitations" . Received, September 17, 2010; Revised, September 22, 2010; Accepted, February 3, 2011; Published, February 14, 2011.

8. Abolfazl Akbarzadeh, Rogaie Rezaei-Sadabady, [...], and Kazem Nejati-Koshki "Liposome: classification, preparation, and applications", Nanoscale Res Lett. 2013; 8(1): 102. Published online 2013 Feb 22. doi: 10.1186/1556-276X-8-102

9. Scherphof G, Roerdink F, Waite M and Parks J: Disintegration of phosphatidylcholine liposomes in plasma as a result of interaction with high-density lipoproteins. Biochim Biophys Acta 542: 296-307, 1978.

10. Gulati M, Grover M, Singh S and Singh M: Lipophilic drug derivatives in liposomes. Int J Pharm 165: 129-168, 1998. 12. Scherphof G, Roerdink F, Waite M and Parks J: Disintegration.

11. Allen TM and Cleland LG: Serum-induced leakage of liposome contents. Biochim Biophys Acta 597: 418-426, 1980.

12. Senior J and Gregoriadis G: Is half-life of circulating liposomes determined by changes in their permeability? FEBS Lett 145: 109-114, 1982.

13. Liu Z, Xiong M, Gong J, Zhang Y, Bai N, Luo Y, Li L, Wei Y, Liu Y, Tan X, *et al*: Legumain protease-activated TAT-liposome cargo for targeting tumours and their microenvironment. Nat Commun 5: 4280-4291, 2014.

14. Tari AM, Gutiérrez-Puente Y, Monaco G, Stephens C, Sun T, Rosenblum M, Belmont J, Arlinghaus R and Lopez-Berestein G: Liposome-incorporated Grb2 antisense oligodeoxynucleiotide increases the survival of mice bearing bcr-abl-positive leukemia xenografts. Int J Oncol 31: 1243-1250, 2007.

15. Yu L, Dean K and Li L: Polymer blends and composites from renewable resources. Prog Polym Sci 31: 576-602, 2006.

16. Janib SM, Moses AS and MacKay JA: Imaging and drug delivery using theranostic nanoparticles. Adv Drug Deliv Rev 62: 1052-1063, 2010.

17. Grossman JH and McNeil SE: Nanotechnology in cancer medicine. Phys Today 65: 38-42, 2012.

18. Zhang R, Luo K, Yang J, Sima M, Sun Y, Janát-Amsbury MM and Kopeček J: Synthesis and evaluation of a backbone biodegradable multiblock HPMA copolymer nanocarrier for the systemic delivery of paclitaxel. J Control Release 166: 66-74, 2013.

19. Miele E, Spinelli GP, Miele E, Tomao F and Tomao S: Albuminbound formulation of paclitaxel (Abraxane ABI-007) in the treatment of breast cancer. Int J Nanomed 4: 99-105, 2009.

20. Chen H-T, Neerman MF, Parrish AR and Simanek EE: Cytotoxicity, hemolysis, and acute in vivo toxicity of Dendrimers based on melamine, candidate vehicles for drug delivery. J Am Chem Soc 126: 10044-10048, 2004.

21. Dourado ER, Pizzorno BS, Motta LM, Simao RA and Leite LF: Analysis of asphaltic binders modified with PPA by surface techniques. J Microsc 254: 122-128, 2014.

22. Libutti SK, Paciotti GF, Byrnes AA, Alexander HR Jr, Gannon WE, Walker M, Seidel GD, Yuldasheva N and Tamarkin L: Phase I and pharmacokinetic studies of CYT-6091, a novel PEGylated colloidal gold-rhTNF nanomedicine. Clin Cancer Res 16: 6139-6149, 2010.

23. Kim KY: Nanotechnology platforms and physiological challenges for cancer therapeutics. Nanomedicine (Lond) 3: 103-110,2007.
24. Idris NM, Gnanasammandhan MK, Zhang J, Ho PC, Mahendran R and Zhang Y: In vivo photodynamic therapy using upconversion nanoparticles as remote-controlled nanotransducers. Nat Med 18: 1580-1585, 2012

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STRUCTURAL AND OPTICAL STUDIES OF NEODYMIUM DOPED LEAD BOROTELLURIDE GLASS AND GLASS CERAMICS

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Abstract: The series of glasses with compositions xNd_2O_3-30PbO-(60-x) B_2O_3-10TeO_2 (where x=0.0 to 0.5 mol %) have been prepared by conventional melt quenching technique. Amorphous and crystallization nature of the samples was confirmed through X-ray diffraction technique. The compositional dependence of different physical parameters such as density, molar volume, dielectric constant, reflection loss, and polarizability etc., are determined. The measured densities of glasses increases with increase of Nd_2O_3 concentration. The calculated band gap values of these glasses decreases from 1.801 to 1.615 eV with increase of Nd^{3+} concentration. The decrease in band gap is due to increase of bonding defect and non-bridging oxygen. These glasses have a high transmission in the visible, the near infrared regions, and very low OH-vibration absorption bands. IR and Raman studies give the information regarding the structure of glass composition. The addition of alkali modifier in the tellurite network leads to the conversion of the TeO_4 units to TeO_3 units with a varying number of non-bridging oxygen atoms. Emphasis has also been given to the low frequency modes and particular points related to the low-frequency Raman phenomenology are discussed in view of the experimental findings.

Keywords: Glasses, Differential scanning calorimetry(DSC), Infrared spectroscopy, Raman spectroscopy and X-ray diffraction.

1.Introduction

Neodymium doped all-solid-state laser sources have been recognized as the most efficient laser sources for numerous applications in the fields of high-resolution spectroscopy, biology, industry, defence, etc. The applications in these areas stimulated the development of low threshold high gain host media for Nd^{3+} ion doping. It is evident that the development of host material for Nd^{3+} ions requires optimum material properties, which are characterized by a low frequency phonon spectrum and a low content of OH^- groups. Because these properties make it possible to reduce excitation losses due to multiphonon relaxation. Apart from the silicate and phosphate glasses, which are used as host material for Nd^{3+} doped laser glasses [1, 2], the OH^- free tellurite glasses have been a subject of increasing interest for optoelectronic applications. Especially because of their high refractive index and low phonon energies. These tellurite glasses combine good mechanical stability, chemical durability and high linear and non-linear refractive indices. With a wide transmission window (typically 0.4–6μm), which make them promising materials for photonic applications such as lasers, optical fibre amplifiers, non-linear optical devices, and so on [3–6].Trivalent neodymium has been recognized as one of the most efficient lanthanides for solid state lasers in different crystalline and amorphous materials, due to its intense emissions at about 1064 and 910nm[7–12]. The studies of the concentration dependence of luminescence indicated that Nd^{3+} ions concentration possesses significant influences on the up-conversion mechanisms and fluorescence colour in triply doped with $HO^{3+,}$ Yb^{3+} and Nd^{3+} ions oxides [13]. However, a little information is available on structure and properties of the multi component lead boro telluride glasses containing rare earth ions. Therefore, the aim of the present study has been to investigate the effect of rare earth of type Nd^{3+} content on optical band gap, density, molar volume and structural properties of these glasses.

2. Theory

The absorption coefficient, $\alpha(\nu)$ in amorphous materials, in the optical region near the absorption edge at particular temperature, obeys empirical relation known as, Urbach rule [14] given by

$$\alpha(\nu) = \alpha_o \exp(h\nu / E_c) \qquad (1)$$

Where $h\nu$ is photon energy, α_o is a constant and E_c is an energy which interpreted as the width of the localized state in the normally forbidden band gap which is also known as the Urbach energy.

Optical absorption in solids and liquids occur by various mechanisms in all of which the photon energy will be absorbed by either lattice or by electrons where the transferred energy is conserved. The lattice (or phonon) absorption will give information about the atomic vibration involved and this absorption of radiation normally occurs in the infrared region of the spectrum. The higher energy parts of the spectrum particularly those associated with the interband electronic transition will provide further information about the electron states. In these processes, the electrons are excited from a filled band to an empty band by the photon absorption and as a consequence of this; a marked increase in the absorption coefficient $\alpha(\nu)$ will result. The onset of this rapid change in $\alpha(\nu)$ is called the 'fundamental absorption edge' and the corresponding energy as the 'energy gap' [15]. In amorphous materials the absorption due to the band-to-band transitions that determines the optical energy gap was interpreted by Davis and Mott [16] and can be written in general form:

$$\alpha(\nu) = (B / h\nu)(h\nu - E_{opt})^n \qquad (2)$$

Where B is a constant and $h\nu$ the photon energy, E_{opt} the optical energy gap and n is an index which can have any values between ½ and 2 depending on the nature of the interband electronic transitions [17]. The goodness of the fit of the data to the formula for either n = ½ (direct band gap) or $n=2$ (indirect band gap) is determined. It has been found that for many amorphous materials, a reasonable fitting of Eq. (2) with $n=2$ are achieved. This is the case of indirect transitions, where the interactions with lattice vibrations take place.

3. EXPERIMENT

3.1 Sample preparation

The basic glasses with composition xNd_2O_3 -30PbO-(60-x) B_2O_3-10TeO_2 (where x=0.0 mol% to 0.5 mol %) were prepared by melt quenching method. The starting materials, Nd_2O_3, PbO , $B_2O_3$and TeO_2 taken in the appropriate proportion weighed in digital electronic balance and mixed thoroughly in a porcelain crucible. Then heated in an electrical furnace by increasing the temperature gradually the mixture was melt at a temperature around 950^0C. Thus obtained homogeneous melt was quenched between two brass plates. The prepared glass samples were heat treated at 350^0C for 3hr and during which the base glass transfers into glass ceramic composite. DSC measurements were carried out for all prepared samples with the commercial Netzsch Simultaneous Thermal Analyzer STA409C with 32-bit controller. Raman spectra were collected on a spex triple Raman spectrometer (Industries model) with the 488nm line of a coherent innova 307 argon ion laser for excitation.

3.2.X-ray diffraction

The X-ray diffraction pattern of the powdered samples of the glasses were recorded using XPERT PRO diffractometer in which the K_α radiation of wavelength 1.54056A^o were generated at the Cu-anode. The scanning rate was 10^o/min. The fine powders of all samples are used to check the amorphous and (or) crystalline nature using X-ray diffractometer (Philips, XPERT PRO).

3.3. Differential scanning calorimetry

The temperature at which a transition occurs from molten liquid state to glassy state is the glass transition temperature (T_g). The value of Tg dependence on the cooling rate and composition in the glass. As the precursor glass and the glass-ceramics of series are prepared without changing the composition and quenching rate.

3.4 Density and molar volume

The densities of the glass samples at room temperature were measured by the Archimedes principle, using toluene as an immersion liquid (density of toluene = 0.8635 gm/cm^3 at RT)

$$\rho = \frac{a}{a-b} \quad \text{gm / cm}^3 \qquad (3)$$

Where a is the weight of the glass sample measured in air and b is the weight when the glass is immersed in toluene.

Average molecular weight of multi component glass system was calculated using the relation

$M_{av} = X_{PbO}Z_{PbO} + X_{TeO2}Z_{TeO2}+X_{B2O3}Z_{B2O3}+X_{Nd2O3}Z_{Nd2O3}$

Where X_{PbO}, X_{TeO2},X_{B2O3} and X_{Nd2O3} are the mole fractions of the constituents oxides, and Z_{PbO} , $Z_{TeO2,}$ Z_{B2O3} and Z_{Nd2O3} are the molecular weights of the constituents oxides.

The molar volume (V_m) is calculated by using the formula,

$$V_m = M / \rho \text{ cm}^3/\text{ mole} \quad (4)$$

Where M is the molecular weight and ρ is the density of corresponding glass samples [18].

3.5 Optical absorption

The optical absorption spectra for these glasses were recorded using Hitachi-U-3200 absorption spectrophotometer in the wavelength region 300–1000 nm at normal incidence. The optical absorption coefficient $\alpha(\nu)$ was calculated for each sample at different photon energies by using the relation.

$$\alpha(\nu) = A/d \quad (5)$$

Where A is the absorbance and d is the thickness of the samples.

In order to calculate optical band gap (E_g), a graph was plotted between $(\alpha h\nu)^2$ and $h\nu$ for each sample and from the linear extrapolation to zero ordinate, the value of (E_g) was calculated [19].

3.6 Molar refraction (R_m) and Polarizability (α_e)

The molar refraction R_m is

$$\frac{n^2-1}{n^2+2}(V_m) = R_m \quad (6)$$

Where V_m is the molar volume and n is the refractive index of the samples. Equation (7) is known as Lorentz–Lorentz equation which relates the polarizability (α_e) of oxide ion as follows,

$$\frac{n^2-1}{n^2+2}(V_m) = \frac{4}{3}\pi N\alpha_e \quad (7)$$

Where V_m is the molar volume, N the Avogadro number (N=6.023×10^{23}/ mol) [20].

The dielectric constant (ε) was calculated from the refractive index of the glass using [21].

$$\varepsilon = n^2 \quad (8)$$

The reflection loss (R) from the glass surface was computed from the refractive index by using the Fresnel's formula as [22].

$$R = \left(\frac{n-1}{n+1}\right)^2 \quad (9)$$

The molar refractivity (R_m) for each glass was evaluated using equation [23].

$$R_m = \frac{(n^2-1)M}{(n^2+2)\rho} \quad (10)$$

Where M is the average molecular weight and ρ is the density in gm/cm^3.

The number of density N_i., the number of ions per cubic centimetre the Nd^{3+} ions was calculated using the relation[24]

$$N_i = \frac{(x\rho N_A)}{(m_{av})} \quad (11)$$

Optical dielectric constant (p δt / δp) was calculated using the formula[25]

$$p\frac{\delta t}{\delta p} = (\varepsilon - 1) = (n^2 - 1) \quad (12)$$

4.Results and discussion

Fig.1 shows the typical X-ray diffractogram of the investigated parent glass and respective glass-ceramics.

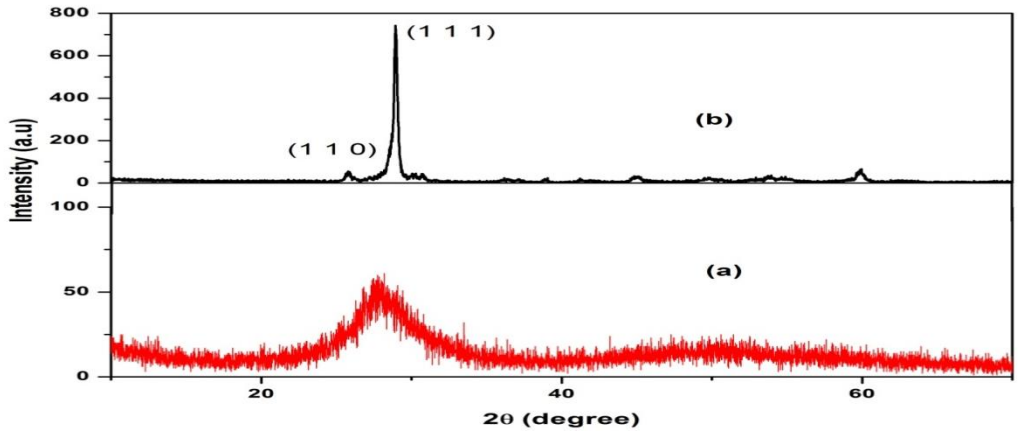

Figure.1 Typical XRD comparison spectra of (a) glass and (b) glass ceramic.

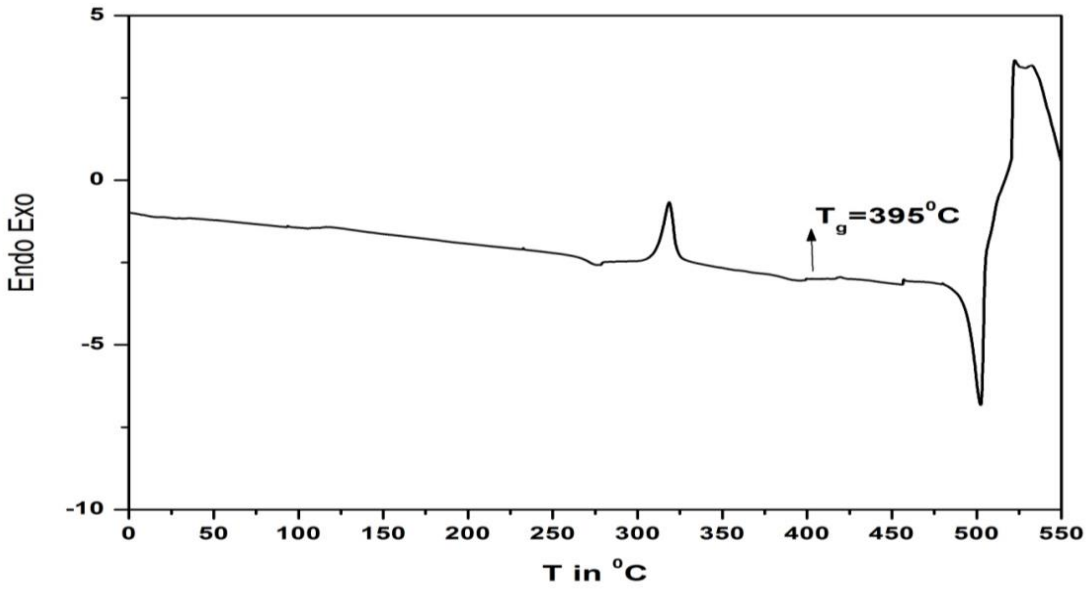

Figure.2 A typical DSC spectra of Lead -Borate-Telluride glasses doped with Nd_2O_3.

The T_g is determined only for a typical base glass using exothermic trace of DSC (SDT Q600 V20.9 Build 20, Universal V4.5A TA Instruments) as shown Fig .2 and it is found to be 395^{0}C. From the DSC pattern, the values of glass transition temperature (T_g) increases with Nd_2O_3 content is presented in Table 1.

Sl. No	Physical property	Nd_2O_3 in mol%					
		0	0.1	0.2	0.3	0.4	0.5
1	Density (ρ) (g/cm^3)	3.502	3.646	3.698	3.750	3.858	3.921
2	Mean atomic volume (V_M) (cm^3/mol)	26.27	25.23	24.878	24.533	23.846	23.46
3	Refractive index (n) at 589.3nm	1.380	1.398	1.418	1.435	1.467	1.483
4	Molar refractivity (R_M) (cm^{-3}) (±0.005)	6.0850	6.0892	6.2694	6.4017	6.6166	6.6996
5	Dielectric constant, (∈) (±0.005)	1.904	1.954	2.010	2.059	2.152	2.199
6	Reflection loss R%	2.5	2.7	2.9	3.1	3.5	3.7
7	Electronic polarisability (α_e) $\times 10^{-24}$ (ions/cm^3) (±0.005)	24.12	24.14	24.85	25.37	26.23	26.56
8	Nd^{3+}-ion concentration, ($\times 10^{20}$ ions/cm^3)	0	2.386	4.453	7.36	10.10	12.8
9	dielectric constant, p δt /δp	0.9044	0.9544	1.0107	1.0592	1.1520	1.1992
10	Optical band gap(E_g) for glass	1.801	1.775	1.715	1.690	1.649	1.615
11	Glass transition (T_g in ^{0}c)	379	385	388	395	402	413

Table.1 showing the variation of calculated density, mean atomic volume, refractive index, molar refractivity, dielectric constant, reflection loss, electronic polarizability, ion concentration, glass transition, and optical energy gap of glass.

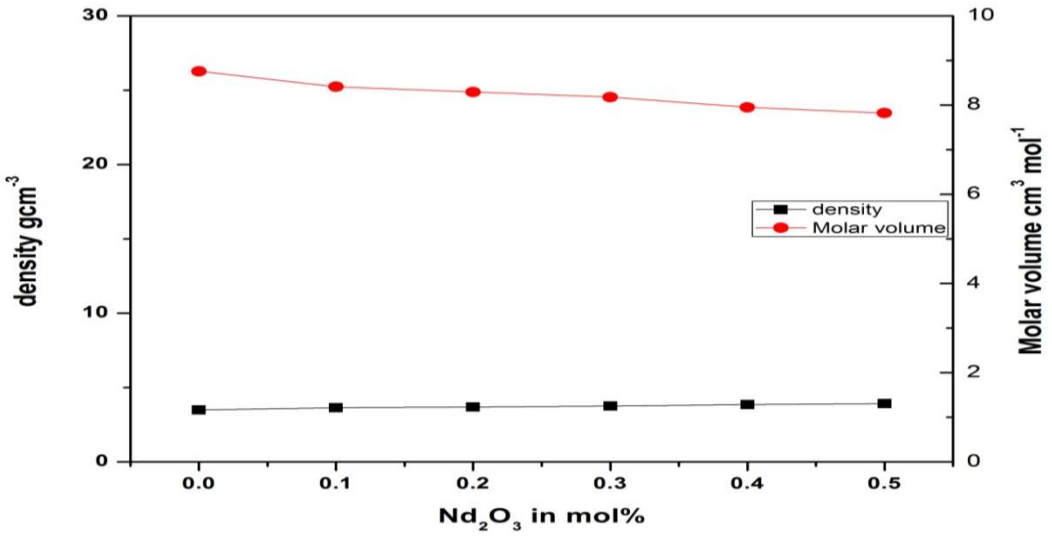

Figure.3 Variation of density and molar volume with respect impurity of glass.

Figure.3 shows the variation of density and molar volume with Nd_2O_3 concentration and values are presented in the Table 1. It can be observed that the density increases with increase in Nd_2O_3. This attributed due to replacement of lower molecular weight substance B_2O_3 with higher molecular weight of oxide ions Nd_2O_3 in the glass network. The change in molar volume depends on the rate of change of both density and molecular weight. It also shows that addition of impurity results in extension of glass system. The molar refractivity, which depends on the refractive index, density and average molecular weight

of glass shows minimum for base glass further increases with impurity. This agrees with results reported in literature [26]. The calculated polarizability of the oxide ion listed in the Table.1, was plotted against Nd_2O_3 concentration as shown in Fig.4. It has been seen that the oxide ion polarizability increases linearly with increase of rare earth. The correlation equation and the square of correlation coefficient R^2, which can be used to measure the effectiveness of the least-square fitting. The results show that the refractive index of the glass does not only depends on the density but also depends on the electronic polarizability of the glass and variation with impurity as shown in Fig.4 [27].

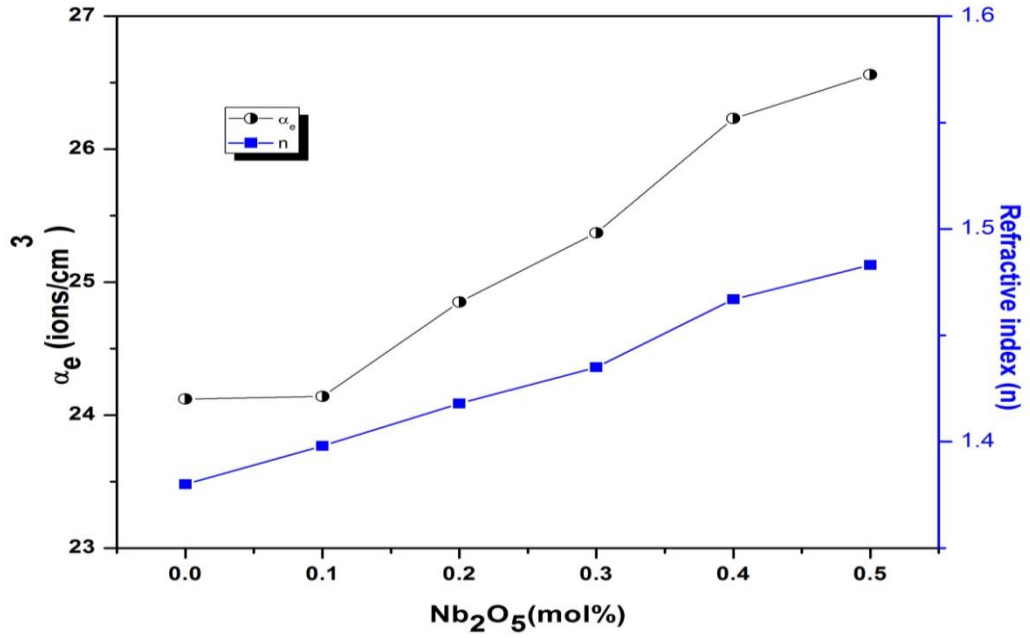

Figure.4 Variation of electronic polarizability and refractive index of glass with impurity

The variation of physical quantities with increase in Nd_2O_3 content agree with the reported literature [22]. Fig.5 illustrates the absorption spectra of Nd^{3+} co-doped lead borate telluride glasses in the visible and near -infrared region, which indicates that the major transitions associated to rare earth ions present in the host matrix. It is found that the intensities of the most of the absorption bands increasing with increase of rare earth oxides.

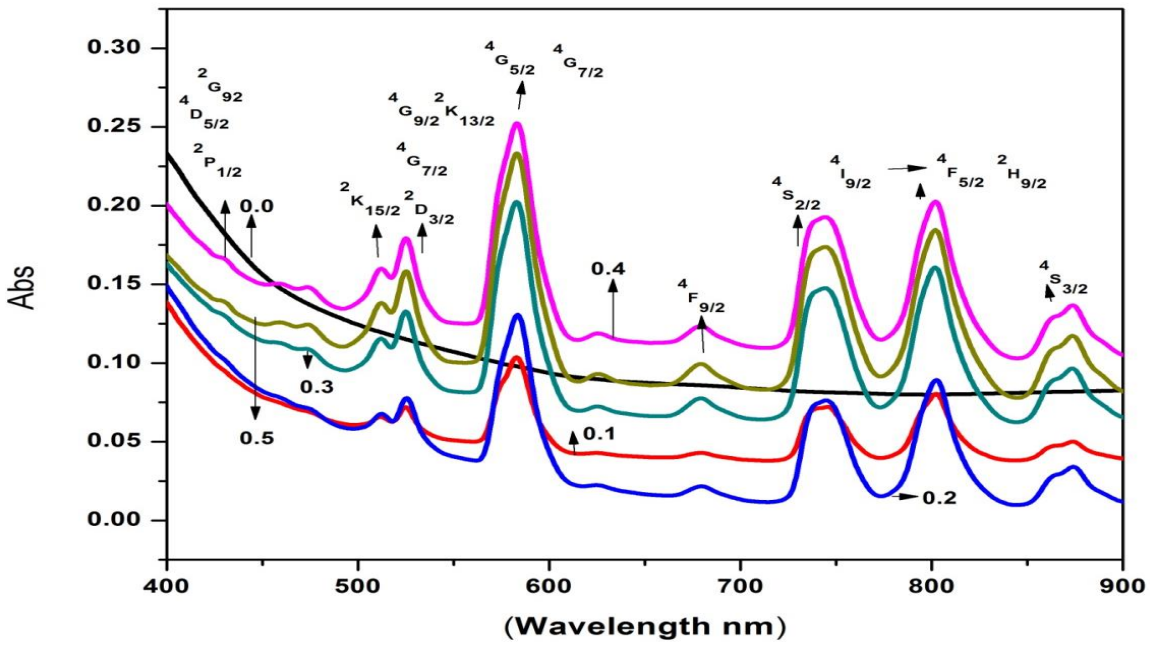

Figure.5 UV absorption comparison spectra of glass.

In the present work, the absorption of Nd^{3+} for the transitions $^4I_{9/2}$--->($^4F_{5/2}$,$^2H_{9/2}$) observed at 800nm.Another absorption band observed around 522nm is attributed due to transition of $^4I_{9/2}$--->($^4I_{9/2}$,$^2G_{7/2}$).From the Fig.5, can be seen that the spectra consist of various absorption levels corresponding to the transitions between the ground state and higher states ($^4F_{9/2}$, $^2G_{7/2}$+$^4G_{5/2}$, $^2K_{13/2}$+$^4G_{7/3}$+$^4G_{9/2}$, $^2K_{15/2}$+$^2D_{3/2}$+$^2G_{9/2}$, $^2P_{1/2}$, $^4D_{3/2}$+$^4D_{5/2}$+$^4D_{1/2}$) inside the $4f^3$ electronic configuration of the Nd^{3+} ions. The transitions were assigned by comparing the band positions in absorption spectra of glasses with those reported in literature [28].

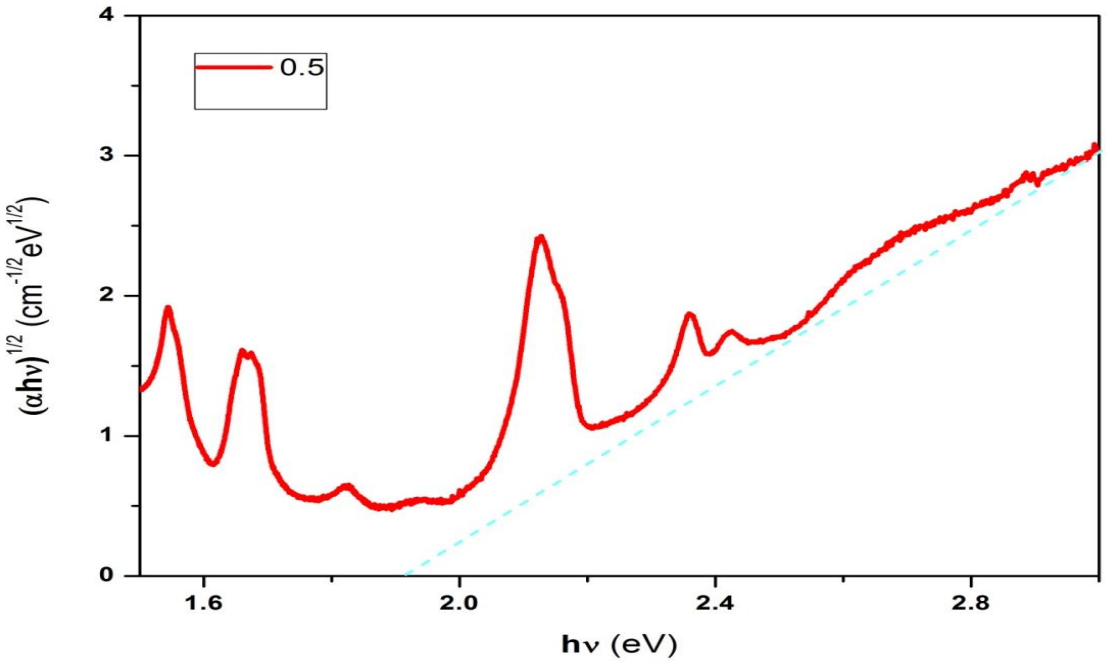

Figure.6 typical Plot of (αhu) $^{1/2}$ as a function of energy for glass.

Figure.6 is a typical graph of$(\alpha h\upsilon)^{1/2}$ verses hυ, by extrapolation of linear region of the curve to hυ axis- the energy band gap has been obtained. The energy band gap decreases with increasing mol% of rare earth oxide. The optical band gap in the present glass system in range of 1.801-1.615eV. The value of optical band gap slightly decrease with the increase of Nd_2O_3 this trend may be due to increase of bonding defect and also non-bridging oxygen in the network. This leads to an increase of the degree of localization of electrons thereby the increase of donor centre, due to the decrease of optical band gap, the shift of absorption edge toward the longer wavelength has take place.

Figure.7 shows the infrared transmittance spectra of the present glass system in the region 4000-400cm^{-1}. Literature survey indicates that vibrational modes of the borate network are mainly active in the three infrared spectral regions.

A region around 600-700cm^{-1} due to the bending of the B-O-B linkages in BO_3 group, another region in 800-1200cm^{-1} due to the B-O bond and region in 1200-1600cm^{-1} due to the stretching of the trigonal BO_3 units [29].

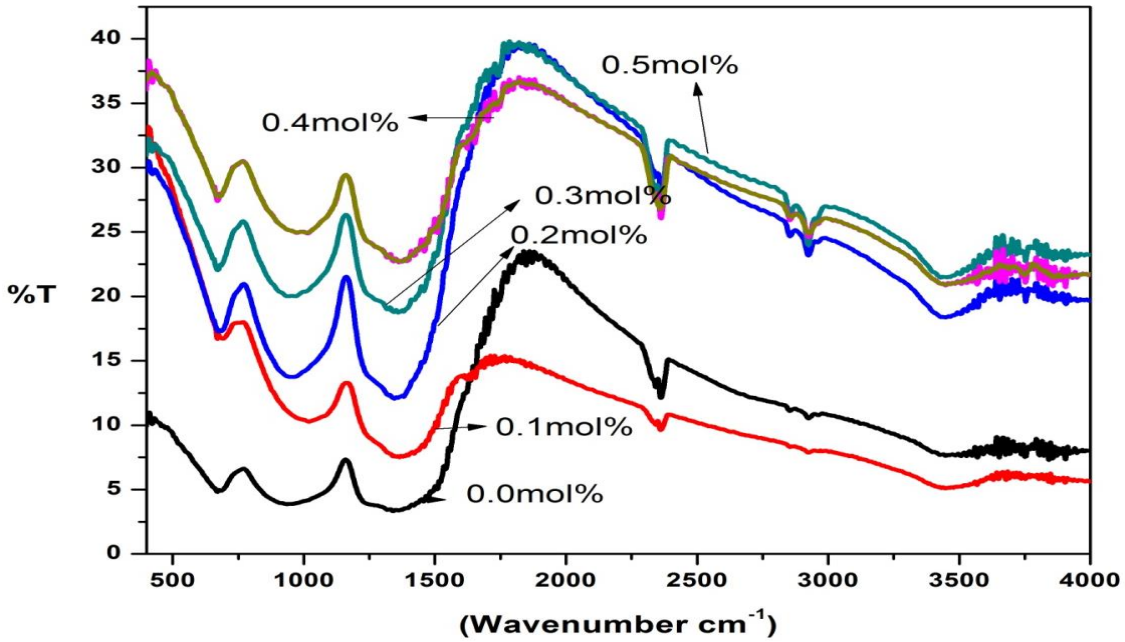

Figure.7 FTIR comparison spectra of glass.

The structural bands of the present glass system is characterised by IR absorption bands in the wave number regions 400-600cm^{-1}, 633-646cm^{-1}, 678-688cm^{-1}, 756-767cm^{-1}, 910-933cm^{-1},1245-1252cm^{-1} and 1342-1360cm^{-1}. Intense absorption bands or weak shoulders in the region 633-767cm^{-1} corresponds to TeO_4.TeO_3/TeO_{3+1} units are preserved in all the studied glasses. In the region 600-800cm^{-1}, B-O-B bending vibrations manifest themselves [30]. The peaks in the region 1342-1360cm^{-1} are assigned due to B-O stretching vibrations in[BO_3] units and from various types of borate groups [31-32]. IR studies revealed that the structure of prepared glass network consists of [TeO_3]/[TeO_{3+1}], [TeO_4], [BO_3], [BO_4] and B-O-Pb linkages.

From the Fig.8.Raman spectroscopic study showed that the addition of Nd into tellurite glass converts TeO_4 trigonal bipyramid (tbp) units to TeO_3 trigonal pyramid (tp) units, and also possibly some terminal TeO_{3+1} polyhedral. The Nd effect on the species of tellurite structural groups is similar to that of other metal cations of mono valent, divalent, and trivalent. It was observed Nd-O local structural transition was also found in the current study. A transition, was observed in the correlations, both band position and intensity, between Raman stretching vibration bands near 600 and 730 cm^{-1}. The low frequency band represents the stretching vibration mode of TeO_4 tbp units and the high frequency band represents the stretching vibration mode of TeO_3 trigonal pyramid (tp) units. Therefore, the observed transition may suggest the formation of TeO_{3+1} polyhedron units in the glasses with Nd_2O_3 concentration greater than 0.1 mol%. Near 744 cm^{-1}, the bending vibration band for Te-O-Te linkages showed a significant decrease for the glass with Nd_2O_3 concentration. This suggesting a considerable breakage of the telluride network observed for base sample.

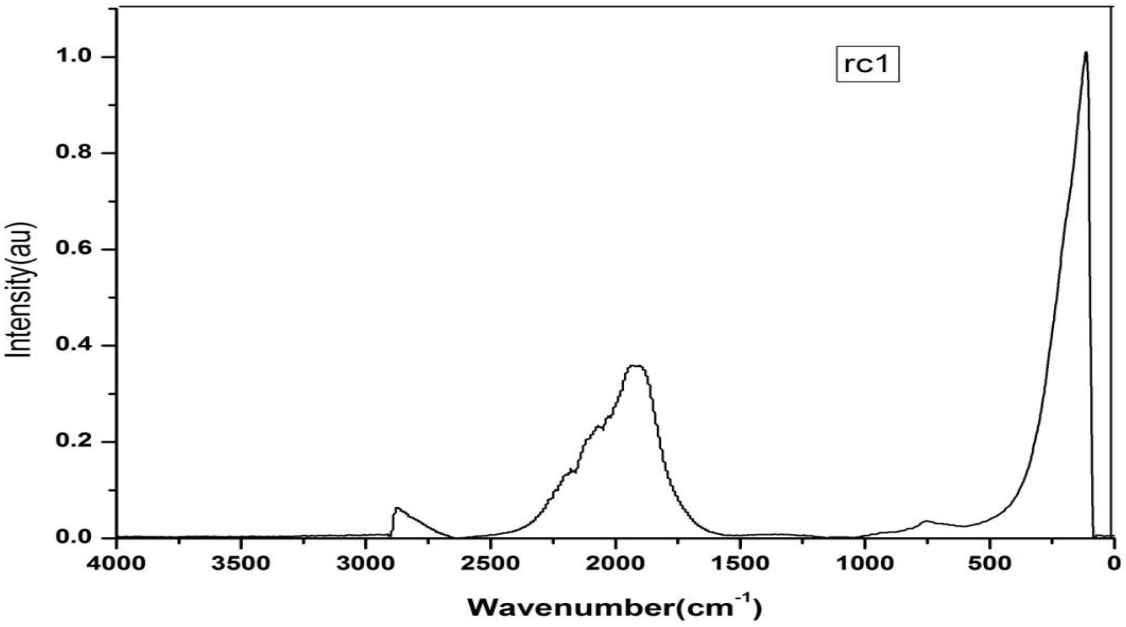

Figure.8 Typical Raman spectra of glass.

Based on Raman spectroscopic results the structure of pure TeO_2 and tellurium oxide based glasses reveals two basic findings: First, the pure TeO_2 consists of TeO_4 trigonalbipyramids (tbps) in which one equatorial site of the sp^3 hybrid orbitals is occupied by a lone pair of electrons and the other two equatorial and axial sites are occupied by oxygen atoms. Second, the addition of alkali and/or alkaline earth modifiers to pure TeO_2 network causes a change of the Te coordination polyhedron from TeO_4 tbp to TeO_3 trigonal pyramid (tp) in which one of the Te sp^3 hybrid orbitals is occupied by a lone pair of electrons. The spectrum of the glass is characterized by three polarized bands at high frequencies, viz. a broad band near 475 cm^{-1}, an intense band at ~ 670 cm^{-1} and a shoulder band near ~ 770 cm^{-1}. These bands have been attributed to the bending mode of Te–O–Te or O–Te–O linkages, to stretching modes of the TeO_4 tbp, to stretching mode of the TeO_3 tp units, respectively [33-35]. At lower frequencies the spectrum is dominated by a well resolved asymmetric peak, viz. the Boson peak, and several low lying vibrational lines centred at ~ 130 cm^{-1} and ~ 280 cm^{-1}. These bands observed in the low-frequency region are assigned to a bending vibration of TeO_3 tp having two or three NBO atoms [33, 34].

5 . CONCLUSION

The study of glass systems shows that density and refractive index increases with increasing of Nd_2O_3 concentration. Due to annealing processes samples transformed to crystalline phase, confirmed by XRD. The increase in the molar volume with Nd_2O_3 content implies that the extension of glass network is due to increase of the number of Non bridging oxygen atoms. The optical absorption spectra was used to calculate and analysed the allowed indirect transitions. Optical band gap increases slightly with Nd_2O_3 content due to increase in the degree of localization of electrons thereby increase of the donor content in the glass system. Moreover, the results found in this study show that the refractive index of glass not only depends on density but also depend on the electronic polarizability.IR studies revealed that the structure of prepared glass network. In the present studies, we reported the room temperature Raman spectra of these glasses. The data are discussed in terms of the glass local structure and the effect of the incorporated cation in the glass.

Referenceses

[1] P.R.Ehrmann, J.H.Campbell, J Am Ceram Soc, **85** (2002) 1061.
[2] Y.Qiao, N.Da, D.Chen, Q.Zhou, J.Qiu, T. Akai, Appl Phys B, **87** (2007) 717.
[3] M.J.Weber, J.D.Myers, D.H.Blackburn, J Appl Phys, **52** (1981) 2944.
[4] N.Lei, B.Xu, Z.Jiang, Opt Commun,**127** (1996) 263.
[5] H.Kalaycioglu, H.Cankaya, G. zen, L.Ovecoglu, A Sennaroglu, Opt Commun, **281** (2008) 6056.
[6] R.Balda, J.Fernandez, M.A.Arriandiag, J.M.Fernandez-Navarro, J Phys Condens Matter, **19** (2007) 086223.
[7]Barnes.N.P, Storm.M.E, Cross.P.L, Skolant.M.W. IEEE, **26** (1990) 558.
[8] Lu.J, Prabhu.M, Song.J, LiC, Xu.J, Ueda.K, Appl Phys B, **71**(2000)469.
[9] DeSousa.D.F, Nunes.LAQ, Rolling.J.H, Besso.M.L. Appl Phys B, **77**(2003)59.
[10] Michel.J.C, Morin.D, Fuzel.F. Rev Phys Appl, **13** (1978) 859.
[11]Fernandez.J, Iparraguirre.I, Balda.R, Azkargorta.J, Voda.M, Fernandez- Navarro. J M Opt Mater, **25** (2004) 185.
[12]Sobczyk.M. OptMater, http://dx.doi.org/10.106/j.optmat. 2012.10.043,inpress.
[13] Sobczyk.M. Mater Lett,**88** (2012) 86.
[14]F.Urbach, Phys Rev, **92** (1953) 1324.
[15]C.A.Hogarth, A.A.Hosseini, J Mater Sci, **18** (1983) 2697.
[16]N.F.Mott, E.A.Davis, Philos Mag, **28** (1970) 903 .
[17]S.K.J. Al-Ani, A.A. Higazy, J Mater Sci, **26** (1991) 3670.
[18] B.Eraiah, Sudha G Bhat, J of Physics and Chemistry of solids, **68** (2007) 581.
[19] Jarnail singh, Gurmel singh, Asian J of chemistry, **2(10)** (2009)153. [20]M.Tsuda,S.Soga, H.Inoue, A.N.Makishima, J of Appl Physics, **85** (1999) 29.
[21] B.Bendow, P.K.Benerjee, M.G.Drexhage, J.Lucas, J Am Ceram Soc, **65** (1985)92.
[22] Y.Ohisti, S.Mitachi, T.Tanabe, Phys Chem Glasses, **24** (1983)135.
[23] J.E.Shelby, J Ruller, Phys Chem Glasses, **28 (**1987)262.
[24]A.S.Rao, optical materials, **10** (1998)245.
[25]J.Schroede, J Non-Cryst Solids, **40** (1980)549.
[26]S.Mohan, K.S.Thind, G.Sharma, J Glass physics and chemistry, **34(3)** (2008)265.
[27]M.Abdel-Baki, F.A.Abdel-Wahab, A.Radi and F.El-Diastry, J Physics and Chemistry of Solids, **68** (2007) 1457.
[28]P.Chimalawong, J.Kaewkhao, T.Kittiauchawal, American Journal of Applied Sciences**7(4)**(2010)584.
[29]P.Gayathripavani, S.Suresh, V.Candramuoli, Optical Materials, **34**(2011)215.
[30]A.Bhargava, R.L.Snyder, R.A.Condrate, Mater Res Bull, **22**(1987)1603.
[31]M.Ganguli,K.J.Rao, J Solid State Chem, **145** (1999)65.
[32]W.L.Konijnendijk,J.M.Stevels, J Non-Cryst Solids,**18(3)**(1975)307.
[33] Sekiya T, Mochida N, Ohtsuka A and Tonokawa M. J Non-Cryst Solids, **144** (1992) 128.
[34] Tatsumisago M, Minami T, Kowada Y and Adashi H. Phys. Chem. Glasses, **35** (1994a **)** 89.
[35] Noguera O, Merle-Mejean T, Mirgorodsky A P, Smirov M B, Thomas P and Champarnaud-Mesjard J-C, J Non-Cryst Solids **330** (2003)50.

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"Sustainable Growth through Nano Science and Artificial Intelligence for Safeguard of Environment"

Review On E-commerce

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ABSTRACT

The rapid evolution of computing and communication technologies and their standardizations have set high expectation in e commerce possible. The transactional speed increased with lower cost and reach globally customers easily and mainly the vendors have been one of the reasons for the over whelming popularity of this new way of commerce. Due to the equitable nature of communication over the internet , in which many security concerns involved. These concerns range from the verification for the identities of the people concerned to the protection and validity of data in transfer.

INTRODUCTION:

Electronic commerce is another way to sustain or boosting existing business practices. Other than that, e-commerce is a paradigm shift. It is a modern innovation that is gradually changing the traditional way of doing business [1]. E commerce is showing an extraordinary business growth in our country. Another growth of internet added in this. Ecommerce has brought an drastic changes in online travel industry in many ways and added a new and more sales avenue through online retail industry in our country[2]. Ecommerce converts the traditional ways of doing business into digital ways electronically. As the Internet brought revolution in the field of information and communication, e-commerce has brought relevant revolution in the international and national fields of business transactions [3-5]

DISCUSSION:

ADVANTAGES OF ECOMMERCE

Geographical Limitations overcome

New Customers gained with internet

Cost Minimised

Fast product identification

Travel Time and Cost saved

Comparison Shopping provided

Good deals

Provide Abundant Information

Opened 24/7

TYPES OF E-COMMERCE

Business to Business (B2B):

B2B (business to business), a type of ecommerce is the exchange of products between businesses, other than between businesses and consumers. B2B transaction is done between 2 companies, such as wholesalers and online retailers.

a) Business to Consumer (B2C):

Business to consumer is a business take place directly between a business organization and a consumer. More advertising is required to attract customers.

b)Consumer-to-Consumer (C2C):-

Consumer to consumer ecommerce is a online transactions done between two private consumers via online, without the involving third party.

c)Consumer-to-Business (C2B)

Consumer to business is a type of business model where the customer provides a product to the business. This is the reverse module of the business-to-consumer model, in which a company provides a service to customers through the sale of goods and services.

d)Business-to-Administration (B2A)

Business to administration ecommerce, also referred to as Business to Govt, is when a business provides an online service for the government through a website. One way to understand Business to administration ecommerce is through taxes. Taxes, which collected from government, can be filed online through third-party businesses, such as TurboTax or H&R Block.

e)Consumer-to-Administration (C2A)

Consumer-to-administration (C2A) — Consumer-to-administration (C2A) e-commerce encompasses all electronic transactions between individuals and public .

PAYMENT METHODS

a) Cash On Delivery - COD

COD is a type of transaction where the goods receiver pays for a good at the time of delivery.

Advantages:-

Customer's choice

No need for credit/debit card

Secure mode of payment

Improve the count of orders

Disadvantages:-

Delayed payment

Extra charges for COD

Loss in returns

Customer fraud

Return delivery charge

b) Cash before delivery:

CBD is very simple as we pay full amount once our booking has been done and also the balance must be made before the product will be shipped to the customer.

Facilitators of ECommerce in India:- Information directories: Portals like http://www.trade-india.com/ and http://trade.indiamart.com/ maintain directories giving trade details on almost any topic, whether it is from apparel to toys, from gems to huge machinery, or . The service and products are listed for a serious information-seeker to find what he wants with appropriate details with sub-headings to make it easy. Some other similar sites are http://www.indiagrid.com/, http://indiainfo.com/ and http://indiatimes.com/. Allied services provided by them are message boards, chat rooms, forums, etc. B. Banks: 1) Net banking/phone banking: This is an online banking facility available for savings account holders as well as current account holders. Also we have Net banking services such as : Demat Accounts, Foreign Exchange services, Direct/Instant payment of bills on the account-holder's behalf, Financial Planning etc. 2) Credit/Debit Cards- Banks supports ecommerce by providing the most commonly used trade instrument. Ecommerce would be impossible without Credit or Debit Card. Few of the major Indian players in these fields are: http://www.hdfcbank.com/, http://www.icicibank.com/ and http://www.statebankofindia.com.

CONCLUSION:

Ecommerce is growing rapidly. A number of technologies have converged to facilitate the proliferation of e-commerce. The rapid advances in computer technology coupled with rapid acceleration in communication networks and the development of sophisticated software have revolutionized the way business is done. However, this is not sufficient to proliferate ecommerce applications. With proper understanding of business needs and management of enterprise information security resources, ecommerce will mature profusely and will immensely benefit every individual. This work was partially supported by grants from the R&D in ecommerce & Information Security Group, Department of Information Technology, Ministry of Communication and IT, Govt. of India.

REFERENCES:

1) Moorthy, K. M., Voon, O. O., Samsuri, B. S. A., Gopalan, M. and Yew, K., "Application of Information Technology in Management Accounting Decision Making", International Journal of Academic Research in Business and Social Sciences, Vol. 2, No. 3, March 2012,pp- 1-16 11.
2) Shivani, Grewal, H., "E-Commerce: Security Challenges & Growth: An Indian Perspective", IJMRS's International Journal of Management Sciences, Vol. 01, Issue 02, June 2012, pp- 44-51 12.
3) Somani, C., "VIRTUAL COMMUNITY: The New Hope for E-Commerce", Indian Journal of Computer Science and Engineering, Vol. 3 No. 1 Feb-Mar 2012, pp- 20-23 13.
4) Waghmare, G. T., "E-Commerce; A Business Review and Future Prospects in Indian Business", Indian Streams Research Journal, Vol. 2, Issue. IV, May- 2012, pp-5
5) Sunita S. Padmannavar / https://citeseerx.ist.psu.edu/

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A Review On Utilization Of Solar Energy

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Abstract:

Solar energy is a renewable source of energy and it is accepted globally and utilized more because of the benefits it offers and the new technologies is been engaged to produce electricity. The solar panels serve the purpose of absorbing solar energy and converting to electrical power through the photovoltaic effect (PV) this is considerably reducing and ease problems related to climate change, energy scarcity etc. as of 2019 the capacity expansion was around 2563.8GW with previous year capacity and annual addition was around 580.1GW which increased around 7.4% of new installation of solar[9] it implies how solar energy and other renewable energy are playing a tremendous role globally. And one of the important key requirement for social and economic development of any nation of the world is the electricity supply systems. Recently there is a huge growth In access to solar electricity in many countries, notably China, United states, Japan, Germany, India etc as a result there is a decrease in global population without access to electricity with an appreciable value. This paper review presents the state of solar energy capacity in the world and also identifies the key areas of improving the efficiency, functioning, solidity and budget and as well as the essential methods that may help policy makers to implement it in future. The results shows that there is a recurrent growth in solar energy annually and at the end of 2019. between 2000 and 2019 , figures Increased by 632.4GW in 2019,global cumulative solar PV capacity amounted to 633.7GW with new 115GW of new PV capacity Installed same Year[9]. Due to much demand for electricity progressive builders are suggesting much efficient Solar photovoltaic (PV) renewable energy as an option For their customers.

INTRODUCTION:

Recently there is a demand for clean and eco- friendly energy source Solar energy is energy that comes from the sun .and with the help of solar technologies that convert solar energy in to electrical energy either through photovoltaic (PV) panels or through mirrors that concentrate solar radiations. This energy is used to generate

electricity[10].this improvements resulting in cost reductions and government policies supportive of renewable energy development and utilization.

The conversion of solar energy in to electricity can be achived directly using photovoltaic (PV) panels or indirectly with the help of concentrated solar power(CSP)[10]. Concentrated solar power had a global total installed capacity of 6451MW in 2019, up from 382MW in 2018.spain accounted for half of the world's capacity, at 2300MW,dispite no new capacity entering commercial operations in the country since 2013. The united state follows with 1740MW.intrest is also notable in north Africa and middle east, as well as India and China[2]. solar energy has an estimated world wide average power potential of 24W/m2 of the earth surface.. According to IRENA report, as at the end of 2019 the world's cumulative installed PV capacity reached 580.1GW in 2019,bringing the total renewable energy addition to 2563.8GW at 7.4% growth from 2018.new solar PV addition is **97.5GW** where Asia is with 56GW , Europe with 19GW , 11.2GW in north America, 1.2GW in Africa ,2GW in middle east ,1.2 GW in south America ,0.4GW in central America,4.7 GW in Oceania, and 1.5GW in Eurasia. As of 2019[2].

MATERIALS AND METHOD:

The main function of photo voltaic system is to convert solar energy in to electricity and it is categorized in two parts one is PV array (this includes the Photo Voltaic panels and the support structures) and the balance-of-system(BOS) components(which includes storage batteries ,charge controllers, Inverters and wirings)[10].

Solar electric systems are made out of four basic components: Solar Panels, Batteries, Charge Controllers and Inverters.

a) Solar Panels: This is most basic and fundamental components of the system. These panels charge the batteries. To gain more power, several such solar panels are wired together to form a structure what is called as a solar array. The size of this solar array decides the quantity of energy which is generated.

b) Charge Regulators or Charge Controllers: The main function of the charge controller in solar electric system is to limit the solar panels from over charging of battery. It may come in different size and shapes but the function of this charge regulator remains the same. Electric vehicles also have controllers

c) Batteries: The electrical energy produced by solar electric system is stored in batteries, when batteries get charged it can be utilized whenever it is required.

d) Inverters: The main and prominent function of this inverters is to convert the DC Power which is stored in batteries to AC Power. And which is used to run all the necessary appliances in home. Just for example: for charging the PC battery we need around 50W inverter but when if you want to run home appliances you need around 5000w+ inverter system.[09]

Here the Figure A shows that DC Load is connected to the charge controller and battery storage system respectively, it is necessary to integrate circuit breaker in between the charge controller and the battery

storage system to avoid the excess current flow to battery in case of any short circuit which will be replicated to all necessary points.[10]

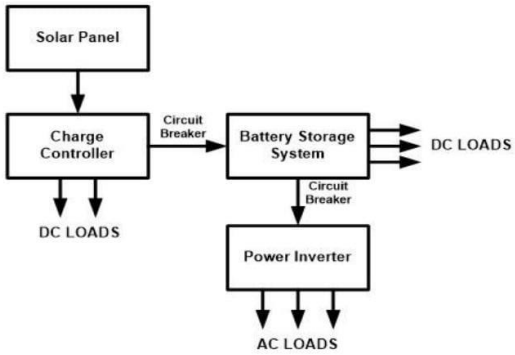


Figure A: Block diagram of photovoltaic system[11]

Advantages of the solar Energy plant

a) First and fore most its renewable energy

b) Low running cost

c) More efficient and easily available

d low maintenance cost as solar panels last over 30 years

e) Eco-friendly

f) No monthly bills

g) Might be a source of income

f) Improving technology

g) Improves the economy

h) Job provision

i) Reduces dependence on foreign oil and fossil fuels

j) This can be installed virtually anywhere in a field to on a building

Disadvantages of the solar energy plant:

a) It is expensive to setup

b) Unable to use in cloudy weather

c) Less efficiency

d) It utilizes more space to setup

e) Dependency on latitude

Table No.1 Renewable energy capacity and solar energy capacity (2009 to 2019) inGW

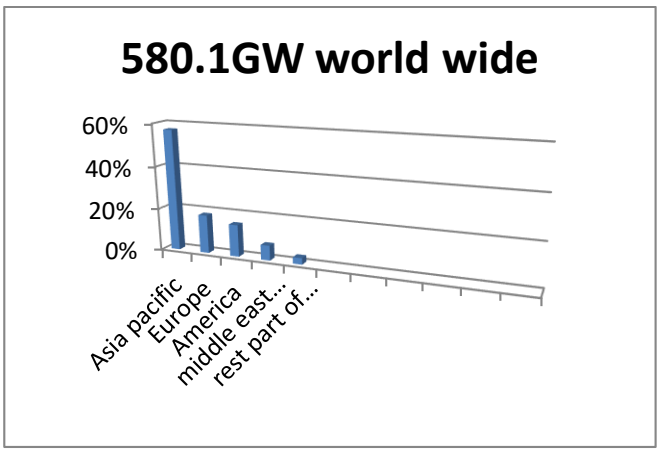
Year	Renewable Energy Capacity	Solar Energy Capacity
2009	1,136.226	23.371
2010	1,224.050	40.871
2011	1,329.202	72.683
2012	1,441.393	102.871
2013	1,563.122	139.602
2014	1,693.254	177.496
2015	1,848.157	225.820
2016	2,007.996	297.293
2017	2,179.448	391.063
2018	2,350.755	485.826
2019	2526.7	633.7

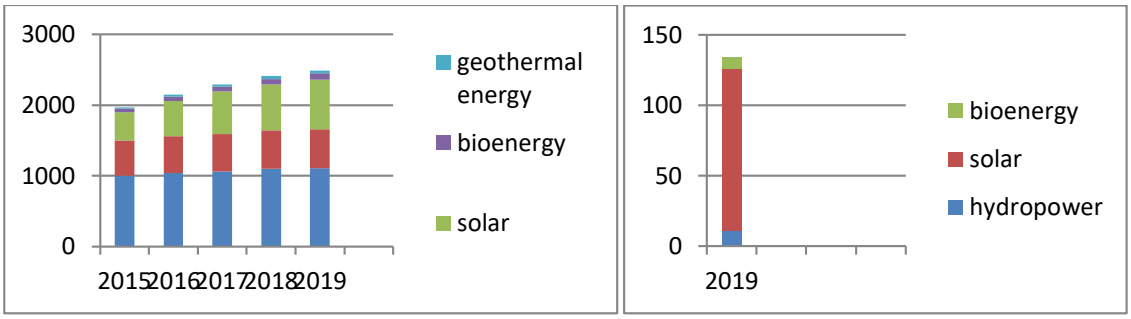
Source: International Renewable Energy Agency[2]

TABLE No 2. New solar PV addition in different regions 2019 (GW)

Region	New Solar Energy Installed Capacity in 2019
Asia	56GW
Europe	19GW
north America	11.2GW
south America	1.2GW
central America	0.4GW
Oceania	4.7GW
Eurasia	1.5GW
Middle east	2GW

Source : International renewable energy agency[2]





Graph source: International renewable energy agency[2]

TABLE 1: TOP 10 COUNTRIES FOR INSTALLATIONS AND TOTAL INSTALLED CAPACITY IN 2019

	FOR ANNUAL INSTALLED CAPACITY				FOR CUMULATIVE CAPACITY	
1	China	30,1 GW	1	China	204,7 GW
(2)	European Union	16,0 GW	(2)	European Union	131,7 GW
2	United States	13,3 GW	2	United States	75,9 GW
3	India	9,9 GW	3	Japan	63 GW
4	Japan	7,0 GW	4	Germany (EU)	49,2 GW
5	Vietnam	4,8 GW	5	India	42,8 GW
6	Spain (EU)	4,4 GW	6	Italy (EU)	20,8 GW
7	Germany (EU)	3,9 GW	7	Australia	14,6 GW
8	Australia	3,7 GW	8	UK (EU in 2019)	13,3 GW
9	Ukraine	3,5 GW	9	Korea	11,2 GW
10	Korea	3,1 GW	10	France (EU)	9,9 GW

Source: IEA PVPS

Nations with the most solar capacity:

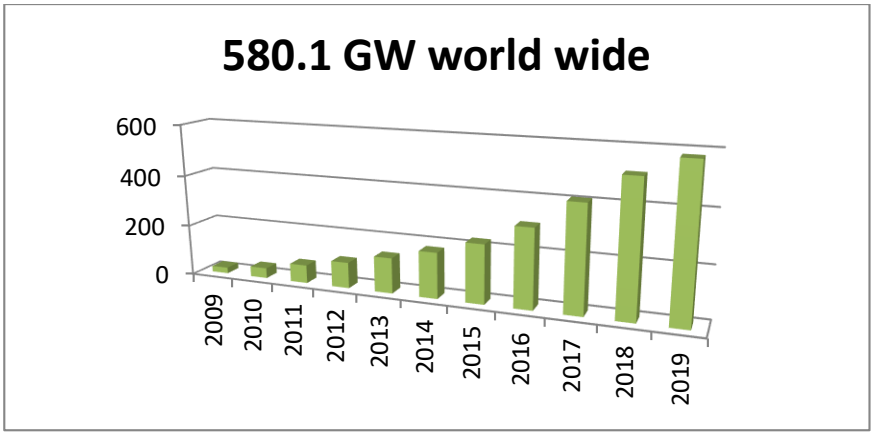
Table 3. shows that china has a bigger solar energy capacity than any other countries in the world, these achievements are made easier due to the fact that China is the world's largest manufacturer of solar panels and USA is chasing them with an appreciable capacity value while Japan is third and we can clearly understand from the table that three Asian countries are among top five nations with the most solar PV installed capacity, this makes the Asia the leading region with the total of 330,427MW with 68.3% of total installed capacity which is contributing more than 50% of the total solar energy installed capacity in the world.

Table No.3 :Solar power capacity of top five countries;

Sl.No	Country	Solar energy installed capacity(2019)	Region
1	China	205GW	Asia
2	United states	76GW	North america
3	Japan	63.2GW	Asia
4	Germany	49.2GW	Europe
5	India	38GW	Asia

Source:nsenergybusiness.com

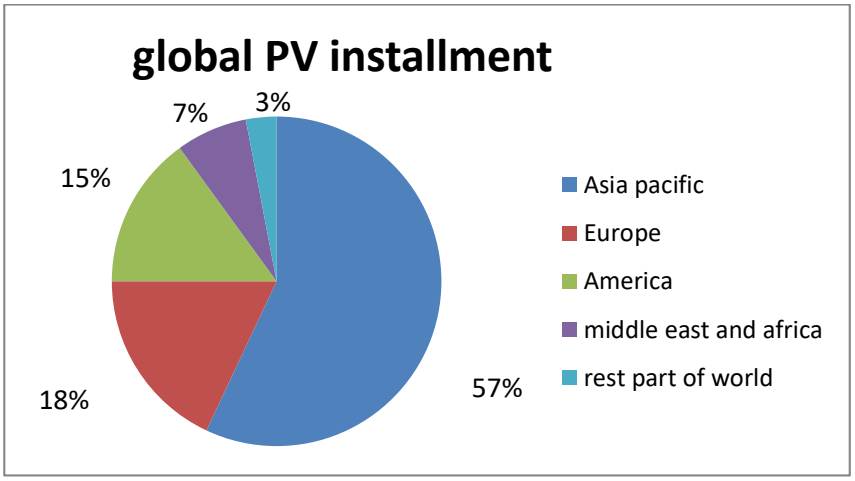
RESULT AND DISCUSSION:



Solar power capacity in GW

Source: Bequerel Institute and IEA PVPS

Figure No.2 Chart showing solar energy capacity by different regions in world 2019(GW)



Percentage of installed Solar Energy plant of different regions in the world in 2019 PV Installation

As per the study and analysis its clear from the figure that There is a recurrent growth in solar power capacities yearly China tops the world

with most capacity, besides figure shows the percentage of power capacity in different regions of world from the pie chart, Asia has the largest percentage with 57% its due to the three countries namely china Japan and India are massive producers of solar power and comes under the top five countries with much good percentage of installation of solar energy plant in the world.

Around 99% of the solar photovoltaic is most commonly installed capacity and around only 1% of concentrated solar power system also used in some regions of the world with minimum installed capacity.

CONCLUSION:

Solar Energy is easily available and due to green house effect and unavailability of constant conventional energy source have made renewable energy sources as an alternative energy source to adopt solar energy is one of the fast growing renewable source of energy as per the result there is a recurrent growth in utilization of solar energy and benefits associated with it. As per Pie chart analysis Asia region nations has the largest installment capacity around 57% ,Europe stands second with 18% and and Americans stands third with 15% and 10% with middle east, Africa and other part of world. As a request for continuous and uninterrupted supply in different regions progressive builders are suggesting the solar PV as an option for customers, moreover solar energy is much abundant source of energy and will be more functional , affordable , reliable and solidity which will also help development on large scale. Below stated are some recommendations to improve the efficiency of solar power technology.

RECOMMENDATIONS:

The following are the suggestions for improvement of Solar energy power technology[11]:

a) Renewable energy power station such as solar photovoltaics (PV) should be actively encouraged.

b) There should be massive increase in manufacturing process and should improve the efficiencies with decrease in the manufacturing cost.

c) All incandescent or CFL bulbs should be replaced by the LED’s to increase the efficieny of the solar power technology.

d) Turn off all the devices after use.

e) More importance should be given for saving power and should take up the culture of energy efficient home .

f) more power consumption machines should be run during the day time when there is sunlight.

REFERENCES:

1) IRENA,IREDA, Reports of 2019 & wikipedia

2) IRENA, "Renewable capacity statistics 2020, International Renewable Energy Agency (IRENA).

3) IEA, IRENA, UNSD, WB, WHO, "Tracking SDG 7: The Energy Progress Report 2019," Washington DC

4) MESIA, Solar Outlook Report 2019, Middle East Solar Industry Association, Dubai – UAE, 2019

5) https://www.finder.com/uk/nation-most-solarpower(accessed 22 OCT 2021)

6) G. R. Timilsina, L. Kurdgelashvili, and P. A. Narbel, "A Review of Solar Energy Markets, Economics and Policies," The World Bank Development Research Group Environment and Energy Team, 2011.

7) GCEP, "An Assessment of Solar Energy Conversion Technologies and Research Opportunities," Global Climate and Energy Project, Stanford University, 2006.

8) Infolink-group.com ; www.evwind.es(accessed 22 OCT 2021)

9) http://en.wilipedia.org/wiki/solar_power_Indi &upbatterycentre.com

10) A review of solar energy journal of multidisciplinary engineering science and technology(JMEST)vol.6 issue q12,December 2019

11) Article on study of the efficiency and dynamic characteristics of an energy harvester based on flexible structure galloping. Energies 2021,14,6548, https://doi.org/10.3390/en14206548 , https://www.mdpi.com/journal/energies.

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"Sustainable Growth through Nano Science and Artificial Intelligence for Safeguard of Environment"

View On Crypto Currency

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ABSTRACT:-

Cryptocurrency is a digitally issued tender by some of websites that is been protected by cryptography so this makes the cryptocurrency impossible to counterfeit or double-spend. Blockchain advanced technology is the base for cryptocurrency over large number of decentralized networks. The main idea to be focused over cryptocurrency is that they are not distributed by any of the officially registered authorities and this makes them immune to governments involvement or manipulation.

INTRODUCTION:-

As the word cryptocurrency itself utters that it is an encrypted technology which are been secured, presently there is a negative view by common people over cryptocurrency for countless reasons, as they could be used in illegal activities. Still the people who are having idea about the cryptocurrency praise the cryptocurrency because of its speedy work and secured network [1].

Initially cryptocurrency was called tokens when they were issued by many small companies in the initial days and they were used mostly for buying and selling of goods and services that are provided by some companies which all uses it. Present days cryptocurrency is been preferred for profitable investment. Cryptocurrency can be easily understood by comparing them with the tokens or chips issued at the casinos. Blockchain technology is the main base for cryptocurrency (the blockchain technology is a decentralized technology that is spread over countless computers [2-4].

DISCUSSION:

TYPES OF CRYPTOCURRENCY:-

More than 13,000 different crypto currencies are traded publicly, according to CoinMarketCap.com, a market research website. And crypto currencies continue to proliferate, raising money through initial coin offerings, or ICOs[5].

Out of which top10 crypto currencies are:-

1) Bitcoin
2) Ethereum
3) BinanceCoin
4) Cardano
5) Tether
6) Solana
7) XRP
8) Palkadot
9) USDCoin
10) Dogecoin

ADVANTAGES:-

To understand the advantages of cryptocurrencies we must get acknowledged with the present day banking system. Considering an example of transferring of amount from India to an 'X' country the process includes depositing the money in the bank a/c of the person and then transfering it and the process requires three to four working days to get the transfer completed, but the same transfering process is a matter of minutes with the help of cryptocurrencies. The usage of cryptocurrency also reduces the human errors. Also while transfering through cryptocurrency we don't need any help of any of the agencies like banks etc., The transfer is provided the end to end encryption so the details of the transfer only remains with person transfering and the receiver. With the cryptocurrency we will be avoiding the transfer charges that we paying to the financial institutions on every transactions present day [5].

DISADVANTAGES:-

The first and foremost disadvantage of usage of cryptocurrency is that it is a threat to security of the nation. Cryptocurrency being an encrypted transfer method makes it the primary choice for the terrorist, naxalites, so that the transactions will be hidden from the government and its investigating agencies . Cryptocurrency also has become the best choice to the black money holders so that once they convert black money into cryptocurrency then the money is totally non-transperent to government. Another disadvantage of cryptocurrency is that the people aren't thinking it as a tender instead are hoping it as an investment market where the value of currency increases day by day. Some of the cryptocurrencies such as Dash, Montero, ZCash offers high privacy and this makes the same highly difficult to trace [5].

CRYPTOCURRENCY IN INDIA:-

Present day, in India, cryptocurrency has an amusing status because it is not a legal tender of the country but also not even illegal (unlike rupees ,the legal tender of the country issued by RBI)

Even though people of India being acknowledged about all the points mentioned above still as per a study 10 crore of people in India are owning cryptocurrency and this makes India a bigger user base for cryptocurrency investment than other countries in the world.

HOW TO INVEST IN CRYPTOCURRENCY IN INDIA:-

The cryptocurrency market has grown up to such a height that today in India that billions of dollars of trading is been happening in the Indian market of cryptocurrency. Here are the top crypto exchanges serving the Indian market:

WazirX
CoinDCX
CoinSwitchKuber
ZebPay
UnoCoin

To invest in cryptocurrency in India one must first visit the site then create there wallet then with the help of the money in there bank a/c they must buy the cryptocurrency by transfering money with the transfer method mentioned in the site.

Although the cryptocurrency trade in India doesn't fall under any existing law, exchanges follow KYC norms to ensure the medium is not used for activities such as money laundering.

In India once one invest in cryptocurrency then he/she can use it for buying or selling of good and services and this makes it easy and simple .

STEPS TO INVEST:-

To invest in cryptocurrency one must follow the following steps :

a. first one must register him/her self with email ID and a strong password need to be created.
b. there will be another level of safeguarding authentication that will be optional
c. then one's KYC details must be produced and then one should wait until it gets verified and approved.
d. even though the registration is instantaneous still it consumes one to two days for approval
e. when the wallet is approved by the site then one can transfer the funds to his/her exchange wallet and start with trading.

PRECAUTIONS:-

Before buying a cryptocurrency exchange wallet one need to look into the companies prospectus for the following information:

1. is the company secured?
2. is the company preferable?
3. is the company well known?
4. does any other companies or person owns share in it?
5. is the cryptocurrency provided by company is in use or need to be developed?

The more the description about the company in prospectus the more the chances it could be legal in future, but never to forget that legalization of cryptocurrency is a huge debate still.

Also must be cautious about hackers as it is a biggest threat to cryptocurrency [5].

REFRENCES:

[1] https://www.nerdwallet.com/article/investing/cryptocurrency

[2] https://www.investopedia.com/terms/c/cryptocurrency.asp

[3] https://www.chathamhouse.org/2021/01/digital-currencies

[4] https://www.cnbctv18.com/cryptocurrency

[5]https://www.publictv.in/cryptocurrency

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PHOTOCATALYTIC DEGRADATION OF PESTICIDES BY TITANIUM DIOXIDE.

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Abstract

The development of the agrochemical industry has dramatically increased in the last few decades. Due to the widespread intensive agricultural activities,it is necessary to address the issues related to the pesticide applications as well as improper wastewater disposal methods. 2, 4-D and 2, 4-DP are the widely used pesticides that have noticeable influence not only on the plant (leaves and roots), but also the quality of soil. In this article we review on the removal of toxicity in 2, 4-D and 2, 4-DP by using TiO2 as catalyst. It has been observed that TiO2 in the nanoparticle form effectively degrade the toxicity of 2, 4-D and 2, 4-DP.

cause: -among all the pesticides a large amount of chlorinated compounds are currently reaches to the environment. This is the most serious agricultural problem and constitutes the most important family of toxic non-biodegradable compounds.

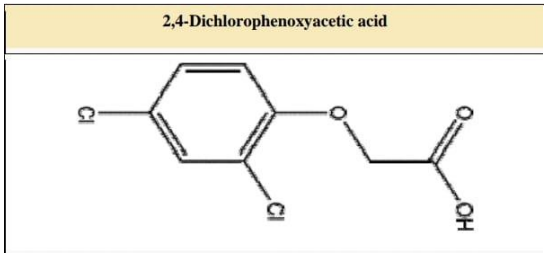
INTRODUCTION: -

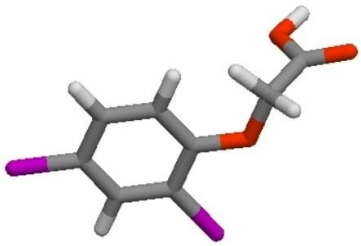
Due to an increase in pesticide usage in agriculture worldwide, there exists a need for the development of an effective pollutant removal process for pesticides in agricultural runoff water.it is advantageous for the treatment to not require the addition of treatment chemicals which could potentially have harmfull effect on the environment. A reactor utilizes a photocatalyst titanium dioxide with the exposure to uv light for treatment of pesticide 2,4-D,2,4-DP.

2,4-dichlorophenoxyacetic acid (2,4-D) :

2,4-dichlorophenoxyacetic acid (2,4-D)is a common systemic herbicide which is used in the controlment of broadleaf weeds. It is most widely used herbicide in the world, 2,4-D is also an important synthetic

auxin (A group of naturally occurring and artificially synthesized plant harmones),often used in laboratories for plant research.





Molecular Formula : $C_8H_6Cl_2O_3$

This was developed during world war2 by a British team, Aimi ng to increase the crop yields for a nation at war. This herbicide is greatly allowed to enhanced the weed control in wheat,maize,rice and similar cereal grass crop.

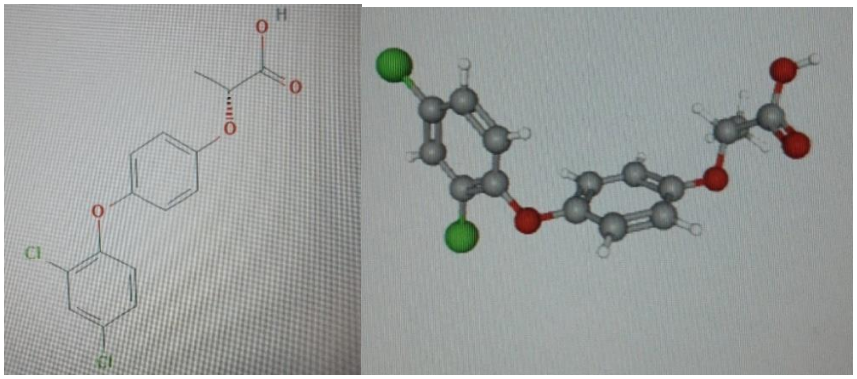
USES:1. weed control, 2.no_till burndown , 3.control of broad leaf trees in conifer plantings , 4.grass hayfields , 5.cereal grains , 6.corn and sorghum , 7.as a synthetic auxin analogue.

TOXICITY:

01. The amine salt formulations can cause irreversible eye damage(blindness)
02. Ester formulations are considered non-irritating to the eyes.
03. This herbicide caused male reproductive problemincluding dead and malformed sperm.
04. Mainly focus on Cancer risk: this is due to the increase in the risk of mortality due to amyotrophic lateral sclerosis.

2,4-Dichlorophenoxy propionic acid :

2,4-Dichlorophenoxy propionic acid it is an degrading bacterial strain, it was isolated after numerous sub cultivations of a mixed culture obtained by the soil column enrichment. This herbicide is mainly for to increase the maximum specific growth of the plant.



Molecular formula: $C_9H_8Cl_2O_3$,2-(2,4-dichlorophenoxy) propanoic acid

2-(2,4-diclorophenoxy)propanoic acid is an aromatic ether that is 2-hydroxypropanoic acid

In which the hydroxy group at position 2 has been converted to its 2,4-dichlorophenyl ether. It is a monocarboxylic acid, an aromatic ether and a dichlorobenzene.

TOXICITY:

01. There are evidence that 2-(2,4-Dichlorophenoxy)Propionic Acid causes cancer in animals.
02. Exposure to 2-(2,4-Dichlorophenoxy)Propionic Acid can cause fever, nausea, vomiting, diarrhea, stomach pain and poor appetite.
03. While 2-(2,4-Dichlorophenoxy)Propionic Acid has not been tested, it is not classifiable as to its potential to cause reproductive harm.
04. Breathing 2-(2,4-Dichlorophenoxy)Propionic Acid can irritate the nose, throat and lungs causing coughing, wheezing and shortness of breath.

TITANIUM DIOXIDE:(TiO_2):-

It has been widely used as a photocatalyst in many environmental and energy applications due to its efficient photo activity ,and high stability, and mainly it available to everyone because of its low cost and the main advantage, it is safety to the environment and humans.

Titanium dioxide is of two types:-

01.Homogenrous: OH radicals by oxidation of OH^- anions.

02.Heterogeneous: generation of O_2^- radicals by reduction of O_2.

PREPARATION OF TiO_2:-

This TiO2 is prepared by sol-gel method by dissolving Ti (OC3H7)4 in methanol\ethanol solution with molar ratio 1:1:10. obtained solution maintained at 75degree for 3 hours this sample drained at 110 degree centigrade and calcined at 50degree centigrade for 120 min. this complete photocatalytic reactor and light source experiment done in cylindrical vatch reactor. this procedure and analysis of the mixture is doe with spectrophotometer. And absorbance characteristic with the calibration curve method.

We took a topic called **Photocatalytic degradation of pesticide by titanium dioxide ,** so here we are going to reduce the toxicity of the pesticides which are mentioned in the abstract **(2,4-D and 2,4-DP)** , where these pesticides are widely used in our country, but somany are don't aware of the toxicity levels of these pesticides. But still we are at stage of finding the solution to reduce the toxicity level in the pesticides.

According to reduce in the toxicity level the photocatalytic process takes place, and for this process widely used catalyst is **TiO_2** , by this catalyst we can reduce the toxicity level by the radiation method, and also by the Advanced oxidation processor (AOPs) method. These two methods are widely used in the degradation process. And here among different techniques Heterogeneous technique is an efficient technique to destroy organic pollutants in water.

By the complete process of the photocatalytic activity can effectively degrade the selected pesticides (2,4-D,2,4-DP).

After the reaction the solution can be separated from the suspension. Because the pesticides can sediment in mixture when the stirring was stopped.

But while the TiO_2 is added to the solution it won't be sedimented by the reaction. Because it has the activity to dissolve any kind of pesticides by this the effect or the transfer of toxicity level be decreased in the environment.

CONCLUSION:-

Here we know that titanium dioxide is a nanomaterial, and their photocatalytic activities were investigated for the photocatalytic degradation of 2,4-dichlorophenoxy acetic acid and 2,4-dicholorophenoxy propionic acid.

The results were found is by the photocatalytic activity where the titanium dioxide as a catalyst we can effectively degrade the toxicity levels of selected pesticides. And we can reduce the level of toxicity in plants, animals, and humans etc.

Finally we conclude this article with the slogan **"Heal the planet we have. Make it a better place to live in for the upcoming race".**

ACKNOWLEDGEMENT:-

I would like to express my sincere gratitude to my teacher, Dr. Indudhar P.vali sir for giving me a such good opportunity to work in the article writing on Review of Degradation of pesticides by titanium dioxide.

REFERENCES:-

Abdennouri, M., Galadi, A., Barka, N., Baaˆlala, M., Nohair, K.,

Elkrati, M., Sadiq, M., Bensitel, M., 2010. Synthesis, characterization and photocatalytic activity by para-chlorotoluene photooxidation of tin oxide films deposited on Pyrex glass substrates. Phys.

Chem. News 54, 126–130.

Augugliaro, V., Baiocchi, C., Prevet, A.B., Garcia-Lopez, E., Loddo,

V., Malato, S., Marci, G., Palmisano, L., Pazzi, M., Praumauro,

E., 2002. Azo-dyes photocatalytic degradation in aqueous suspension of TiO2 under solar irradiation. Chemosphere 49, 1223–1232.

Barka, N., Qourzal, S., Assabbane, A., Nounah, A., AıˆtIchou, Y.,

2010. Photocatalytic degradation of an azo reactive dye, reactive

yellow 84, in water using an industrial titanium dioxide coated

media. Arab. J. Chem. 3, 279–283.

[0:07 pm, 27/10/2021] Pruthvi.: BCPC (British Crop Protection Council), 1997. The Pesticide Manual,

eleventh ed. BCPC, England.

Bhattacharyya, A., Kawi, S., Ray, M.B., 2004. Photocatalytic degradation of orange II by TiO2 catalysts supported on adsorbents.

Catal. Today 98, 431–439.

Bovey, R.W., Young, A.L., 1980. The Science of 2,4,5-T and Associated

Phenoxy Herbicides. Wiley & Sons, New York, pp. 425–433.

Colborn, T., Vom Saal, F.S., Soto, A.M., 1993. Developmental effects

of endocrine disrupting chemicals in wildlife and humans. Environ.

Impact Assess. Rev. (14), 469–489.

Czımerova, A., Bujdak, J., Dohrmann, R., 2006. Traditional and novel

methods for estimating the layer charge of smectites. Appl. Clay Sci

(34), 2–13.

Ding, Z., Zhu, H.Y., Lu, G.Q., Greenfield, P.F., 1999. Photocatalytic

properties of titania pillared clays by different drying methods. J.

Colloid Interface Sci. (209), 193–199.

EPA (U.S. Environmental Protection Agency), 2004. Pesticides Industry

Sales and Usage: Market Estimates 2000–2001, EPA, USA.

Gafar Muhamad, S., 2010. Kinetic studies of catalytic photodegradation of chlorpyrifos insecticide in various natural waters. Arab J.

Chem. 3 (2), 127–133.

Kurian, M., Sugunan, S., 2003. Liquid phase benzylation of o-xylene

over pillared clays. Ind. J. Chem. 42A, 2480–2486.

Pe´reza, M.H., Pen˜uela, G., Maldonado, M.I., Malato, O., Ferna´ndezIba´n˜ez, P., Oller, I., Gernjak, W., Malato, S., 2006. Degradation of

pesticides in water using solar advanced oxidation processes. Appl.

Catal. B Environ. 64, 272–281.

Pichat, J., D'Oliveria, J.C., Maffre, J.F., Mas, D., 1993. Destruction

of 2,4-D in water by TiO2–UV, H2O2–UV, or direct photolysis.

In: Ollis, D.F., Al-Ekabi, H. (Eds.), Photocatalytic Purification

and Treatment of Water and Air. Elsevier, Amsterdam, pp. 683–

687.

Roques, H., 1996. Chemical Water Treatment, VCH Verlag, Weinheim, Germany.

Schiavello, M., 1987. Photocatalysis and environment: trends and

applications. NATO ASI Series C, vol. 238. Kluwer Academic

Publishers, London.

Vulliet, E., Chovelon, J.M., Guillard, C., Herrmann, J.M., 2003.

Factors influencing the photocatalytic degradation of sulfonylurea

herbicides by TiO2 aqueous suspension. J. Photochem. Photobiol.

A Chem. 159, 71–79.

Zhang, L., Kanki, T., Sano, N., Toyoda, A., 2001. Photocatalyticdegradation of organic compounds in aqueous solution by A TiO2-coated rotating-drum reactor using solar light. Solar Energy 70,331–337.

Zhu, H.Y., Li, J.Y., Zhao, J.C., Churchman, G.J., 2005. Photocatalysts prepared from layered clays and titanium hydrate fordegradation of organic pollutants in water. Appl. Clay Sci. 28,79–88

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A BRIEF REVIEW ON WIND ENERGY TURBINE BLADES

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Abstract

The element of a wind turbine that captures energy from the wind is the rotor. Efficiency will be depend on the number of blades on the rotor their shape, their length, and the speed at which the rotor turns. The total amount of energy available depends on the area swept out by the blades, the swept area.In this article we present a brief review on the various materials being used in the fabrication of wind turbine blades such glass fibres, epoxy matrix compositesetc. In addition a brief outline on the preparation of turbine blades are also reviewed. The pros and cons of different materials is discussed with reasonable explanations.

Introduction

Wind energy is produced with wind turbines, tubular towers with blades rotating at the top when the wind turns the blade. The blade turns a generator and create electricity. It works on the principle instead of using electricity to make wind like a fan. Wind turbines use wind to make electricity. Wind turns the propeller like blade of a turbine around a rotor, which spins a generatorand creates electricity.

Wind turbines can have horizontal and vertical axis the turbines do not actually produce wind energy. The blades turn,convert the enrgy of wind into rotational energy,a form of mechanical energy and wind energy is turn converted into electrical energy

APPLICATONS:

- The wind energy is used to propel the sailboats in river and seas to transport men and materials from one place to another
- Wind energy is used to run pumps to draw water from ground through wind mills
- Wind energy has also been used to run flourmills to grind the grains like wheat and corn into flour
- Now a days wind energy is being used to generate electricity. Wind energy may be considerd as the worlds fastest growing energy source
  By the way development of technology,wind power may become most economical and environmental friendly source of electricity in many countries in the coming 10 to 20 years.

WIND TURBINES

Wind turbines is a device that converts the wind kinetic energy into electrical energy

TYPES OF WIND TURBINES

1.Horizontal axis wind turbines:

Horizontal axis wind turbines are the most familiar type of electricity producing wind mill.most have three large blades that spins parallel to the towers where the main rotor and generator located.

They stand about 60 to 90 meters tall and the blades rotate at 10 to 20 rotations a minute.

ADVANTAGES:

Variable blade pitch,which gives the turbine blades the optimumangle of attack

The tall tower base allows access to stronger wind in sites with wind shear. In some wind shear sites ,every ten meters up the wind speed can increases by 20% and the power output 34%.

DISADVANTAGES:

- The tall towers and the blades upto 90 meters long are difficult to transport. Transportation can now cost 20% of equipment cost.
- Tall horizontal axis wind turbines are difficult to instal,needing vary tall and expensive cranes and skilled operators

VERTICAL AXIS WIND TURBINES:

- These have varied, unusually shaped blades that rotate in complete circle around the generator are located near the ground making maintainance easier and less expensive, VAWTs do not have to be upwind to generate electricity.
- VAWTs can be much smaller than their HAWTs. Standing only 5meters tall these VAWTs can be installed on the roofs of the building.

ADVANTAGES:

- A massive tower structure is less frequently used, as VAWTs are frequently mounted with lower bearing mounted near the ground.
- A VAWTs can be located nearer the ground, making it easier to maintain the moving parts.

DISADVANTES:

- Most VAWTs produce energy energy at only 50% of the efficiency of HAWTs in large part because of additional drag that they have as their blades rotate into the wind.

While VAWTs parts are located on the ground, they are also located under the weight of the structure above it.

CHALLENGES:

- Wind power must still complete with conventional generation source on a cost basis.
- Good land-based wind sites are often located in remote location far from cities where from the electricity is needed.
- Wind resource development might not be the most profitable use of the land.
- Turbines might cause noise and aerthetic pollution.
- Wind plants can impact local wild life.

ROTOR BLADES OF WIND TURBINE:

Blades are the main mechanical parts of a wind turbine. The bladesconvert wind energy into usuable mechanical energy. When the wind strikes on the blades, the blades rotates. This rotation transfers its mechanical energy to the shaft. We design the blades like aeroplane wings. The wind turbine blader can be 40meters to 90meters long. The blade should be mechanically strong enough to with stand strong wind even during the storm. At the same time, the wind blader should me made as light as possible to facilitate

smooth rotation of the blades. For that, we make the blades with fibre glass and carbon fibre layers on synthetic reinforce.

COMPOSITES FOR WIND TURBINE BLADES

Wind turbines blades are primarly made composite materials that combine high-tensile-strength fibers with polymer resins to form glass or carbon-fiber-rein forced polymers(GFRP).

GLASS AND CARBON FIBERS:

Glass and carbon fibers. The stiffness of composites is determined by the stiffness of fibers and their volume content. Typically, E-glass fibers (i.e., borosilicate glass called "electric glass" or "E-glass" for its high electric resistance) are used as main reinforcement in the composites. With increasing the volume content of fibers in UD composites, the stiffness, tensile and compression strength increase proportionally, yet, at high volume content of fibers (after 65%), there might be dry areas without resin between fibers and the fatigue strength of the composite reduces .

Typically, the glass/epoxy composites for wind blades contain up to 75 weight % glass.Many investigations toward the development of fibers, which are stronger than the usual E-glass fibers, have been carried out. The high strength fibers (which are still used seldom in practice, but represent a promising source of the composite materials improvement) include glass fibers with modified compositions (S-glass, R-glass, etc.), carbon fibers, basalt and aramid fibers. S-glass (i.e., high strength glass, S means "Strength" here) developed in the 1960s, shows 40% higher tensile and flexural strengths, and 10-20% higher compressive strength and flexural modulus, as compared to E-glass.

The S-glass is much more expensive than E-glass. S2 glass was developed in the 1968 as a commercial version of S-glass. S glass and S2 glass fibers have the same composition (mag esiumalumino-silicate). The main differences are in sizing (fiber coating) and certification procedure. The price of S2-glass is around 10 times of that of E-glass. R-Glass fibers, introduced in 1968, are produced with a calcium aluminosilicate glass with less silica and added oxides. Some other special glasses developed by Owens Corning are ECRGLAS, Advantex and most recently WindStrandTM glass fibers. The WindStrandTM glass fibers show15 percent higher stiffness and up to 30 percent higher strength when compared to E-glass .

Matrix

Due to the low weight requirement to the wind blades, polymers are the main choice as the matrix material for the wind blade composites. As noted above, matrix of composite controls fracture toughness, delamination strength and out-of-plane strength and stiffness of the composite, and influences the fatigue life of the composites. Typically, thermosets (epoxies, polyesters, vinylesthers) or (more seldom) thermoplastics are used as matrixes in wind blade composites. Thermosets based composites represent around 80% of the market of reinforced polymers (Nijssen, 2007, Joncas, 2019). The advantages of thermosets are the possibility of room or low temperature cure, and lower viscosity (thus, allowing better impregnation and adhesion). Initially, polyester resins were used for composite blades. With the development of large and extra-large wind turbines, epoxy resins replaced polyester and are now used most often as matrixes of wind blade composites. While polyester is less expensive and easier to process (needs no post-curing), epoxy systems are stronger (high tensile and flexural strength) and more durable as compared with polyester resins. Epoxy matrixes ensure better fatigue properties of the composites. The production of epoxy based composites is more environmentally friendly. Still, recent studies (e.g., by Swiss company DSM Composite Resins) support arguments for the return to unsaturated polyester resins, among them, faster cycle time and improved energy efficiency in the production, stating that the newly developed polyesters meet all the strength and durability requirements for large wind blades. Thermoplastics represent an interesting alternative to the thermoset matrixes. The important advantage of thermoplastic composites is their recyclability. Their disadvantages are the necessity of high processing temperatures (causing the increased energy consumption and possibly influencing fiber properties) and, difficulties to manufacture large (over 2 m) and thick (over 5 mm) parts, due to the much higher viscosity. The melt viscosity of thermoplastic matrices is of the order 102 -103 Pax s, while that for thermosetting matrix is around 0.1-10 Pax s. Thermoplastics (as differed from thermosets) have melting temperatures lower than their decomposition temperatures, and, thus, can be reshaped upon melting. While the fracture toughness of thermoplastics is higher than that of thermosets, fatigue behavior of thermoplastics is generally not as good as thermosets, both with carbon or glass fibers (Nijjssen, 2007). Other advantages of thermoplastics include the larger elongation at fracture, possibility of automatic processing, and unlimited shell life of raw materials (Lystrup et al, 1998). Further, the development of matrix materials which cure faster and at lower temperatures is an important research area. Resins with faster cure and lower curing temperature allow reducing the processing time and automating the manufacturing. In some cases, thixotropic agents, like fumed silica and certain clays, are used to control viscosities of resins during manufacturing. In several works, the possibilities of improvement of composites properties by adding

nanoreinforcement in matrix were demonstrated. Additions of small amount (at the level of 0.5 weight %) of nanoreinforcement (carbon nanotubes or nanoclay) in the polymer matrix of composites, fiber sizing or interlaminar layers can allow to increase the fatigue resistance, shear or compressive strength as well as fracture toughness of the composites by 30…80%. Graphite particles fiber coatings on glass fibers allow increasing the fatigue life up to 100 times e.g., (Bian, 1996). Summarizing the brief overview, one can state that apart from the basic solution (epoxy/E-glass composites) widely used for medium and large wind blades, there are several very promising directions of development of stronger, more reliable and economically producible composites, among them: • High strength fibers (strong glasses, carbon, aramid, other fibers) can ensure higher stiffness and sometimes better strength and damage resistance of composites; the disadvantages are higher costs and in some cases lower compressive strength (carbon fibers) and high sensitivity to local defects (e.g., misalignment). Hybrid composites with mixed E-glass and high strength fibers allow to achieve the combination of higher stiffness (due to carbon fibers) with limited cost increase • Thermoplastic resin matrixes, as opposed to the widely used epoxy matrix, are recyclable, can be reshaped upon melting and have higher fracture strain. Their disadvantages are high processing temperatures and higher viscosity, leading to the more expensive and difficult processing times. Resins with faster cure and lower curing temperature allow us to reduce the processing time and automate the manufacturing. Further, the nanomodified matrixes or sizing on fibers have a potential to increase the fatigue strength of the composites.

Manufacturing of Wind Turbine Blades:

During the first decades of the wind energy development, wind turbine blades were often produced using the wet hand lay-up technology, in open molds. The glass-fiber reinforcement was impregnated using paint brushes and rollers. The shells were adhesively bonded together/to the spars. This technology was used mainly to produce small and medium size blades (up to 35 and 55 m, respectively). For larger blades, the same technology was used, but the web were inserted and adhesively bonded between two sides, and the plies with more fiber content were used. The disadvantages of the open mold technology are high labor costs, relatively low quality of products and environmental problems. In 1970s, several companies and institutes explored the applicability of filament winding technology, seeking to improve the quality of turbine and to reduce labor costs [13].

The introduction of vacuum infusion and prepreg technologies allowed improving the quality of manufacturing [14]. The prepreg technology, adapted from the aircraft industry, is based on utilizing “pre-impregnated” composite fibers, which already contain an amount of the matrix material bonding them together. Prepreg (widely used, for instance, by the Danish wind turbine producer Vestas) allows the industrial impregnation of fibers, and then forming the impregnated fibers to complex shapes.

The most widely used technology to produce the wind blades, especially longer blades, is the resin infusion technology. In the resin infusion technology, fibers are placed in closed and sealed mold, and resin is injected into the mold cavity under pressure. After the resin fills all the volume between fibers, the component is cured with heat. The resin infusion technologies can be divided into two groups: Resin Transfer Molding (RTM) (resin injection under pressure higher than atmospheric one) and Vacuum

Assisted Resin Transfer Molding (VARTM) (or Vacuum Infusion Process) (when resin is injected under vacuum or pressure lower than atmospheric, typically, under a vacuum bag) [15]. A variation of VARTM called SCRIMP™ (i.e., Seemann Composite Resin Infusion Process) was developed in late 1980s and is quite efficient for producing large and thick parts. Currently, vacuum assisted resin transfer molding (VARTM) is the most common manufacturing method for manufacturing of wind turbine rotor blades. With his method, layers of fabrics of dry fibers, with nearly all unidirectional fibers, aligned in the direction along the length of the blade, are position on mold parts along with polymer foams or balsa wood for sandwich structures (for the aeroshells). In order to form a laminate that is thick by the root and gradually becomes thinner towards the tip, most plies run from the root only partly toward the tip; the termination of a ply is called ply-drop. The fabrics and subsequently covered by a vacuum bag and made air-tight. After the application of vacuum, low-viscosity resin flows in and wets the fibers. After infusion, the resin cures at room temperature. In most cases, wind turbine rotor blades are made in large parts, e.g., as two aeroshells with a load-carrying box (spar) or internal webs that are then bonded together. Sometimes, the composite structure is post cured at elevated temperature. In principle, this manufacturing method is well suited for upscaling, since the number of resin inlets and vacuum suction points can be increased. A challenge with upscaling is however, than quite many layer of dry fabrics must be kept in place and should not slip relative to each other. The composite is quite thick by the root section, typically exceeding 50–60 mm in the consolidated state. In practice, it can be a challenge to avoid the formation of wrinkles at double-curved areas and areas with un-wetted fibers and air bubbles can be entrapped in the bondlines. After manufacturing, the blades are subjected to quality control and manufacturing defects are repaired. Since a large blade represents a large value in materials, increasing sizes means that it becomes less and less attractive to discard blades with manufacturing defects. Thus, with increasing size the requirements towards materials go towards easier processing and materials should preferably be more damage tolerant so that larger manufacturing defects can be tolerated. shows the schematics of the manufacturing of a wind turbine rotor blade by assemblage and bonding of two aeroshells and two shear webs.

The infusion process is usually cheaper that the prepreg process. However, the prepreg composites have more stable, better and less variable mechanical properties than the composites produced by resin infusion. This technology is relatively environmental friendly, and makes it possible to achieve higher volume content of fibers, and to control the materials properties. Further, the prepreg technology allows higher level of automation and better choice of resins.

Lately, the automated tape lay-up, automated fiber placement, two-pieces or segment wind blades, enhanced finishing technologies are expected to come into use to improve quality and reduce costs of the composite blade manufacturing [14]. A big challenge, in comparison with e.g., automatization of composite structures for aerospace, is the much larger thicknesses and the much larger amount of materials to be places in the molds for wind turbine rotor blades. For some parts of the blades, 3D woven composites represent a promising alternative to producing fiber reinforced laminates. Mohamed and Wetzel [16] suggested producing spar caps from 3D woven carbon/glass hybrid composites. It was demonstrated that this technology allows producing spar caps with higher stiffness and lower weight, than the commonly used technologies.

Wind energy pros and cons:

There are advantages and disadvantages to any type of energy source, and wind energy is no different. In this article, we'll review some of the top pros and cons of generating electricity from wind turbines.

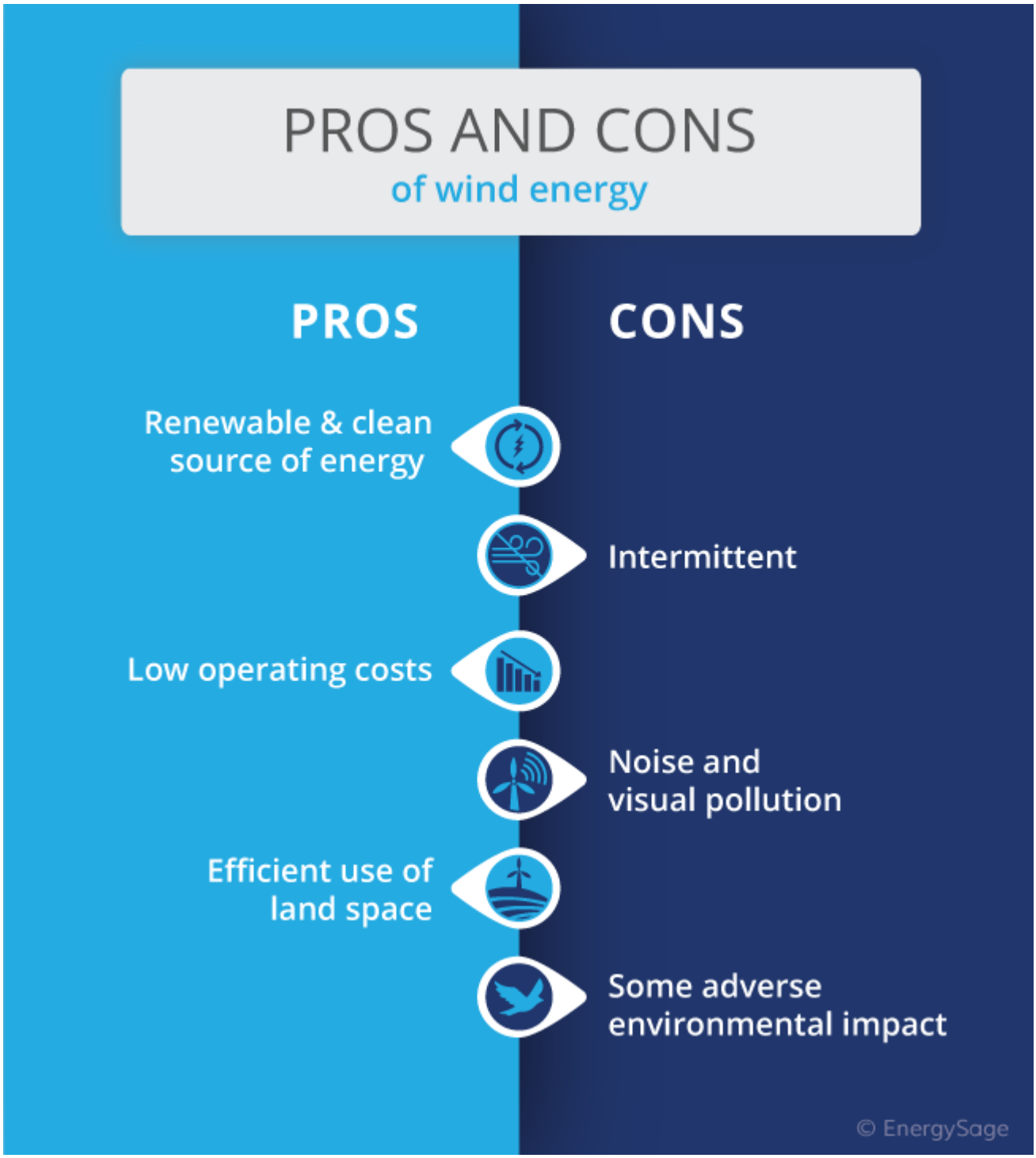
Top pros and cons of wind energy:

Wind energy is one of the most commonly used types of renewable energy in the U.S. today, and also happens to be one of our fastest-growing sources of electricity. However, while there are a number of environmental benefits to using wind energy, there are some downsides. Here are a few of the top pros and cons:

Pros and cons of wind energy

Pros of wind energy	Cons of wind energy
Renewable & clean source of energy	Intermittent
Low operating costs	Noise and visual pollution
Efficient use of land space	Some adverse environmental impact

On the pros side, wind is a clean, renewable energy source, and is one of the most cost-effective sources for electricity. On the cons side, wind turbines can be noisy and unappealing aesthetically, and can sometimes adversely impact the physical environment around them. Similar to solar power, wind power is also intermittent, meaning that turbines are reliant on weather and therefore aren't capable of generating electricity 24/7.


PROS AND CONS
of wind energy
PROS
CONS
Renewable & clean source of energy
Intermittent
Low operating costs
Noise and visual pollution
Efficient use of land space
Some adverse environmental impact
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CONCLUSION

Finally, I want to say the advantages of wind energy are more than the disadvantages so my opinion that wind energy which has many benefits, such as it is less expensive than factories, less space, are easily available all over the world and non-polluting to the environment. So wind energy is also more useful than traditional methods to create energy. Meaning that it is getting cheaper and cheaper to produce wind energy.

REFERENCES

- https://www.irena.org
- https://en.m.wikipedia.org
- https://www.energy.gov
- https://www.coursera.org
- https://www.nationalgeographic.org
- https://www.ncbi.nlm.nih.gov
- https://www.ge.com
- https://www.energysage.com

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A BRIEF REVIEW ON THERMOELECTRIC PERFORMANCE OF HALF HEUSLER ALLOYS

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Abstract

In this article we briefly review on the thermoelectric (TE) performance of the Half–Heusler(HH) alloys. In the recent years HH alloy based TE materials have greatly attracted the research community and shown great improvement in waste heat recovery. They are widely used because of their high TE performance, environmental friendliness, highstability, moderate cost and good mechanical properties.It is well known that TE materials can be made up of either n-type or p-type. Here in we report about the performance of both the materials. Overall it has been noticed that thep-type HH alloys have shown poor thermoelectric performance. In addition, different physical parameters were reviewed.

Introduction

Thermoelectric (TE) materialsis the ability of directly converting heat into electricity and vice versa, which can harvest waste heat and have been gaining intensive attentions for its potential applications in energy conversion technologies. The performance of a thermoelectric material is determined by the dimensionless figure of merit (ZT), defined as $ZT = (S^2\sigma/\kappa)\ T$, where S, σ, κ, and T are Seebeck coefficient, electrical conductivity, thermal conductivity, and absolute temperature,respectively. To achieve high conversion efficiency, largeZT value is required, that means high Seebeck coefficient, high electrical conductivity, and lowthermal conductivity are favorable. Recent improvements to increase the TE efficiency is made by reducing the size and dimensionality of TE materials in nanoscale and nanostructured materials due to quantum confinement and nanostructure effect. Enhanced ZT valueshave already been achieved in materials

such as Bi2Te3 based materials which are used for applications near room temperature, lead chalcogenides and skutterudites for middle temperature power generation, and SiGe for high temperatures. Among these materials half-Heusler compounds stand out for its high thermal stability, good mechanical strength, low toxicity, etc.

Half-Heusler materials with the general formula *XYZ* (for example, TiNiSn, ZrCoSb, LiSiAl, etc.) constitute a widely investigated class of semiconductors and intermetallic compoundswhere X and Y are transition metals and Z is a main group element.A series of doped samples were synthesized and studiedby arc-melting the elements to first form ingots, then ball-milling the ingots to obtain finepowders, and finally hot-pressing the fine powder to form bulk samples.HH is used in solar cell applications, transparent conductor applications, piezoelectric applications, spintronic applications, and its topological band-structure properties due to there mid-to-high range from 500 °C to 800 °C temperature power generation applications. The big advantage in the optimisation of thermoelectric properties of HH compounds is the opportunity to dope each of the four sub-lattices individually.

TE performance of n-type HH alloys

For p-as well as n-type materials, peak ZT values in the range of ZT~1 or in case of n-type material even ZT > 1. HHs are complex compounds: MCoSb and MNiSn, where M can be Ti, Zr, Hf, or a combination of two or three of these elements. The compounds form in a cubic crystal structure with an *F4/3m* space group. These phases are semiconductors with an 18 valence electron count (VEC) per unit cell and a narrow energy gap, and the Fermi level is slightly above the top of the valence band. Different approaches have also been adopted to improve the thermoelectric performance of the MNiSn based n-type half-Heuslers. carrier concentrations can be optimized by doping with the adjacent elements such as Sb forSn, Ta for M, and so on . Ternary alloying of M by Hf, Zr, and Ti can reduce the lattice thermal conductivity by introducing point defects scatteringNb has one more valence electron than Hf/Zr so it can increase the carrier concentration for this n-type half-Heusler compound. In fact, Hiroaki Muta*et al.* did Nb doping in ZrNiSn and TiNiSn before and the maximum ZT value of 0.6 was obtainedfor Zr0.98Nb0.02NiSn at 800 K . Most recently, Julia Krez*et al.* reported Nb doping in thephase separated n-type Ti0.3Zr0.35Hf0.35NiSn compound and peak ZT value around 0.7 at 900 K. It is interesting to note that some full-Heusler nanoinclusions are found within the half-Heusler matrix by SEM and TEM analysis, which could also play a positive role in the improvement of the thermoelectric properties.

TE performance of p-type HH alloys

HH Alloys of P-type materials, NbFeSb is a promising TE material which exhibits a high power factor of up to 10 mW m^{-1} K^{-2} at room temperature and *ZT* of 1 at 1000 K by experimental and theoretical studies . The thermoelectric figure of merit (ZT) is given by the equation ZT=S2σT/κ and several theoretical and experimental studies which aim to optimise the thermal conductivity (κ) as well as the Seebeck coefficient (S) and electrical conductivity (σ) ,have been conducted in the past couple of years have a larger potential for band-engineering to improve the thermoelectric properties, as degenerate band extremer allow for an increase in the density of states effective mass. The main research focus was on developing p-type materials based on XIVCoSb. This involved developing strategies for alloying and carrier doping and resulted in zT 1and zT 0.7 at 773 K for the n-types and p-types respectively. Recent advances include the rise of p-type compositions XVFeSb (XV = V, Nb and Ta) and ZrCoBi, each with zT 4-1 at 773 K. It also includes the widespread use of single parabolic band (SPB) and Callaway modelling, coupled to first principles calculations, which have placed understanding of the HH alloy. However, the typical p-type HH compounds, (Zr,Hf)CoSb, have the reproducible highest zT of only ~0.5. Therefore, developing high performance p-type HH compounds is imperative to achieve high efficiency high temperature TE devices based on HH compound.

Discussion *n-type HH alloys*

Half-Heusler ingot was synthesized by arc-melting instoichiometry. To ensure the homogeneity, the ingot was arc-melted under Ar protection at least three times and flipped over every time. Then the alloyed ingot was directly put into a stainless steel jar with grinding balls and ball-milled for 5-9 hours(SPEX 8000M Mixer/Mill).to make them nanopowders. Finally the nanopowders were hot pressed in a graphite die to form bulk samples. The disks of 12.7 mm in diameter and around 2mm in thickness were obtained for measurements. On the other hand, another ingot sample was made by annealing the arc-meltedingot at 700 °C for 60 hours for comparison with the ball-milled nanostructured samples. The volumetric densities of the samples were measured by Archimede's method. The thermal diffusivities of the disks were measured on a laser flash equipment (LFA457, Netzsch). Samples were also cut into about 2 x 2 x 12 mm bars for electrical conductivity and Seebeck coefficientmeasurements on a commercial equipment (ZEM3, Ulvac).

Hall measurements were performed on a Physical Property Measurement System (Quantum design) to get the carrier concentrations of these samples at room temperature.

The Hall mobility μH is calculated by the equation μH = σ / (nHe), where σ, nH, and $e$are electrical conductivity, Hall carrier concentration, and elementary charge, respectively. The samples were also characterized by XRD (X'pertPROPANalyticaldiffractometer with a Cu Ka radiation source), SEM (LEO

1525), and TEM (JEOL 2100F) to study their crystallinity and grain size. The measurement errors were estimated to be 3% for electrical conductivity, 5% for Seebeck coefficient, 3% for thermal diffusivity, and 3% for specific heat capacity, which results in an uncertainty of 11% for ZT. For better readability, all the figures are plotted without error bars.[For example:VCoSb was synthesized by arc-melting method using vanadium pieces (99.7%, Alfa Aesar), cobalt pieces (99.9+%, Alfa Aesar), and antimony rod (99.8%, Alfa Aesar)]

Discussion of p-*type HH alloys:*

We start following the procedure of using BoltzTraP to obtain the electronic properties of the material and then solve the phonon BTE using ShengBTE. The higher atomic mass of (compared to Nb) increases the scattering strength is doped , which reduces the lattice thermal conductivity of the compound. At the same time, p-type charge carries exhibit higher mobility and relaxation time, which increases the power factor. Here we calculate κlatt by solving the Boltzmann transport equation andsubsequently including the contributions of grain boundaries, point defects and electron–phonon interaction. A detailed study of the carrier concentration and temperature dependance of the Seebeck coefficient (S), Power factor, lattice and electronic thermal conductivity and hence the figure of merit (ZT) is carried out. The chemical stability, electronic structure, mechanical stability and TE properties for the compounds simulations are performed by using density functional theory (DFT) implemented within Vienna simulation package (VASP) with a projected augmented-wave basis.We used the Generalized Gradient Approximation (GGA) with Perdew-Burke-Ernzerhof (PBE) scheme for the electronic exchange-correlation functional. Tetrahedron method with Blochl corrections were used to calculate the Density of states (DOS). This uses Maximally Localised Wannier Function (MLWF) basis set by interpolating first principle plane wave results to determine the Seebeck coeffcient (S), electrical conductivity and the electronic part of the thermal conductivity using semi classical Boltzmann transport theory .To calculate the lattice contribution to the thermal conductivity we use Boltzmann transport theory for phonons as implemented.It is expected that Sn&Sb will lead to an increase in the electrical conductivity of the samples due to the increase in hole concentration (p) and/or mobility (μ). Such high grain boundary density is expected to increase phonon scattering leading to a large reduction in the lattice thermal conductivity of the compositions.). To check the purity of the synthesized materials, powder X-ray diffraction (PXRD) patterns were measured using a PANalytical X'pert Pro X-ray diffraction system equipped with a curved graphite crystal monochromator.

Conclusions

In conclusion, half-Heusler compounds with VEC of 19 are successfully synthesized by arc-melting, ball-milling and hot-pressing. Despite the high carrier concentration due to the VEC
of 19, the electrical conductivity is not very high since the mobility is low. By the nanostructuring approach, the thermal conductivity can be reduced and the power factor can be improved simultaneously compared to the ingot. Lower hot-pressingtemperature results in some porosity. A peak power factor of 25 μW cm-1 K-2 and ZT of about 0.5 are achieved at 700 °C for all the nanostructured samples. A cost-effective ball-milling and hot-pressing technique has been applied to n-type HHs to improve the *ZT* value. This enhancement in *ZT* mainly results from reduction in thermal conductivity dueto the increased phonon scattering at the grain boundariesof nanostructures, and optimization of carrier contributionleading to lower electronic thermal conductivity. Further *ZT* improvement would be possible if the grains were less than100 nm in size.In the p-types, there is more diversity and more opportunity for bandstructure engineering. Alloying has been widely explored to reduce thelattice thermal conductivity but can also lead to substantially different bandstructures. The electronic structures of the half-Heusler alloys are unique because of the very low effective masses of the p type carriers.The latter compound is probably at the edge of a transitionbetween the indirect and direct band gap, which probably could be tuned by application of strain.Most importantly, ScPtSb exhibits particularly good thermoelectric performance with the power factor reaching 4–6 mWK−2m−1 at high temperatures. For all the ScMSb phases studied, the thermoelectric characteristics can be tuned by intentional doping of charge carriers in arange from 1019 to 1021 cm−3.The results obtained in this work indicate that using the deformation potential approximation for the carrier relaxation time is necessary for adequate discussion of the ab initio calculated transport properties of half-Heusler alloys.

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References

- **Synthesis and thermoelectric properties of n-type half-Heusler compound VCoSb with valence electron count of 19**

HaoZhang,aYumeiWang,b,cLihongHuang,b,dShuoChen,bHeshabDahal,bDezhiWang,b and ZhifengRenb*

- **Creep-deformation behavior of (Mo0.85Nb0.15)Si2 lamellar-structured C40/C11b two-phase crystals**

Koji Hagiharaa*, HarukaArakia, TakaakiIkenishia, Takayoshi Nakanob

- **Thermoelectric properties of n-type half-Heusler compounds (Hf0.25Zr0.75)1-*x*Nb*x*NiSn**

HaoZhanga, YumeiWangb,c, KeshabDahalb, Jun Maob LihongHuangb,d, QinyongZhangd*, and ZhifengRenb*

- **Effect of Hf Concentration on Thermoelectric Properties of Nanostructured N-Type Half-Heusler Materials Hf x Zr 1–x NiSn 0.99 Sb 0.01**

ShuoChen , Kevin C. Lukas , Weishu Liu , Cyril P. Opeil , Gang Chen , and ZhifengRen **

- **Enhancement in Thermoelectric Figure-Of-Merit of an N-Type Half-Heusler Compound by the Nanocomposite Approach**

Giri Joshi, Xiao Yan, Hengzhi Wang, Weishu Liu, Gang Chen,* and ZhifengRen*

- **Mechanical properties of half-Heusler alloys**

G. Rogla, b, c, *, A. Grytsiva, b, c, M. Gürtha, b, c, A. Tavassolia, d, C. Ebnerd, A. Wünschekd, S. Puchegger d, V. Soprunyukd, W. Schranzd, E. Bauer b, c, H. Müller b, M. Zehetbauerd, P. Rogla, c

- **Huge power factor in p-type half-Heusler alloys NbFeSb and TaFeSb**

G A Naydenov, P J Hasnip ,V K Lazarov and M I J Probert

- **Bismuth based Half Heusler Alloys with giant thermoelectric figure of merit**

Vikram, Jiban Kangsabanik, Enamullah and Aftab Alam

- **Thermoelectric performance of nanostructured p-type Zr0.5Hf0.5Co0.4 Rh0.6Sb1−xSnx half-Heusler alloys**

Pramathesh Maji , Julien P.A. Makongo , Xiaoyuan Zhou , Hang Chi , Ctirad Uher , Pierre F.P. Poudeu

- **Thermoelectric performance of p-type half-Heusler alloys ScMSb (M = Ni, Pd, Pt) by calculations**

Maciej J. Winiarskia, Kaja Bili´nskab, Kamil Ciesielskia, Dariusz Kaczorowskia

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A Review on Detection of Adulterants in Edible Oil Using FTIR-ATR Spectroscopy

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Abstract

Food adulteration is one of the primary concern in these days. It not only reduces the value of nutrients in a particular food but also cause severe side-effects on the human health. Edible oil is used in most of the food items directly or indirectly to add calories, essential fats and vitamins to the food. Throughout the world different edible oils are being used in different regions, to mention a few, sunflower oil, coconut oil, corn oil, olive oil, groundnut oil etc. In this article we briefly review on the different adulterants being used in these oils. In particular, we report on their spectroscopic signatures by using FTIR-ATR spectroscopy.

Introduction

A food Something which provides nutrients. Nutrients are substance which provides energy for activity and to do all the functions of body. Nutrients are required to our body in a a specific amount compounds such as free fatty acid. One of the essential ingredients that we used in our day-to-day life is oil. Edible oils consist of about 96% triglycerides composed of different fatty acids. Some other compounds or groups of compounds such as free fatty acid, phospholipids, and other antioxidants also be found. Adulteration of vegetable oil is define as addition of cheaper inferior harmful substances to oil. The variety of edible oils are Sunflower oil, coconut oil, olive oil, groundnut and corn oil etc. But it has been liable to adulteration by adulterants like thermally deteriorated oil, animal fats, argemone oil, paraffin etc. Society demands for quality and safety of oils and food products which surely appropriate analytical tools for quick and accurate analysis of them. Many methods are there for checking the oil quality. Analytical techniques used for the detection of oil quality are viscosity index, chromatographic techniques, atomic emission spectroscopy, fourier transform infrared spectroscopy etc. In this review we concentrate on Fourier transform infrared spectroscopy (FTIR),

which is common and available apparatus in quality control laboratory which is inexpensive non-destructive and environment protecting technique. FTIR- transform infrared Spectroscopy is technique used to obtain and infrared spectrum of absorption or emission of a solid, liquid or gas. It collects high resolution spectral data over a wide spectral range which measures intensity over a narrow range of a wavelength at a time. Fingerprints of authentic commodities may be considered to represent their overall chemical composition and therefore have the potential to detect the adulteration. This method to be with chemometric tools. Chemometric treatments on FTIR-ATR oil samples. This is fastest technique for analysis of samples without usage of any reagents.[3]

FTIR-ATR spectroscopy and chemometric for authentication of fats and oils

Sample preparation:

FTIR is one of the vibrational spectroscopy, in which sample analysis will be based on interaction between functional groups by electromagnetic radiation. sample preparation is done by collecting a different edible oils. The thermal stability of the edible oils from 30℃-170℃. A set of pure samples of different edible oils were collected. In another set the pure oils are adulterated by adding another vegetable oils and by other adulterants. A pair of sodium chloride plates is taken and clean these 2 NaCl plates with chloroform and dry them with tissue.one drop of oil sample onto a NaCl plate by using a dropper and sandwich it using the other NaCl plate without an air bubbles. Then place NaCl plates into the sample holder. Then these different samples were studied and compared by spectral analysis of FTIR-ATR spectroscopy.

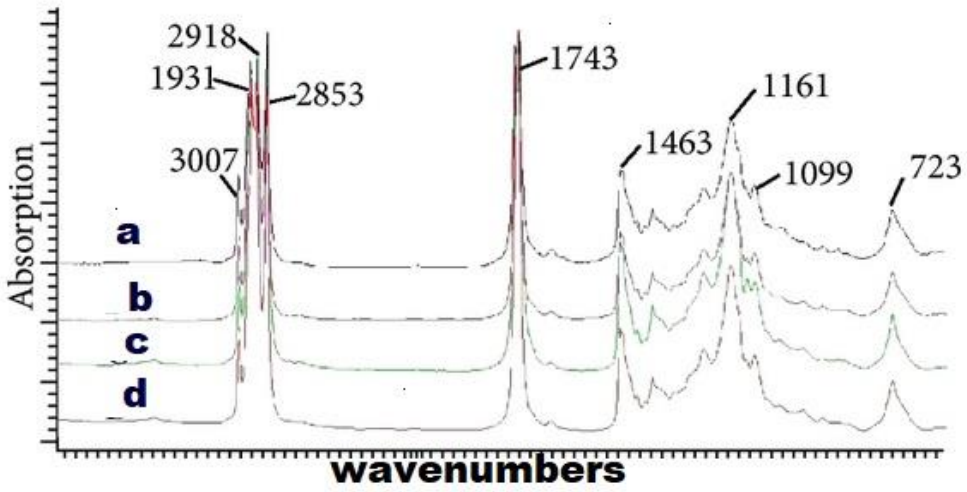
Method and Measurements:

FTIR-spectroscopy measures IR region ranging from 14000cm^{-1}-50cm^{-1} in electromagnetic radiation spectrum. The theory that it works is that the bond between different elements absorb light at different frequency. The sample which absorbs IR light radiation at different wave length is measured to detect the molecular and structural composition of the material. The main device that is present in the FTIR spectrometer is interferometer which identifies the samples by sending an optical signal which is having all IR frequencies. The interferometer that consists of a beam splitter, one movable mirror and another fixed mirror. The IR radiation that is sending through the source through the colimeter to the beam splitter. The half of the light is reflected and half of the light is transmitted by the beam splitter. The transmitted light and the reflected light strike the fixed mirror and the movable mirror respectively. The two lights reflected back by the mirrors and 2 beams of light recombine with each other at the beam splitter and which undergo constructive and destructive interference as the changes in the position of moving mirror to produce interference pattern. The light beam is passed through the sample, some radiation is absorbed by the sample and some passes through it. The resulting signal at the detector is a spectrum representing a molecular finger

print of the sample. FTIR combined with ATR and chemometric software. ATR is the attenuated total reflection which works on the property of total internal reflection. To collect the infrared spectrum in ATR mode the sample is placed on the surface of the crystal which is having greater refractive index. By using the property of TIR it gives an evanescent wave.

The detection of the adulterants in the virgin walnut oil (VWO). The spectrum obtained from FTIR using HATR crystal with DGTS detector. The measurements of oils sample is done by putting the sample directly on crystal surface at controlled room temperature. By the resolution of the $4cm^{-1}$, 40 scans are collected in the IR region of $4000\text{-}650cm^{-1}$. The sample spectra is displayed as the average spectra but it is collected in the triplicate. After every sample scanning the crystal was cleaned with hexane twice and acetone and then dry with a clean tissue for the data of each spectrum.

Results and discussion:



IR spectra of soybean oil (SO), pure tea seed oil (PO), sunflower oil (SFO), and virgin walnut oil (VWO) at IR region of 4000–650 cm^{-1}. (A) VWO, (B) SO, (C) PO, and (D) SFO.

It is very difficult to detect adulterants in oils and fats physically. Because, some of the oils and fats may have similar chemical composition. So, IR spectroscopy is very important in identification of the molecular structure and absorption bands of the particular functional groups. Most of the peaks and shoulders of the spectrum are characteristic of the specific functional groups of different oils and fats. FTIR spectroscopy allows one to differentiate authentic oils which is adulterated with others because of fingerprint technique. We can also observe adulteration by studying the spectral changes. The figure exhibits IR spectra of SO, PO, VWO and SFO at the region of $4000\text{-}650cm^{-1}$. The spectrum of VWO, SO, PO and SFO, there is some difference to VWO with respect to the spectra of SO, PO and SFO at the frequency of $3007cm^{-1}$. $2854cm^{-1}$ due to symmetrical and assymmetrical strectching vibration of $-CH_2-$. $1463cm^{-1}$ because of $-CH_2$ bending

and 1098cm^{-1} of C−O and 722cm^{-1} of cis −CH=CH− bending vibrations. The frequency regions are observed. The spectral variation is seen in the above frequency regions between VWO and SO, PO and SFO (Edible oils). Hence it is shows that the VWO was adulterated by vegetable oils (SO, PO and SFO).[7]

Conclusions:

The adulteration of oils and fats is the most serious issue in the society. So many techniques are there to detect the adulteration in the oils and fats. The most useful technique is FTIR-ATR spectroscopy. FTIR-ATR combine with chemometrics give a specific analysis of the edible oils. It is very simple and sensitive analytical tool and quick data accession tool. FTIR is much suitable analytical tool for the authentication of oils and fats because of its simplicity and their user friendly, no usage of reagents and inexpensive analytical processes. FTIR spectroscopy of wave analysis is a wonderful technique for the authentication of oils and fats. Due to the fingerprint analysis nature of FTIR-ATR it is emerging as a powerful technique in the authentication analysis of oils and fats as mentioned in this review. Nowadays it is the most standardized method used in the quality control laboratories.

References:

1. .Joana ,v., Luis,C., Jose ,M,M., & martins ,D,A(2015) “investigation of adulteration of oil with TDO using fourier transform mid infrared spectroscopy and chemometrics”. doi.org/10.1080/123311932,2015.1020254.

2. A,Rohman., B ,Ghazali., A, Windarish., Irnawati., (2020) , Review comprehensive , “Review on application of FTIR spectroscopy coupled with chemometrics for authentication analysis of fats and oils in the food products”.[MDPI]

3. M ,Mahboubifar., B ,Hemmateenejad., Javidnia., seminar(2015). “Prediction of the acidity number of edible oil during long heating procedure using chemometrics tools based on the FTIR-ATR results.

4. A,Rohman., Y,B,Cheman., research article, “quantification and classification of corn and sunflower oils as adultrents in olive oil using chemometrics and FTIR spectra” . dio:10.1100/2012/250795.

5. Matthew Temiotope Bamidele., (2019), "Analysis of edible oil using fourier transform infrared spectroscopy and chemometrics".

6. S,A,Antora., M,N,Hossain., M,M,Rahman., M,A,Alim., and M,Kammruzzaman.(2019) ,Research article. "Detection of adulteration in edible oil using FTIR and machine learning". Doi:10.9734/IJBCRR/2019/V261130085.

7. P.liang., H Wang., C Chen., F Ge., D Liu., S Li., B Han., X Xiong., and S Zhao (2012), "The use of fourier transform infrared spectroscopy for quantification of adulteration in virgin walnut oil". https://doi.org/10.1155/305604

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REVIEW OF WIRELESS CHARGING TECHNOLOGY

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Abstract

Wireless charging Technology has been the centre of discussion ever since smartphones have come into human life. How can we make smartphone charging wireless? This is a pretty old question has most companies like Apple, Samsung, etc.., have already developed the wireless charging in case of smartphone and have extended it to other products. This technology has been in works to adopt to Electric vehicles, has this enable us to more safe, contactless, and reliable mode of charging. Already EVs have been using wired charging, which is a very efficient way but has few disadvantages over wireless charging. In this paper, we would like to discuss the possible mechanics that can be adopted in developing Wireless charging technology in electric vehicles such as cars, motorcycles, buses etc. Further, we will discuss about the challenges in implementing wireless charging technology.

Introduction

Wireless charging has been around ever since Nicola tesla demonstrated magnetic resonant coupling, which is the ability to transmit electricity through the air by creating a magnetic field between two coils. Of the two coils one coil acts as a transmitter and device containing second coil in the form Receiver. Wireless charging is majorly of three types' namely inductive coupling, Magnetic resonance coupling, and RF Radiation.

Inductive coupling: When a primary coil of an energy transmitter generates predominantly varying magnetic field across the secondary coil of the energy receiver within the field. This induces current/voltage across the secondary coil, which can stored in a storage system. This type of Wireless charging technology works upto 30cm as published by MIT scientists thorough the invention of a novel wireless charging technology, called MagMIMO.

Magnetic Resonance Coupling: When two coils are placed over a same plane such that they are tuned to resonate at same frequency. This resonance occurs between the coils due to oscillating magnetic fields. This type of wireless charging technology works around few centimetres to few meters.

RF Radiation: RF radiation utilizes diffused RF/microwave as a medium to carry radiant energy. RF/microwave propagates over space at the speed of light, normally in line-of-sight. The typical frequency of RF/microwave ranges from 300MHz to 300GHz. This works within several tens of meters up to several kilometers.

Of all the different forms of wireless charging Inductive coupling is more suitable for static wireless charging technology whereas RF Radiation is more suitable for dynamical wireless charging technology. Wireless charging can be divided into two different types based on requirements of specific vehicles has storage vary form one vehicle to another and so is its power requirements.

Static wireless charging: In this method we should make use of Inductive coupling has this method is easy to implement and efficiency is very high. This system must be designed such that no humans are needed to step out in order to start the charging. As soon as the EVs is stops over the coil the wireless charging will automatically start. We further develop such system to every parking lot to start charging EVs whenever they come a stop, hence we can no longer vary about battery storage capacity.

The major disadvantage of such Inductive coupling is the loss of energy in the form of heat, Need of proper alignment of charger with the charging devices which in poor case connectivity can cause large energy loss.

Dynamical Wireless charging: Dynamical Wireless charging is a step extending the static charging has this can provide continues supply of electric juice required for transportation. The setup for this more or less similar to that of static, here we will need to implant primary coil on the outer boundaries of the roads such that higher efficiency can be achieved. The secondary coil which will be built into the Electric vehicle will help us to transfer current/voltage to a storage of the electric. If we can implement such systems across an area, any electric vehicle can move around the area without any battery due the continuous supply of current/voltage. In order to implement this take a very time to study about all the factors like weather, material, cost, etc.., this technology can be future dystopia where we move away from using patrol, diesel, and other non-renewable sources.

Challenge and possible Solutions

Wireless charging technology has greater Advantages but come in with great deal of disadvantages concerning with its Efficiency, overcharging, Construction, cost of building and maintaining it.

Cost: This technology cost a large amount for the government (or specified company) to take into action. But, this is the future as Fossil fuels are degrading every day. As well the cost of petrol as reached a record high (India 1 litre cost>100). The cost for full charge of an Electric vehicle is around 2500Rs which can lost for about 150km on single charge.

Implementation: A filled Fuel/Gas based vehicle travels larger distance when compared that of an EV. So, in order to overcome this we need to plant more charging setups. As this will enable larger travel distance. Also we increase the capacity of batteries in EV's. These Facilities should be placed at a parking lot of shopping complex, hotels, cinemas, apartments and other public places. So, we can charge anytime and not wary about how much charge is remaining.

Overcharging: When EV is left to charge for more then its required time to complete its charging, it can lead to damage of battery capacity. In order for this not to occur we can implant an sensors so that they can deactivate the coil in the EV and hence Stop the charging process.

Maintenance: The Implementation of this Wireless charging technology is cost big bucks, so does maintaining it. The equipment can be damaged, climates might reduce the efficiency. Proper periodic checks must be done to maintain the facility. Efficiency: we get up to about 96% efficiency in case of Wired charging. In case of Wireless Charging technology its about 92% efficient as some power is lost due to conversion of AC to DC or DC to AC during battery usage and charging respectively. This not a major issue as not much power is lost.

Conclusion

Wireless charging is the frontier of human endeavour. The use of wireless Charging Technology must be adopted across the globe as this help in reduce the greenhouse gases and thus also aids in lowering global warming. Countries like South Korea, Netherlands, U.K, and Italy have been testing electric buses. As of now static Electric charging stations are being tested in some countries, many scientist are working on dynamical Wireless charging mechanics. All the nations should come together for such project as this is more eco-friendly then other sources.

Acknowledgement

The authors would like to thank Dr. Indudhar P. Vali and Dr. Shivananda C S for meaningful discussion and their support.

References

[1] J. Jadidian and D. Katabi, "Magnetic MIMO: How to Charge Your Phone in Your Pocket," in Proc. of the annual international conference on Mobile computing and networking (MobiCom '14), Maui, Hawaii, Sept. 2014

[2] X. Lu, P. Wang, D. Niyato, and E. Hossain, "Dynamic Spectrum Access in Cognitive Radio Networks with RF Energy Harvesting," IEEE Wireless Communications, vol. 21, no. 3, pp. 102-110, June 2014.

[3] X. Lu, P. Wang, D. Niyato, and Z. Han, "Resource Allocation in Wireless Networks with RF Energy Harvesting and Transfer," to appear in IEEE Network.

[4] https://www.powerelectronicsnews.com/wireless-charging-technology-for-evs/

[5] https://www.researchgate.net/publication/345714497_Wireless_Power_Transfer_System_for_Charging_of_Electric_vehicles

[6] https://www.powerelectronics.com/markets/automotive/article/21864097/wireless-charging-of-electric-vehicles

[7] https://www.researchgate.net/publication/316472465_Challenges_and_Potential_Solutions_for_the_Deployment_of_Wireless_Charging_Infrastructure_for_xEVs_in_India

[8] Elena Paul, Nimmy Paulson, Rijo Bijoy, Benny K.K, "WIRELESS CHARGING OF ELECTRIC VEHICLES", International Research Journal of Engineering Technology, Vol.6, Issue 6, June 2019.

[9] Asst Prof.Swapna Manurkar, Harshada Satre, Bhagyashree Kolekar, Pradnya Patil, Samidha Bailmare, "WIRELESS CHARGING OF ELECTRIC VEHICLE" International Research Journal of Engineering and Technology, Vol. 7, Issue3, mar 2020

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Influence of Al^{3+} substitution on the Structural ,elastics , Mechanical properties and Morphology of Nanocrystalline Cd-Co Ferrites.

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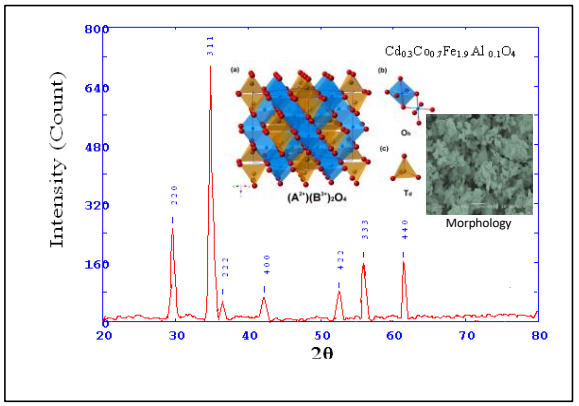
ABSTRACT. The influence of Al^{3+}doped in $Cd_{0.3}Co_{0.7}Fe_2O_4$ nanoparticles were synthesized through one of best simple attractive standard ceramics method and characterized by XRD ,SEM and IR techniques.X-ray analysis confirms the formation of single phaase cubic spinel structure.In the main focus of present experimental study with Al^{3+} doped various concentration effect on the $Cd_{0.3}Co_{0.7}Fe_2O_4$ nanostructure. Lattice constant and crystallite size D of the sample decrease with decrease in Al^{3+}content.Bond length (A-O and B-O),ionic radii (r_A & r_B),micro strain ,X-ray density, dislocation density ,after to detail study of the tetrahedral and octahedral site, respectively. The mean importance of the various Al^{3+} dopant with change steps range of magnetic properties of material



Keywords: Al3+(trivalent aluminium)doped on Cd-Co ferrites , XDR spectrum, Macrostrain, Grain Size, Morphology, Dislocation density, Mechanical properties etc

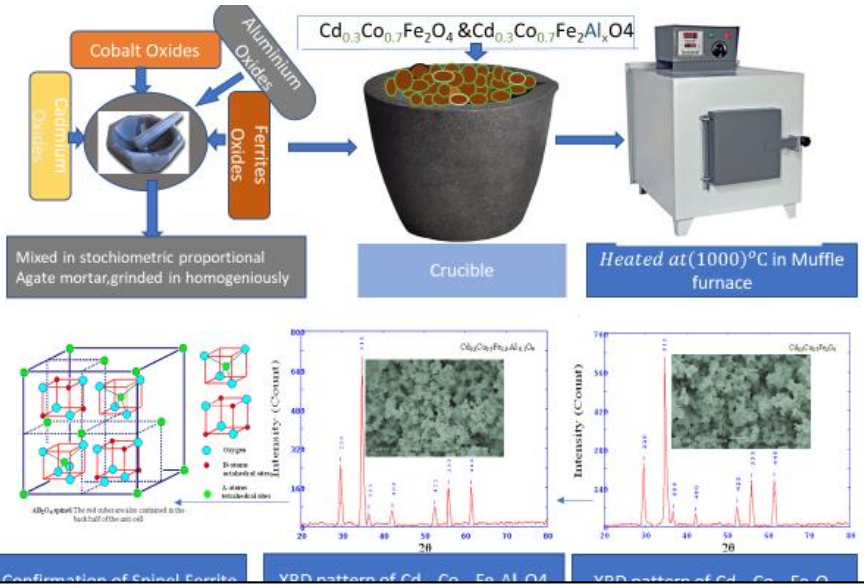
1.INTRODUCTION.

Recently, one of the synthesis at nanoscale region particles is known as nanoparticles(NPs) have been under the mean focus on nanostructure material of many researcher ,due to attractive and enhancement of their nanostructure of structural properties when as compared with the bulk materials [1,2]. When an external magnetic field is applying these nanoparticles (NPs) can be easily shows magnetic properties of spinel ferrites nanoparticles[3,]. The preparation method of the NPs of their colloidal stability and targeting of the nanostructure can be improved with higher the sensitivity of the NPs which depend on the morphology and also surface area to volume ratio[4].These application and properties depend on the size shep,dopant,microstructure and composition et c [5,6].Spinel ferrites have been own proved to be potential material of their synthesis technology of the (NPs) and finding many application ,such as microwave industries, electrical device ,magnetic recording, chemical sensors, catalyst for water splitting, and also a.c and d.c device mean part take up the role as transducers, actuators ,sensor and transformer core owning to their low eddy current loss and efficiency in the radio frequency range [7]. In this present work is

communication, we report the aimed at the preparation of Al^{3+} (trivalent Aluminium) substituted Cd-Co ferrite and to study the effect structure properties, mechanical properties when Al^{3+} doped concentration varies from 0.1 to 0.5 (very small X=0.1,0.2,0.3,0.4and 0.5) on the Cd-Co ferrites structures[8].These structure of the crystallite were confirmed using XRD analysis and SEM facility was utilized to study the morphological of the prepared undoped and doped (trivalent Aluminium) enhancement properties of nanocrystalline material and also observed enhancement of the dielectric properties may be attributed to structure distortion caused by Al^{3+}(trivalent aluminium) substitution in samples and these samples for various favourable application[9].

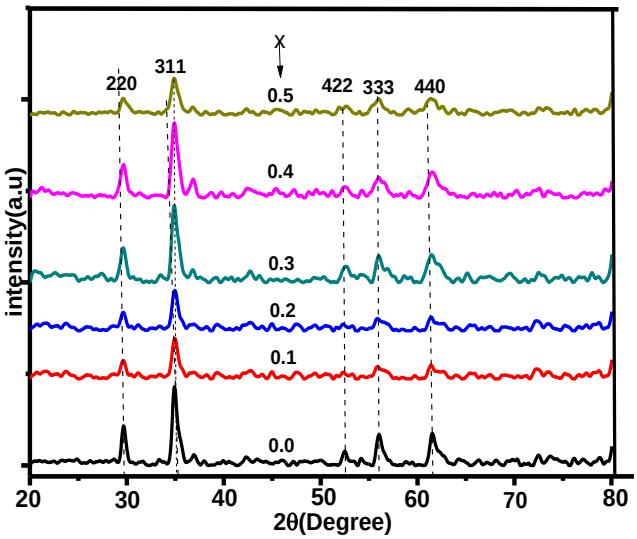
EXPERIMENTAL SECTION:

All chemical used in the standard ceramics technique steps with were purchased from Sigma-Aldrich and the material were analytical grade (AB) with 99% of purity.Such as the material were Cadmium Oxides (CdO),Cobalt Oxides(CoO),Ferrites oxides (Fe_2O_3),Alamium Oxides(Al_2O3),Acetone,Poly Vinyl Alcohol ,were used to synthesized of $Cd_{0.3}Co_{0.7}Fe_2O_4$ and $Cd_{0.3}Co_{0.7}Fe_2O_4$ and $Cd_{0.3}Co_{0.}7Fe_2Al_xO4$ (x is variation concentration from 0.1 to 0.5%) by the standard ceramics technique with muffle furnace as shown in fig,1.

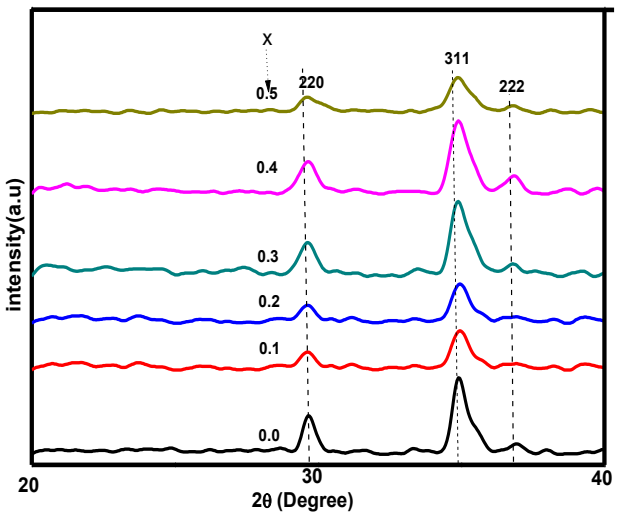


(Fig.2. Process of chart for preparation & characterization of $Cd_{0.3}Co_{0.7}Fe_2O_4$ and $Cd_{0.3}Co_{0.}7Fe_2Al_xO4$)

These materials taking as weighed in the required stoichiometric proportions, mixed and grinded in agate mortar with acetone. The mixture of powder was pre-sintered powder at 600°C for 12h after cooled down at room temperature.The pre-sintered powders were milled to have a fine powder and sintered at 1000°C for 24h after cooled down slowly at room temperature. The sintered powder was milled with acetone and 12% poly vinyl alcohol and pressed of about 5 ton/cm^2using hydraulic press machine The pellets were sintered 1000°C for 3h.The heated and cooling of the sample were carried out at 80°C/h.After next preceding was sample prepared at various concentration of Al^{3+}doping in the $Cd_{0.3}Co_{0.7}Fe_2O_4$ as followed the standard ceramics technique as above fig,1.



(Figure a)



(Figure b)

Figure 2.(a) To investigate of XRD patterns of without & with Al^{3+} dpoing on the $Cd_{0.3}Co_{0.7}Fe_2O_4$ of NPs calcined at 600^0c and 1000^0c synthesized by the standard ceramics technique with muffle furnace as shown in fig,1.(b) Observation from XRD patterns of the shift in intense peak (220),(311)and (222) with an increase in Al^{3+} doping concentration.

Results and Discussion

XRD Analysis:

X-ray diffraction spectroscopy was used to investigate crystallization, phase orientation microstructural properties of $Cd_{0.3}Co_{0.7}Fe_2O_4$ with $Cd_{0.3}Co_{0.}7Fe_2Al_xO4$, (x=0.1,0.2,0.3,0.4,0.5) is the added stepwise. Figure 1,(a), b),(c) was depicts the XRD pattern of polycrystalline well aligned by the $Cd_{0.3}Co_{0.7}Fe_2O_4$ with $Cd_{0.3}Co_{0.}7Fe_2Al_xO4$s synthesised by the standard ceramics technique steps .The diffraction peak appearing at 2Θ ~30.13°, 35.5° ,37.13° ,43.14° ,53.52° ,57.06°,62.66° corresponds to the convention diffraction of (220),(311),(221),(400),(422),(511),(440) planes in the patterns confirms the formation of single phase cubic spinel structure.The growth of $Cd_{0.3}Co_{0.7}Fe_2O$ and $Cd_{0.3}Co_{0.}7Fe_2Al_xO4$,(with Al_x at x=0.1 to0 0.5 %) to added that occurs at 2Θ ~ 35.5 corresponds to the (311) diffraction planes, suggesting the formation of well-textured single phase cubic spinel structure. Compared to $Cd_{0.3}Co_{0.7}Fe_2O_4$, diffraction peak indexed a 2Θ ~ 35.5 and 30.13° corresponds and match with the characteristic single phase cubic spinel ferrites structure of metallic Al^{3+} doped as well as the peak intensity of bare $Cd_{0.3}Co_{0.7}Fe_2O_4$,[10].The prominent peak intensity due to concentration at x=0.1and after are not prominent peak intensity at concentration X=0.2,0.3 ,0.4 and 0.5 and result in a shifted toward higher angle 2Θ with an increase in Al^{3+} doped concentration in $Cd_{0.3}Co_{0.7}Fe_2O_4$. [11] The peak position was found to be shift towards higher diffraction angle due to the decrease ionic radius compared to bare undoped Al^{3+} spinel ferrite structure [12]. To determine the average crystallite size was decrease with an increase Al^{3+} dopant (**Figure: b)** and these broadening of the XRD peak says the nano-crystalline size decrease behaviour ferrite of the all samples was calculated of most prominent peak (311) and (220) planes of XRD by using Debye-Scherrer's relation [13].

$$D_c = \frac{k\lambda}{\beta cos\theta} \quad (2)$$

Where k, is the error limitations of crystallite shape constant is taken as (k=0.9), λ is the wavelength of the X-rays light source (CuKα) is take as (λ =1.5406Å),β -is the peak full width at half maximum intensity ,degrees; θ is the Bragg's diffraction angle for given peak. Further, the lattice constant " a " of the cubic spinel has been calculated from the relation [14]

$$a=d_{hkl}\sqrt{h^2+k^2+l^2} \quad (3)$$

where 'd' is the inter-planar distance between two planes and (h ,k ,l) are the Millar indices was obtained by the Bragg's relation; $2d\sin\theta = n\lambda$, where θ is the diffraction angle and λ is the X-ray wavelength. It's clearly investigated of an increase Al^{3+} -dopant, the lattice parameter also variation in the range from 8.4832 (Å) to 8.3902 (Å) [15]. This is because the Al^{3+} content is contributed to replacement of larger ionic radii (0.5166 (Å) by smaller ionic radii of Al^{3+} (0.4965(Å)) ions which mean lead to the compression of unit cell up to 610.4907(Å) to 590.6319(Å) in [Table:1] [16]

$$V=a^3 \quad (4)$$

Similar observation of lattice constant and Al^{3+} doped concentration is also reported by [17].In figure 1 (d), show that the theoretical X-ray density(ρ_x) was calculated of the ferrite phase X by using the formula as given

$$\rho_x = \frac{ZM}{Na^3} \quad (5)$$

Where Z -is the number of molecules per unit cell (Z=8), M is the molecules weight ,N is the Avogadro's number is constant value (N=6.0223X 10^{23} particles/mole),a is the lattice constant. The x-ray density (ρ_x) decrease in the range with the increase Al^{3+} dopant [18].This is because of the decrease in molecular weight overtakes the decrease in volume of the unit cell ,respectively as clearly investigation in (Figure:2 C)[19].

Table 1. Value of interplanar distance d(Å),latticeparameter$a$(Å),Unit cell Volume(Å), Particles Size D(nm) ,Grain size (nm) X-ray density,Microstrain and Dislocation density D_ρ for $Cd_{0.3}Co_{0.7}Fe_2O_4$ and $Cd_{0.3}Co_{0.7}Fe_2Al_xO_4$ (**x**=0.0,0.1,0.2,0.3,0.4,0.5) of the systems

Composition **(X)** Samples	***d* (Å)**	***a*(Å)**	*Unit Cell Volume (Å)*	*Particles Size, **D**(nm)*	*Grain size (nm)*	*x-ray density*	∈	D_ρ m^{-2}
X=0.0	2.139	8.4832	610.490	28.17	24.70	5.6558	0.00123	$1.260Ex10^{15}$
X=0.1	2.150	8.4402	601.254	18.38	13.55	5.2936	0.00188	$2.960EX10^{15}$
X=0.2	2.152	8.4292	598.429	15.89	12.27	5.2638	0.00218	$3.960EX10^{15}$
X=0.3	2.148	8.4152	595.927	14.32	11.94	5.1650	0.00232	$4.876EX10^{15}$
X=0.4	2.150	8.3990	592.492	14.25	11.08	5.1119	0.00243	$4.924EX10^{15}$
X=0.5	2.150	8.3902	590.631	13.91	09.79	5.0598	0.00249	$5.168EX10^{15}$

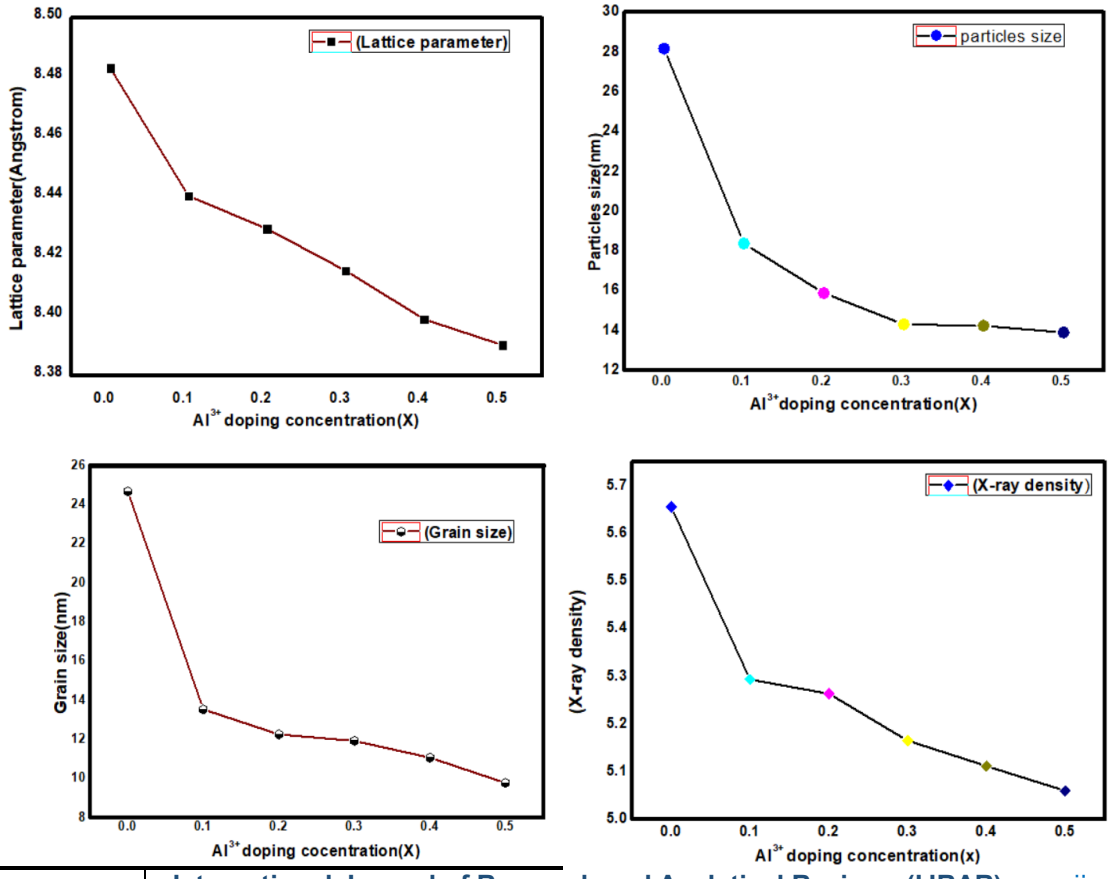


Figure:2 a) study of lattice parameter (Å), **B)**, Particles sized D(nm) ,**c)** Grain Size(nm), **D)** study of X-ray density of$Cd_{0.3}Co_{0.7}Fe_2O_4$and$Cd_{0.3}Co_{0.}7Fe_2Al_xO_4$variation of (x=0.0,0.1,0,0.2,0.3,0.4,0.5)of the systems.

Micro-strain is associated with the dislocation density ρ_D ,total number of dislocation per unit volume of material was determined from the relationships the result are situated as in table[20,21].

$$\text{micro-strain } \varepsilon = \frac{\beta cos\theta}{4} \quad (6)$$

$$\text{dislocation density } \rho_D = \frac{1}{D^2} \quad (7)$$

$$\rho_D = \frac{15\epsilon}{aD} \quad (8)$$

The unique relation between the value of lattice constant (a) and the magnetic hoping length available in the tetrahedral (A-site),octahedral (B-site)i.e."$L"_A$&"L_B" clearly calculated using the formula given below [22]

$$L_A = \left(\frac{\sqrt{3}}{4}\right) a \quad (9)$$

$$L_B = \left(\frac{\sqrt{2}}{4}\right) a \quad (10)$$

Where' a' is lattice constant . (**Figure .3 a),**investigation shows the value of magnetic hoping length."$L"_A$&"L_B of spinel cubic structure i.e.; these"$L"_A$&"L_B which is decrease with the increase of Al^{3+} dopant. This is the valuable relation of hoping length and the value of lattice constant [23].

Oxygen positional parameter (u) for each composite was calculated using the formulae available in the litetrature.Where u^3 given (u) assuming centre of symmetry $\left(\frac{1}{2},\frac{1}{2},\frac{1}{2}\right)$ for which$'u' = 0.250$(origin at B − site), while u^{43} give'u'ssuming centre of symmentry at $\left(\frac{3}{8},\frac{3}{8},\frac{3}{8}\right)$forwhich 'u'=0.375 (Origin at A-site) following relation of these two factors is given[24].

$$u^{43m} = u^{3m} + \frac{1}{8} \quad (11)$$

The investigated 'u' value using the tetrahedral A-site radii (r_A) ,octahedral B-site radii (r_B) were calculated using following relation.

$$r_A = \left(u - \frac{1}{4}\right) a\sqrt{3} - r(O^{2-}), \quad (12)$$

$$r_B = \left(\frac{5}{8} - u\right) a - r(O^{2-}), \quad (13)$$

Where $r(O^{2-})$ is the radii of the oxygen ion (1.32Å),u is indicated the oxygen position parameter. The relation of spinel structural parameter of lattice constant as well as the oxygen parameter of u each composite, interatomic distance (Bond length) was calculated has been following relation[25].

$$d_{BE} = a\ \left(2^{1/2}\right)(1 - 2u^{43m}) \quad (14)$$

$$d_{AE} = a\ \left(2^{1/2}\right)\left(2u - \frac{1}{2}\right) \quad (15)$$

Shared tetrahedral edge (d_{BE}) and Shared Octahedral edge (d_{AE})

$$d_{AL} = \left(\frac{5}{8} - u\right) a \quad (16)$$

$$d_{BL} = \left(u - \frac{1}{4}\right) a\sqrt{3} \quad (17)$$

The tetrahedral bond length(d_{AL}) and octahedral bond length (d_{BL})

$$d_{BEu} = a\left[4(u^{43m}) - 3u^{43m} + \frac{11}{16}\right] 1/2 \quad (18)$$

Composite (X) value	Hoping Length (Å)		Bond Length (Å)		Ionic radii (Å)		Shared edge (Å)		**Un**shared edge (Å)
	A-site	**B**-site	**A**-site	**B**-site	**A**-site	**B**-site	**A**-site	**B**-site	
X=0.0	3.6733	2.9992	1.8366	3.1812	0.5166	1.8612	2.9992	5.9985	3.6733
X=01	3.6547	2.9840	1.8273	3.1650	0.5073	1.8450	2.9840	5.9681	3.6547
X=0.2	3.6499	2.9801	1.8249	3.1609	0.5049	1.8409	2.9801	5.9603	3.6499
X=0.3	3.6438	2.9745	1.8219	3.1557	0.5019	1.8357	2.9752	5.9504	3.5269
X=0.4	3.6368	2.9694	1.8184	3.1496	0.4984	1.8296	2.9694	5.9389	3.6368
X=0.5	3. 633	2.9663	1.8165	3.1463	0.4965	1.8263	2.9663	5.9327	3.6330

Table 2.Value of the relation between particles size ,lattice parameter and other component like hoping length(Å), bond length(Å), ionic radii (Å) shared edge and Unshared edge (Å) for Cd0.3Co0.7Fe2O4 and Cd0.3Co0.7Fe2AlxO4 (x=0.0,0.1,0.2,0.3,0.4,0.5) of the systems.

(Figure .4©) shows the pure ferrite with the Al^{3+} dopant.it is observed the sequentially decrease in the spinel structural parameter of these, ion radii(r_A) at A-site , ion radii (r_B),and edge length(d_{BE}) at A-site and edge length (d_{AE}) at B-site and bond length(d_{AL}) at A-site, bond length (d_{BL}) [26].Further ,well best relation between the inter-ionic distance ,In spinel structure unique parameter was investigated by experimental value of lattice constant (a) and Oxygen parameters (u) .The inter-ionic distance between the tetrahedral (A-site),octahedral (B-site)i.e."d_{AX}","d_{BX}" in cation -anion distance ,composed with the anion-anion closest approach to the tetrahedral edge ,and shared ,unshared octahedral edge, d_{BE}","d_{BEU} has been calculated as shown in (table 2b) [27]. The diagramically ,chart, illustration of the bond length, hoping length, and inter -ionic distance in spinel ferrite structure as shown in (Figure.3c).This is because the inter-ionic distance are crucial to given report of the crystallographic structure was illustration and also have a direct supported on the evolution of magnetic properties [28].This cause the relation of Al^{3+} ion (dopant) must be smaller ion radius as compared to Fe^{3+} ion radii, as clear observed in the (Table .2b).Further, The bond distance between(Me-Me) is cation (b, c, d, e and f) ,(Me-O) is anion-anion ($p, q, r,$ and s) are investigated following relation[29].

Me-O	Me-Me
$(p) = a\left(\frac{5}{8} - u\right)$	$(b) = \left(\frac{a}{4}\right) 2^{1/2}$
$(q) = a\left(u - \frac{1}{4}\right) 3^{\frac{1}{2}}$	$(c) = \left(\frac{a}{8}\right) 11^{\frac{1}{2}}$
$(r) = a\left(u - \frac{1}{8}\right) 11^{1/2}$	$(d) = \left(\frac{a}{8}\right) 3^{1/2}$ n
$(s) = \left(\frac{u}{8} + \frac{1}{8}\right) 3^{1/2}$	$(e) = \left(\frac{3a}{8}\right) 3^{1/2}$
	$(f) = \left(\frac{a}{4}\right) 6^{1/2}$

(Table.3) its shows the clear relation of inter-ionic distance between the cation and cation-anion decrease with increase Al^{3+}trivalent impurity dopant, which are in mean contributed to the decrease in the unit cell volume [30].The overall view of spinel ferrite structural strength in the magnetic interaction (A-B,B-B and A-A) which is depend upon the bond length ,bond angle and between the inter-ionic distance. The strength is inversely proportional to the bond length but directly proportional to bond angle .This cause to the decrease in Me-O and Me-Me distance should result in the strengthening of inter-ionic bonding[31]. **Table 3**.Value of Internal-ionic distances of (Å) for $Cd_{0.3}Co_{0.7}Fe_2Al_XO_4$ and $Cd_{0.3}Co_{0.7}Fe_2Al_XO_4$ (X=0.0,0.1,0.2,0.3,0.4,0.5) of the systems.

Composition **(X)** Samples	**P**	**q**	**r**	**s**	**b**	**c**	**d**	**E**	**f**
$d_{0.3}Co_{0.7}Fe_2O_4$	2.1208	1.8266	3.4993	3.5833	2.9992	3.5169	3.6732	5.5098	5.1946
$Cd_{0.3}Co_{0.7}Fe_2Al_{0.1}O_4$	2.1100	1.8273	3.4911	3.6546	2.9840	3.4990	3.6546	5.4818	5.1683
$Cd_{0.3}Co_{0.7}Fe_2Al_{0.2}O4$	2.1075	1.8249	3.4945	3.6498	2.9801	3.4939	3.6498	5.4747	5.1616
$Cd_{0.3}Co_{0.7}Fe_2Al_{0.3}O4$	2.1038	1.8281	3.4887	3.6437	2.9766	3.4887	3.6437	5.4656	5.1530
$Cd_{0.3}Co_{0.7}Fe_2Al_{0.4}O4$	2.0997	1.8183	3.4820	3.6367	2.9694	3.4820	3.6367	5.4551	5.1431
$Cd_{0.3}Co_{0.7}Fe_2Al_{0.5}O4$	2.0975	1.8164	3.4783	3.6330	2.9663	3.4783	3.6329	5.4494	5.1377

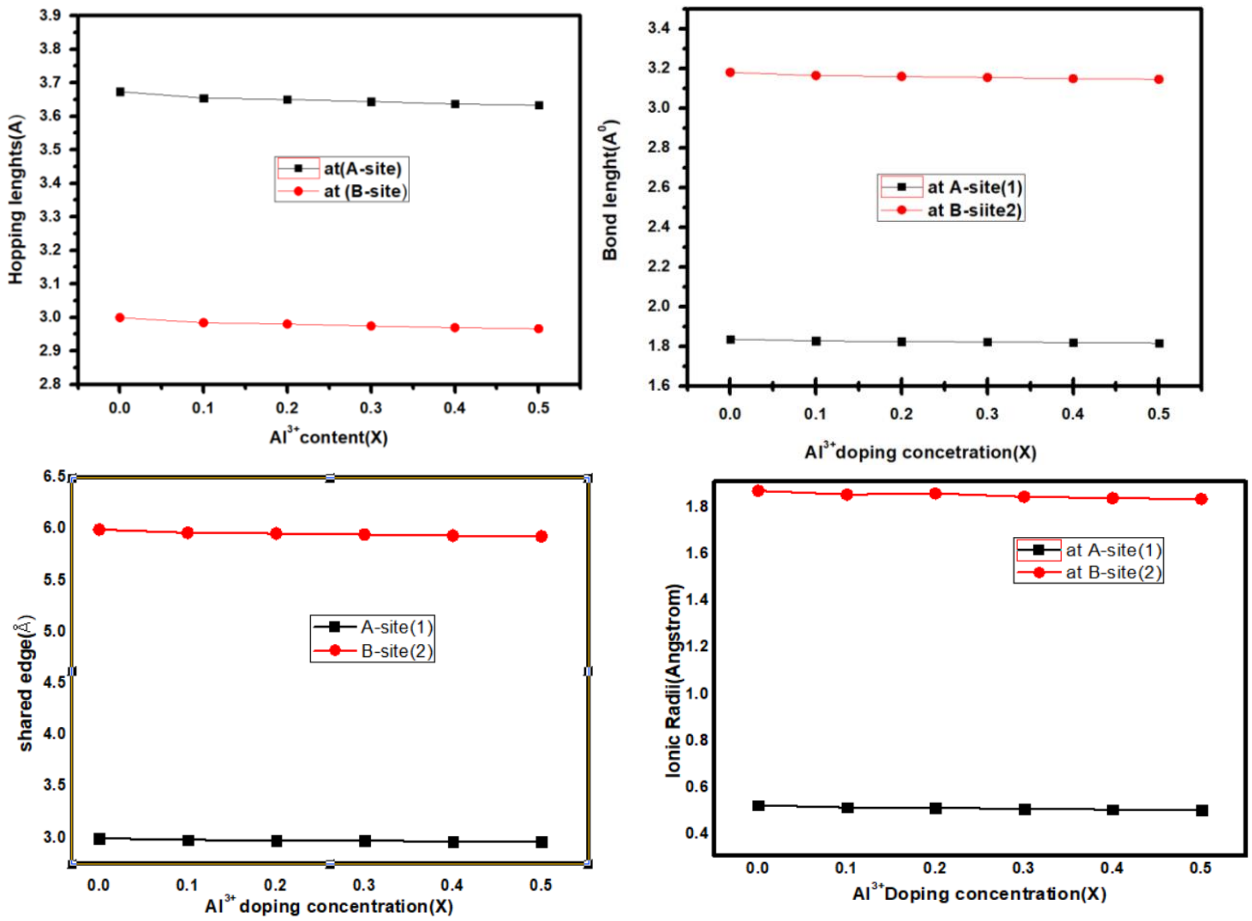


Figure 3: a) Hopping length ,**b)** Bond length, **d)** shared edge& **c)** Ionic radii of tetrahedral (A-site) and Octahedral (B-site) variation for $Cd_{0.3}Co_{0.7}Fe_2O_4$ and $Cd_{0.3}Co_{0.7}Fe_2Al_xO_4$ (x=0.0,0.1,0.2,0.3,0.4,0.5) of the systems

The Scaning Electron Morphology:

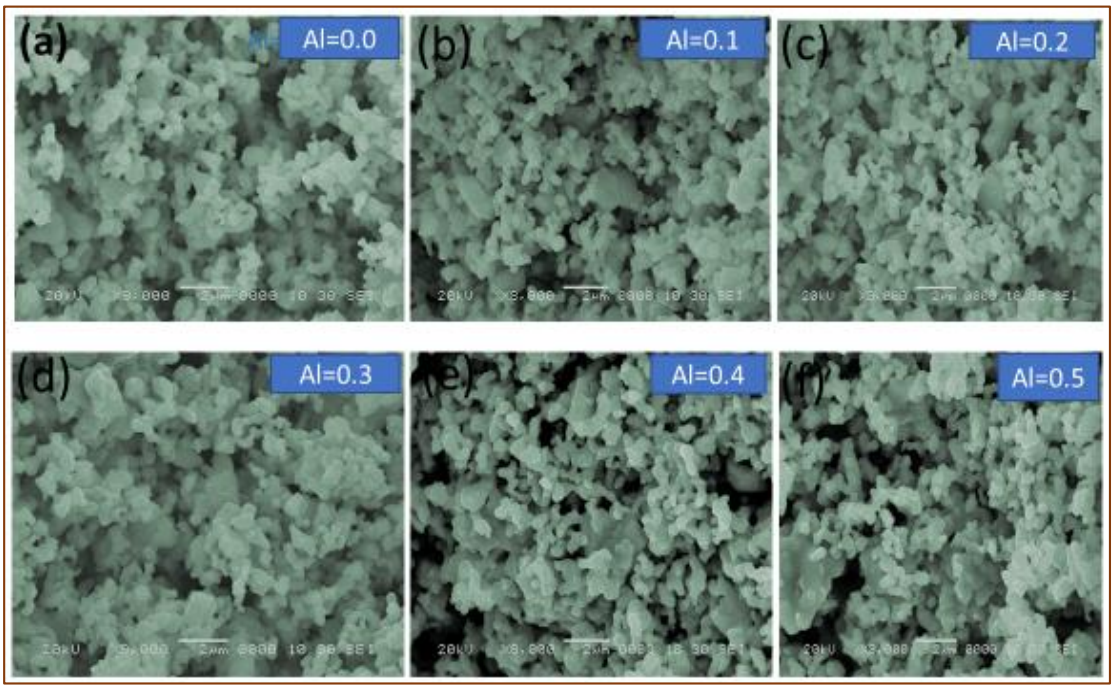


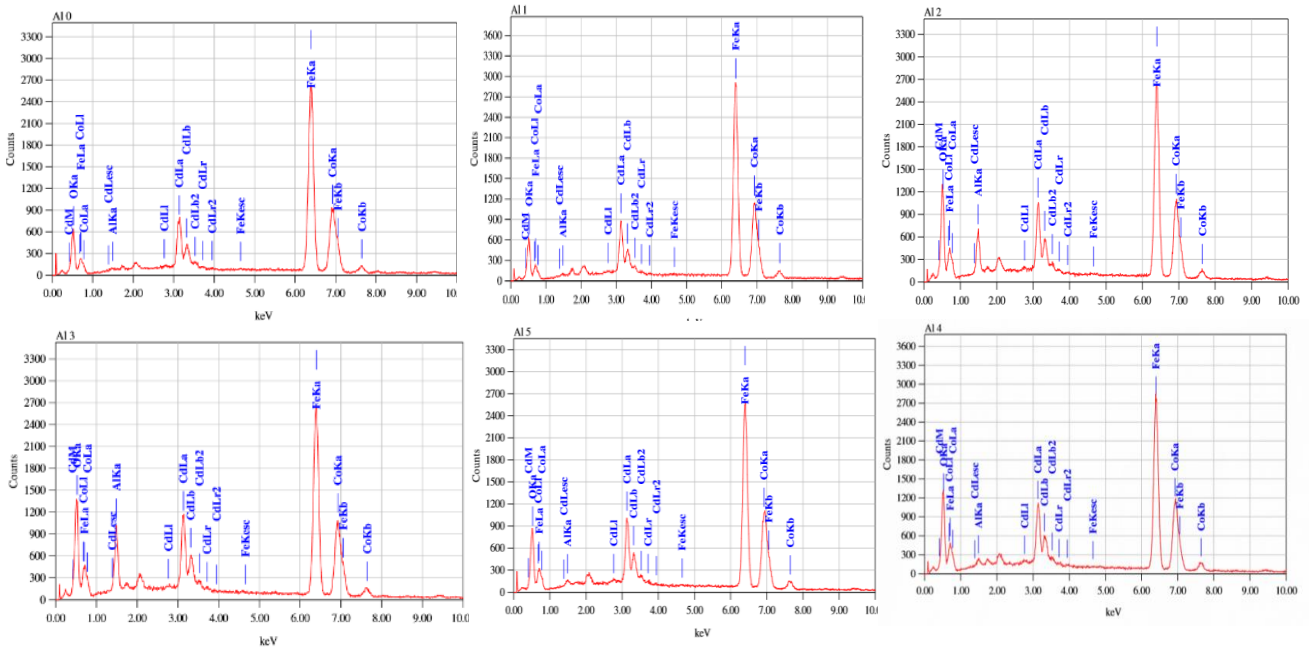
Figure 4.SEM image of $Cd_{0.3}Co_{0.7}Fe_2O_4$ and $Cd_{0.3}Co_{0.}7Fe_2Al_xO_4$ small hexagonal like shaped prepared under the standard ceramics technique steps and various concenntration of Al^{3+} doped :Fig(a)-(x=0.0),Fig(b)-(x=0.1).Fig(c)-(x=0.2),Fig (d)-(x=0.3),Fig(E) –(x=0.4),Fig(f)-(x=0.5) e.tc.

The SEM images of $Cd_{0.3}Co_{0.7}Fe_2O_4$ in Fig (a) ,and Al^{3+} – doped $Cd_{0.3}Co_{0.7}Fe_2O_4$ NPs with various ions concentration (Al^{3+}= 0.0, 0.1,0.2, 0.3,0.4 & 0.05) as shown in Fig (b),(c),(d)(e). The fig (a) indicate that, the image observed the distribution of the grain is uniformed with the grain size was estimated by line intercept method [32]. It was clearly observed that an images fig.(a) is uniformed distribution of the grain size , after variation of the grain agglomerate process into micrometer- sized cluster having decrease grain size with an increasing Al^{3+} ion concentration which proceding allocate of cation positions in lattice [33]. The most significant that the ionic radius Al^{3+} small than $Cd_{0.3}Co_{0.7}Fe_2O_4$ ions due to decrease grain size due to the strong attraction of the particles to each other, Besides such reason as:the interaction between particles was the strong magnetic nature them[34]. The SEM micrographs were taken at 1,000 magnifications by selecting different parts of the samples. The SEM images of $Cd_{0.3}Co_{0.7}Fe_2O_4$ and Al^{3+} – doped $Cd_{0.3}Co_{0.7}Fe_2O_4$ NPs all the samples are shown in Figure 3a, b, c and 3d. It is clear from the micrographs that the microstructure changes with the increasing concentration of Al3+ ions. A closer look on these micrographs shows that grown nanoparticles are spherical shape and Size is affectd by doped at nano -region and have intergranular diffusion[35]. Also, it is seen that the number of pores increases with the increasing doping concentration which results in lesser densification or more porosity , Behind the important role of the $Al^{3+}$was formation of grain growth [36]

The energy dispersive X-ray (EDX):

The energy dispersive X-ray (EDX) analysis of desireble pure in fig (a) and Al^{3+} ions substituting of all the samples as shown in fig (b),(C) ,(d),(e),(f). The comfirmed a desired chemical composition of Al^{3+}substituent of Cd-Co ferrites material.The existance of chemical wight percentage or atomic percentage of the elements Al,Fe,Cd,Co and O clearly was confirmed by EDX spectra.The obtained atomic percentage of each element used in the synthesized product was listed in below the table. Fig. 4(a) .shows the peak of Cd,Co,Fe,O in undoped Cd-Co ferrites .While Al^{3+} doped in the pure ferrite as the samples peak of Cd,Co,Fe ,O,Al in doped

Cd-Co ferrite samples. Table 2 reveals that an increase of Al^{3+} concentration (x)in $Cd_{0.3}Co_{0.}7Fe_2Al_xO4$, (x=0.1,0.2,0.3,0.4,0.5) gradually reduces the Cd concentration from ~28wt% to ~14 wt, while Fe change within -+2%in nearly all samples.



Elemental composition of $Cd_{0.3}Co_{0.7}Fe_2O_4$ and $Cd_{0.3}Co_{0.}7Fe_2Al_xO_4$ is analysis by EDX as shown in fig.

Obs No	Element	X=0.0	X=0.1	X=0.2	X=0.3	X=0.4	X=0.5
1	(O) Atomics (%)	32.84	28.64	46.51	47.87	47.18	38.82
2	(Cd)Atomics (%)	5.47	5.46	4.86	5.03	5.06	5.89
3	(Co) Atomics(%)	16.83	19.14	13.43	12.18	14.65	17.12
4	(Fe) Atomics (%)	44.58	46.14	30.43	28.20	28.05	28.04
5	(Al) Atomics(%)	0.28	0.41	4.86	6.71	6.85	6.86

Conclusion :

Influence of **Al^{3+}** substituted **$Cd_{0.3}$ $Co_{0.7}$ Fe_2O_4** with variation of chemical formula $Cd_{0.3}Co_{0.}7Fe_2Al_xO_4$ (x=0.1,0.2,0.3,0.4,0.5) was stepswise synthesized by the standard ceramics technique with muffle furnace as shown in fig,1. X-ray diffraction spectroscopy was used to investigate crystallization, phase orientation microstructural properties with confirmed formation of single phase spinel structure .The successfully investigation of the influence nano crystallite Size on lattice parameter ,ionic radii , x-ray density cell volume for tetrahedral and octahedral edge were found that the decrease with Al^{3+}doped increase concentration by x-ray diffraction spectrum of the original date. The SEM was provided the morphology of that all prepared samples with Al^{3+} increase concentration were analysis information of decrease grain size ,grain bounder of all prepared samples were in the state of agglomeration.

Reference

1]. Makinson, J. D., J. S. Lee, S. H. Magner, R. J. De Angelis, W. N. Weins, and A. S. Hieronymus. "JCPDS-international centre for diffraction data 2000." Adv. X-ray Anal 42 (2000): 407.

2]. Naidu, K . Chandra Babu, and W. Madhuri. "Microwave processed bulk and nano Ni-Mg ferrites: A comparative study on X-band electromagnetic interference shielding properties." Materials Chemistry and Physics 187 (2017): 164-176.

3]. Hashim, M., Kumar, S., Ali, S., Koo, B. H., Chung, H., & Kumar, R. (2012). Structural, magnetic and electrical properties of Al3+ substituted Ni–Zn ferrite nanoparticles. Journal of alloys and compounds, 511(1), 107-114.

4]. R. Sharma, P. Thakur, P. Sharma, V. Sharma, Ferrimagnetic Ni2+ doped Mg-Zn spinel ferrite nanoparticles for high density information storage, Journal of Alloys and Compounds, 704 (2017) 7-17, doi: 10.1016/j.jallcom.2017.02.021.

5]. Goldman, Alex. Modern ferrite technology. Springer Science & Business Media, 2006.

6]. Spaldin, Nicola A., and Manfred Fiebig. "The renaissance of magnetoelectric multiferroics." Science 309, no. 5733 (2005): 391-392.

7]. Sadiq, I., Naseem, S., Ashiq, M. N., Khan, M. A., Niaz, S., & Rana, M. U. (2015). Structural and dielectric properties of doped ferrite nanomaterials suitable for microwave and biomedical applications. Progress in Natural Science: Materials International, 25(5), 419-424.

8]. Waghmare, S. P., Borikar, D. M., & Rewatkar, K. G. (2017). Impact of Al doping on structural and Magnetic Properties of Co-Ferrite. Materials Today: Proceedings, 4(11), 11866-11872.

9]. Gabal, M. A., W. A. Bayoumy, A. Saeed, and Y. M. Al Angari. "Structural and electromagnetic characterization of Cr-substituted Ni–Zn ferrites synthesized via Egg-white route." Journal of Molecular Structure 1097 (2015): 45-51.

10]. Mane, D. R., U. N. Devatwal, and K. M. Jadhav. "Structural and magnetic properties of aluminium and chromium co-substituted cobalt ferrite." Materials Letters 44, no. 2 (2000): 91-95.

11]. Priya, A. Sathiya, D. Geetha, and N. Kavitha. "Effect of Al substitution on the structural, electric and impedance behavior of cobalt ferrite." Vacuum 160 (2019): 453-460.

12]. Gharibshahian, M., M. S. Nourbakhsh, and O. Mirzaee. "Evaluation of the superparamagnetic and biological properties of microwave assisted synthesized Zn & Cd doped CoFe 2 O 4 nanoparticles via Pechini sol–gel method." Journal of Sol-Gel Science and Technology 85, no. 3 (2018): 684-692.

13]. Naik, M. Madhukara, HS Bhojya Naik, G. Nagaraju, M. Vinuth, K. Vinu, and R. Viswanath. "Green synthesis of zinc doped cobalt ferrite nanoparticles: Structural, optical, photocatalytic and antibacterial studies." Nano-Structures & Nano-Objects 19 (2019): 100322.

14]. Kuru, T. Ş., Eyüpoğlu, V., & Yildiz, F. (2018). The Effect of Al 3+ Additive on the Structural, Optical, and Magnetic Properties of Al-Cd Ferrites Fabricated by Coprecipitation Method. Acta Physica Polonica, A., 134(6).

15]. Tatarchuk, Tetiana R., Natalia D. Paliychuk, Mohamed Bououdina, Basma Al-Najar, Michał Pacia, Wojciech Macyk, and Alexander Shyichuk. "Effect of cobalt substitution on structural, elastic, magnetic and optical properties of zinc ferrite nanoparticles." Journal of Alloys and Compounds 731 (2018): 1256-1266.

16]. Batoo, K. M., & Kumar, S. (2009). Synthesisation, electrical and magnetic properties of Al doped nano ferrite particles. International Journal of Nanoparticles, 2(1-6), 416-422.

17]. Lakshmi, V. K., Gangothri S. Kumar, A. Anugraha, T. Raguram, and K. S. Rajni. "Structural and Magnetic Studies of Zinc Substituted Cobalt Ferrite Nanoparticles prepared by Sol–Gel Technique." In IOP Conference Series: Materials Science and Engineering, vol. 577, no. 1, p. 012068. IOP Publishing, 2019.

18]. Suryawanshi, S. S., Deshpande, V. V., Deshmukh, U. B., Kabur, S. M., Chaudhari, N. D., & Sawant, S. R. (1999). XRD analysis and bulk magnetic properties of Al3+ substituted Cu–Cd ferrites. Materials chemistry and physics, 59(3), 199-203.

19]. Mostaghni, F., & Abed, Y. (2017). Al and PEG Effect on Structural and Physicochemical Properties of CoFe2O4. Materials Research, 20, 569-575.

20]. Tukaram, Vinod, S. S. Shinde, Rameshwar B. Borade, and Ankush B. Kadam. "Study of cation distribution, structural and electrical properties of Al–Zn substituted Ni–Co ferrite." Physica B: Condensed Matter 577 (2020): 411783.

21]. Rao, K. S., G. S. V. R. K. Choudhary, K. H. Rao, and Ch Sujatha. "Structural and magnetic properties of ultrafine CoFe2O4 nanoparticles." Procedia Mater. Sci 10 (2015): 19-27
22]. Vasambekar, P. N., C. B. Kolekar, and A. S. Vaingankar. "Cation distribution and susceptibility study of Cd–Co and Cr3+ substituted Cd–Co ferrites." Journal of magnetism and magnetic materials 186, no. 3 (1998): 333-341.
23]. Kuru, T. Ş., Eyüpoğlu, V., & Yildiz, F. (2018). The Effect of Al 3+ Additive on the Structural, Optical, and Magnetic Properties of Al-Cd Ferrites Fabricated by Coprecipitation Method. Acta Physica Polonica, A., 134(6).
24]. Dalawai, S. P., Shinde, T. J., Gadkari, A. B., & Vasambekar, P. N. (2013). Structural properties of Cd–Co ferrites. Bulletin of Materials Science, 36(5), 919-922.
25]. Borhan, A. I., Iordan, A. R., & Palamaru, M. N. (2013). Correlation between structural, magnetic and electrical properties of nanocrystalline Al3+ substituted zinc ferrite. Materials Research Bulletin, 48(7), 2549-2556.
26]. Devmunde, B. H., Raut, A. V., Birajdar, S. D., Shukla, S. J., Shengule, D. R., & Jadhav, K. M. (2016). Structural, electrical, dielectric, and magnetic properties of Cd2. Journal of Nanoparticles, 2016.
27]. Ullah Rather, S., & Lemine, O. M. (2020). Effect of Al doping in zinc ferrite nanoparticles and their structural and magnetic properties. Journal of Alloys and Compounds, 812, 152058.
28]. T. Tatarchuk, M. Bououdina, W. Macyk, O. Shyichuk, N. Paliychuk, I. Yaremiy, B. Al-Najar, M. Pacia. Structural, Optical, and Magnetic Properties of Zn-Doped CoFe2O4 Nanoparticles, Nanoscale Res Lett (2017) 12: 141, doi: 10.1186/s11671-017-1899.
29]. Tatarchuk, T. R., M. Bououdina, N. D. Paliychuk, I. P. Yaremiy, and V. V. Moklyak. "Structural characterization and antistructure modelling of cobalt-substituted zinc ferrites." Journal of Alloys and Compounds 694 (2017): 777-791.
30]. Bhukal, S., Bansal, S., & Singhal, S. (2014). Co0. 6Zn0. 4Cu0. 2CdxFe1. 8− xO4 (0.2⩽ x⩽ 0.8) magnetic ferrite nano-particle: synthesis, characterization and photo-catalytic degradation of methyl orange. Journal of Molecular Structure, 1059, 150-158.
31]. Lakhani, V. K., Pathak, T. K., Vasoya, N. H., & Modi, K. B. (2011). Structural parameters and X-ray Debye temperature determination study on copper-ferrite-aluminates. Solid State Sciences, 13(3), 539-547.
32]. Hossain, Md Sazzad, S. Manjura Hoque, S. I. Liba, and Shamima Choudhury. "Effect of synthesis methods and a comparative study of structural and magnetic properties of zinc ferrite." AIP Advances 7, no. 10 (2017): 105321.
33]. Kershi, R. M. "Spectroscopic, elastic, magnetic and optical studies of nanocrystallite and nanoferro-fluids Co ferrites towards optoelectronic applications." Materials Chemistry and Physics (2020): 122941.
34]. Dasan, Y. K., Guan, B. H., Zahari, M. H., & Chuan, L. K. (2017). Influence of La3+ substitution on structure, morphology and magnetic properties of nanocrystalline Ni-Zn ferrite. PloS one, 12(1), e0170075.
35]. Chavan R., Apparao R., Shankar D. Birajdar, Rahul R. Chilwar, and K. M. Jadhav. "Structural, morphological, optical, magnetic and electrical properties of Al3+ substituted nickel ferrite thin films." Journal of Alloys and Compounds 735 (2018): 2287-2297.
36]. Kulkarni, A. B., and S. N. Method. "Synthesis and Structural Analysis of Co–Zn–Cd Ferrite by Williamson–Hall and Size–Strain Plot Methods." International Journal of Self-Propagating High-Temperature Synthesis 27, no. 1 (2018): 37-43.

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Orientational order parameter of some CBOnO.mliquid crystalline compounds—an optical study

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ABSTRACT
In nematic phase of liquid crystals, mesogens are one of the most important parameters of the material is Orientational order parameter. All the physical properties of mesogens is determined by this order parameter. We have many methods for the estimation of orientational order parameter in liquid crystal phase. In the presentstudy the dilatometric and birefringence techniques have beenadopted on some liquid crystal like CBOnO.m compounds with spacer*n* = 8, 5 and terminal group *m* = 10.By using birefringence data and density data, the orientational order parameter and the molecular polarizability parameter by Vuks and Neugebauer methods are discussed and the results on number of liquid crystalline compounds with available data areevaluated

KEYWORDS
Birefringence; polarizability;
Liquid crystalline mesogens;
Orientational order parameter;

Introduction

The liquid crystal (LC) state is a distinct phase of matter observed between the crystalline (solid) and isotropic (liquid) states. There are many different types of liquid-crystal phases, which can be distinguished by their different optical properties (such as textures), mechanical and electrical properties. The contrasting areas in the textures depend on the different orientations of liquid crystals in different directions. The liquid crystal molecules are well ordered in their domain. The LCs have no ability to support shearing, and thus flow like ordinary liquids. This is the reason why liquid crystals attained their importance in technological applications, especially in electro optic switches and liquid-crystal displays.

Widespread liquid-crystal displays use liquid crystals.Various researchers are conducting experiments to study the properties of material for understanding the behavior of liquid crystals. The parameter of nematic phase whichgained importance is the orientational order parameter which determines the properties like relations between microscopic and macroscopic, anisotropic properties of LCs.

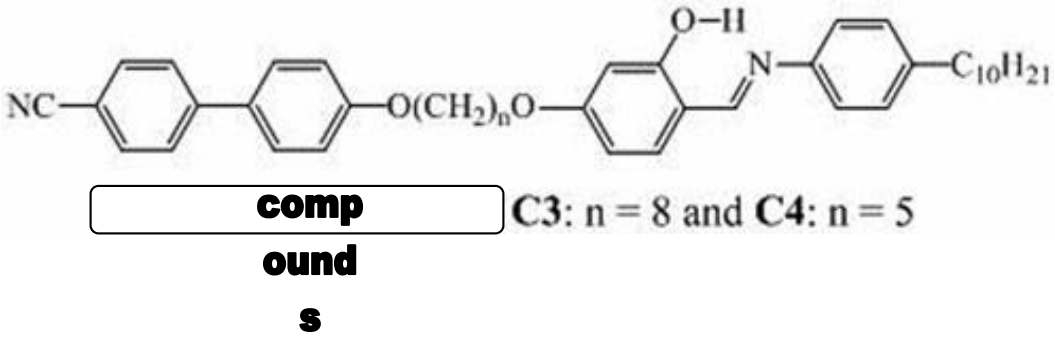
The new novelLC compounds like CBOnO.m compounds have different spacer length. In the present work, the compounds of the homologous series with spacer length *n* = 8, 5 andterminal group *m* = 10 are chosen for dilatometric studiesand birefringenceat differenttemperatures. By using the refractive indices and density data, molecular polarizabilityand order parameter were determined with the data of refractive indices and density for the compounds.

Table 1.***Transition temperatures (°C)[a]and enthalpies (J/g) of compounds C3,C4.***

Compound	Phase transition temperature (°C)
C3 (*n*= 8)	**I 164.6 (8.0)N75.7(63.3) Cr**
C4 (*n* = 5)	**I140.8(1.1) N 127.1[b]SmA95.6[b]SmA[b]82.5(64.3)Cr**

[a]The DSC profiles recorded during the heating and cooling first cycles peak temperature at a rate of 5°C/min.[b] It was observed under the POM that the transition to this phase and was very weak to get recognized in DSC thermogram.
(I = Isotropic phase; N =Nematic phase; SmA[b]= Biaxial A phase; SmA= Uniaxial smectic A phase; Cr = Crystalline phase.

The compounds were synthesised at Centre for Nano and SoftMatter Sciences, Jalahalli, Bangalore, India and they provided facility to carry out the present study.
The transitiontemperatures are listed in Table 1.andthe molecular structure of the compounds studied is as shown below.



comp ound s **C3**: n = 8 and **C4**: n = 5

n = 8&5 and ***m*** = 10

Experimental Study

Estimation of molecular polarizability

The molecular polarizabilities of CBOnO.m compounds are estimated by the authors,consideringVuks and Neugebauer models. Several researchers used these methods[14–18] toestimate liquid crystalline states' molecular polarizabilities and therelevant equations of these methods are represented later.

Density measurements

At various temperatures cathetometer in conjunction with the U-shaped bi-capillary pyknometer was used for thedensity measurements. The measurement of the absolute error ofdensity is $\pm 10^{-4}$ g/cm^3. In the present investigation experimentally designed pyknometer is as shownin Fig. 1

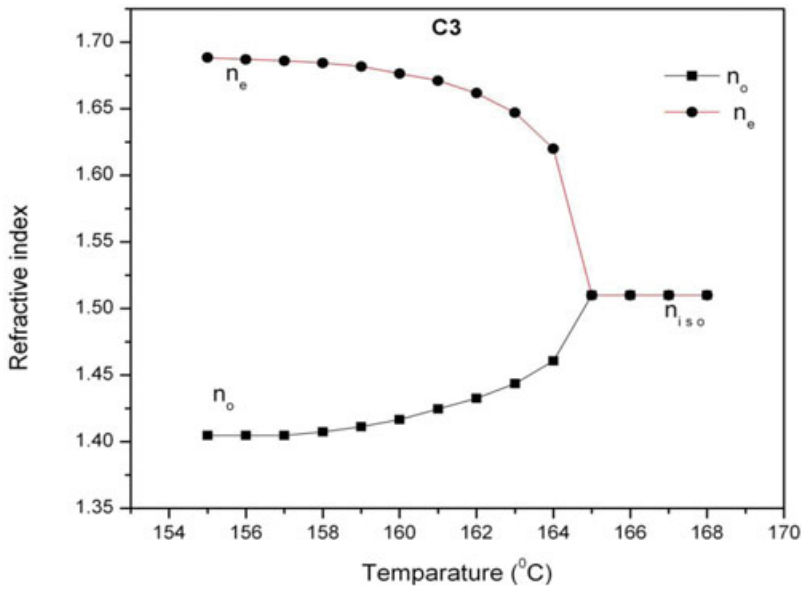
Refractive index measurements

Using the wedge-shaped glass cell similar to the experimental set-up used by Haller et al. [12, 13]to obtain birefringence and by modified spectrometer, therefractive indices measurements were done.With the help of two optically flat rectangular glass plates (50 mm × 25mm) sandwiched with glass slide of thickness 0.05-mm, which serve as a wedge spacer,a wedgeshapedglass cell was prepared. In the cell, the liquidcrystal compound is filled. The edge of the spacer glass plate in the compound in the cell acts as a uniaxial

crystalwith its optic axis parallel to the edge. The refractive indices weremeasured with the accuracy of ±0.0005.

Figure 1.Experimentally designed Pyknometer.

Figure 2.A Graph representing variation of Temperature with refractive index in C3.



Neugebauer method

According to this method, the extraordinary and ordinary molecular polarizabilities are represented by the following equations:

$$\alpha_e = \left(AB - 3 \pm \sqrt{(AB-3)^2 - 4AB}\right)/2A$$

$$\alpha_o = \left(AB + 3 \pm \sqrt{(AB+3)^2 - 16AB}\right)/4A \quad \text{---(1)}$$

where

$$A = \frac{1}{\alpha_e} + \frac{2}{\alpha_o} = \frac{4\pi N}{3}\left[\frac{n_e^2+2}{n_e^2-1}\right] + \left[\frac{2(n_o^2+2)}{n_o^2-1}\right] \quad \text{---(2)}$$

$$B = \left(\alpha_{||} + 2\alpha_{\perp}\right) = \left(\alpha_e + 2\alpha_o\right) = 3\alpha = 9\left(n^{-2} - 1\right)/\left[\left(4\pi N_i\right)\left(n^{-2}+2\right)\right]$$

and N_i is the number of molecules per unit volume in the isotropic phase.

Figure 3.A Graph representing variation of Temperature with refractive index in C4.

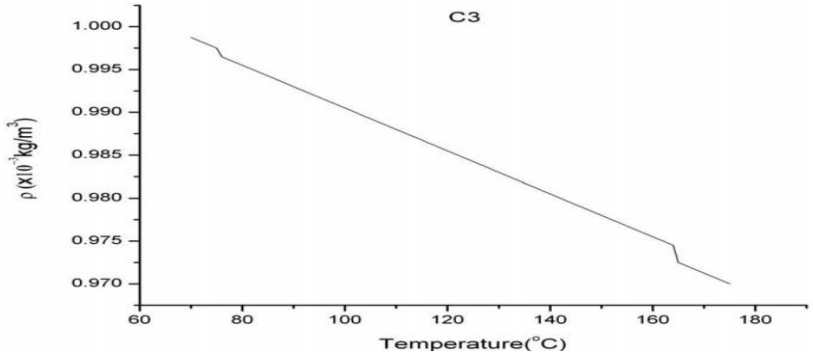
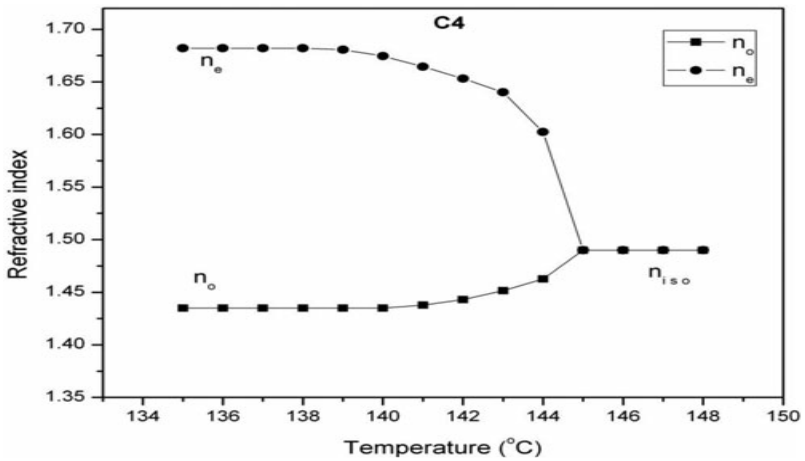


Figure 4.A Graph representing variation of Temperature with density in C3.



Vuksmethod

Chandrasekhar et.al had first applied this model to liquid crystalline molecules in an anisotropic crystal by assuming the field is internal isotropic field. With these assumptions, we obtain extra-ordinary and ordinary polarizability as the following equations.

$$\alpha_e = \left[\frac{3}{4\pi N}\right]\left[\frac{n_e^2 - 1}{\bar{n}^2 + 2}\right] \quad \text{----(3)}$$

where n_e

$$\alpha_o = \left[\frac{3}{4\pi N}\right]\left[\frac{n_o^2 - 1}{\bar{n}^2 + 2}\right] \quad \text{----(4)}$$

and n_o are the extraordinary and ordinary refractive indices of the liquid crystalline molecule and N is the number of molecules per unit volume.

$$\bar{n}^2 = \left[\frac{n_e^2 + 2n_o^2}{3}\right]$$

and $N = N_A\rho/M$ where ρ is the density and M the molecular weight and N_A is the Avogadro number.

Modified Lippincott δ-function method for the estimation of molecular polarizability

For different types of liquid crystals modified Lippincott *δ*-functionmodel was used. In terms of parallel bond component, the non-bond region electron contribution and the perpendicular bond component, the mean polarizability was estimated using the following method which is represented as shown below.

$\sum \alpha_{\parallel P}, \sum \alpha_{\parallel} n$ and $\sum 2\alpha_{\perp}$

The mean polarizability expression is given as

$$\alpha = \left[\frac{\sum \alpha_{\parallel P} + \sum \alpha_{\parallel n} + \sum 2\alpha_{\perp}}{3}\right] \quad \text{---(5)}$$

where the parallel bond component is given as

$$\sum \alpha_{\parallel P} = \frac{4nA}{a_0} \exp\left[\frac{T - T_c}{T_c}\right]\left[\frac{R^2}{4} - \frac{1}{2C_R^2}\right] \exp\left[\frac{(x_1 - x_2)^2}{4}\right] \quad \text{---(6)}$$

here *R* is the bond length,*n* is the bond order,a_0 is the radius of the first Bohr orbit of hydrogen atom, *A* is the *δ*-function strength, *X*A and *X*B are thePauling's electro negativities of atoms A and B in the bond AB, and *CR* is the geometric mean molecular *δ* -function strength. Considering the second term of the right-hand side of the equation (5), we have

$$\alpha_{\parallel n} = \sum_j f_j \alpha_j \text{ --- (7)}$$

hereαj is its atomic polarizability and *fj* is the fraction of the non-bonded electrons of the j^{th} atom.

The third term of equation (5),

$$\sum_i 2\alpha_{\perp i} = (3N - 2n_b)\frac{\sum x_j^2 \alpha_j}{\sum x_j^2}$$

$$= n_{df}\frac{\sum x_j^2 \alpha_j}{\sum x_j^2} \quad \text{---(8)}$$

wheren_{df}= (3*N* − 2*n*b), n_{df} is the number of degrees of freedom from the equation wheren_b is the number of bonds in the present molecule. *N* is the number of atoms.

Figure 5.A Graph representing variation of Temperature with density in C4.

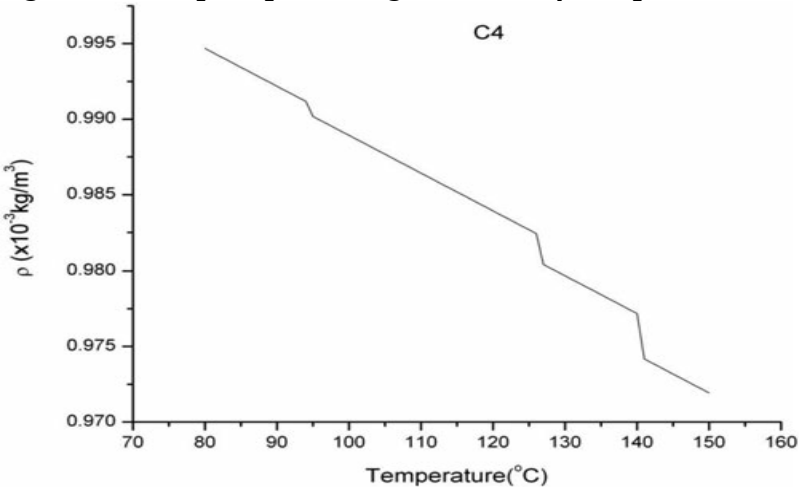


Figure 6.A graph of Variation of Polarizability isotropy with temperature in C3.

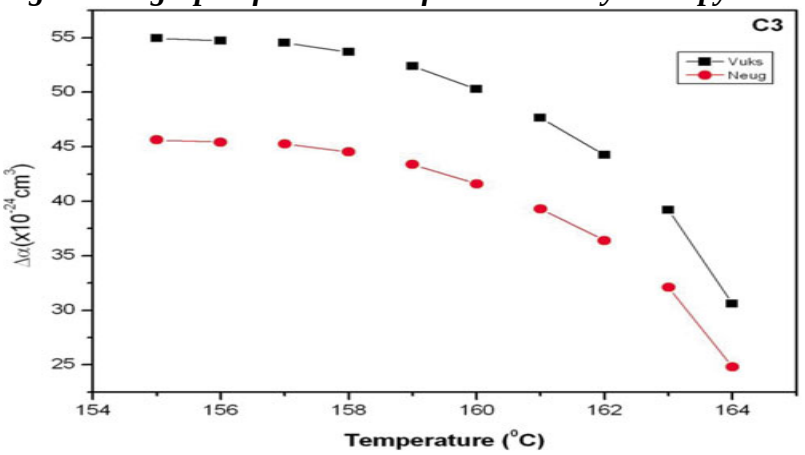
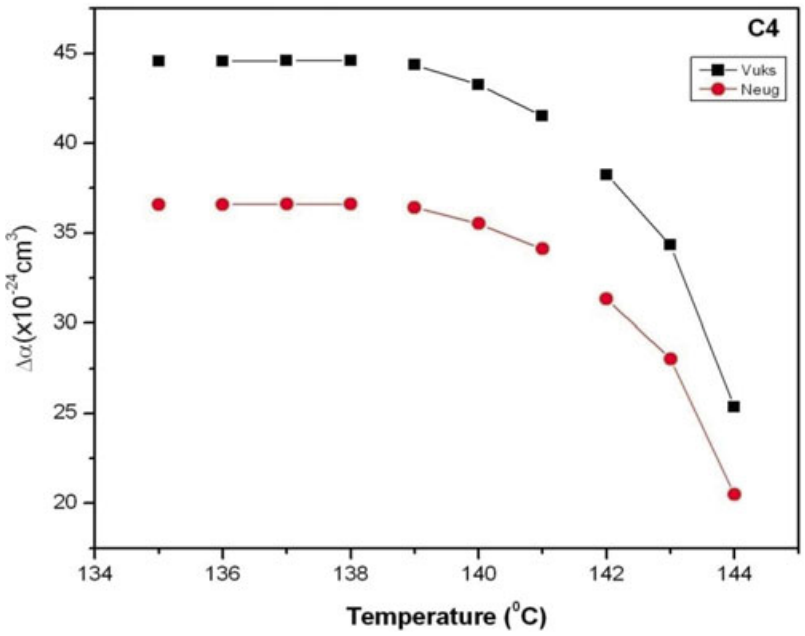


Table 2.Mean molecular polarizabilities obtained in the liquid crystalline compounds by different methods[10^{-24} cm^3].

Compound	Lippincott δ-function model				Vuks model	Neugebauer model
	$\alpha_{\parallel p}$	$\alpha_{\parallel n}$	$2\alpha\perp$	$\propto_M$	$\propto_M$	$\propto_M$
C3	167.74	1.779	76.37	82.08	80.00	79.87
C4	164.69	1.779	62.61	76.36	74.97	75.90

Figure 7.A graph of Variation of Polarizability isotropy with temperature in C4.



Estimation of orientational order parameter in the nematic phase

To estimate the order parameter inthe nematic phase, the Vuksmethod isapplied. In this method equations used are as follows

$$S = \left(\frac{\alpha}{\alpha_{\parallel}-\alpha_{\perp}}\right)\frac{n_e^2-n_o^2}{\bar{n}^2-1} \qquad (9)$$

Where $\bar{n}^2 = \left(\frac{n_e^2+2n_o^2}{3}\right)$

Neugebauer method

The order parameter in the case of the Neugebauer method [17]

$$S = \left(\frac{\alpha}{\alpha_{\parallel}-\alpha_{\perp}}\right) f(B) \qquad \text{---(10)}$$

where $f(B) = \left\{\left(\frac{9}{4AB}\right)\left[\left(B^2 - \left(\frac{10}{3}\right)B + 1\right)^{1/2} + \left(\frac{B}{3}\right) - 1\right]\right\}$

and $B = \frac{n^2-1}{n^2+2}\left[\frac{n_e^2+2}{n_e^2-1} + \frac{2(n_o^2+2)}{n_o^2-1}\right]$

Figure 8.A graph of Variation of S with Reduced temperature in C3.

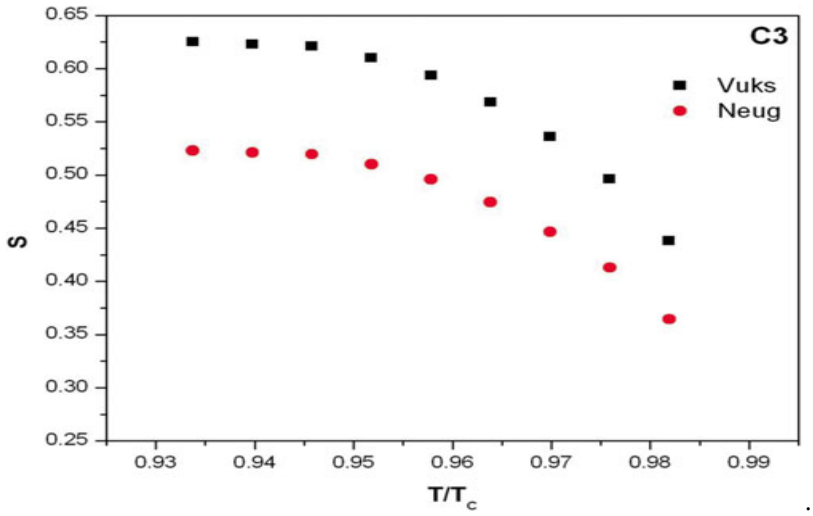
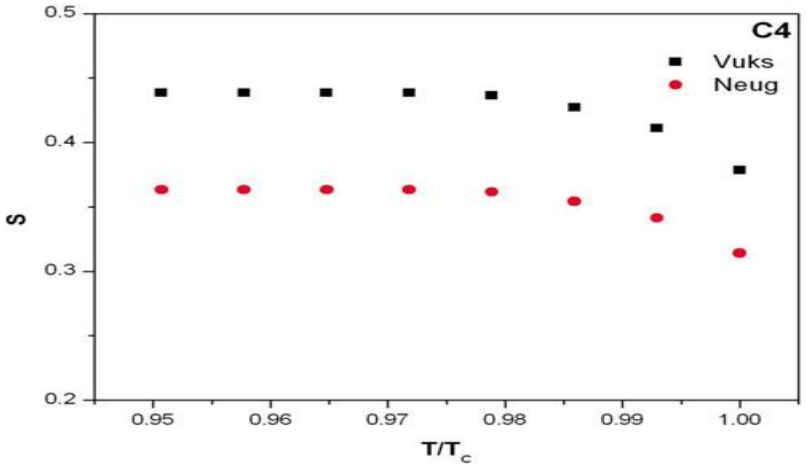


Figure 9.A graph of Variation of S with Reduced temperature in C4.



Results and discussion

In this paper, the refractive indices of the CBOnO.m liquid crystalline compounds aremeasured at different temperatures with the instrument,modified spectrometer alongwith the small-angled prismwhich contains the liquid crystalline compound. Amonochromatic sodium source of wavelength589.3 nm is used.

The monochromatic incident light splits into two lines with one higher and the other lower than the isotropic values when isotropic nematic-phase transformation takes place. They arecalled ordinary *n*o and extraordinary $n_e$refractive indices. The value ofn_o decreases with decrease in temperature, whereas the value $n_e$increases,both attain nematic phase at deepsaturationregion. The variation ofrefractive indices corresponding with temperature inisotropic nematic region is illustrated in Figs. 2,3.

The variation of density with temperature is measured byusing Ushapedbi-capillary pyknometer attached with dilatometer and the graph is represented in Figs. 4 and 5.Experiment found that rise intemperature decreases the density and at phase transformations, the molecules align themselvesin a particulardirection and hence density increases andvolume decreases. The density jumpis noticed.

The polarizability anisotropy obtained during liquid crystalline phase at different temperaturesis presented in Figs. 6 and 7. Using refractive indices data, the molecular polarizabilitieswere estimated by Vuks and Neugebauer internal field models at different temperatures.Further, the mean molecular polarizability is evaluated by modified Lippincott δ-functionmodel. These values are compared with Vuks and Neugebauer models and the results are as shown in Table 2. The polarizability values obtained by Lippincott δ-function model andby refractivity method are found to be nearly the same and hence confirm the applicability

ofLippincott δ-function model for liquid crystals. The order parameter with reduced temperatureis evaluated for the above compounds by Vuks and Neugebauer methods and shownin Figs. 8 and 9.

Conclusion

The extraordinary and ordinary refractive indices reach saturation deeply at the nematicphase.The calculations carried out using both Vuks and Neugebauer models depicts that withincrease in temperature orientational order parameter also decreases.

ByVuks andNeugebauermodels,themolecular polarizability values are estimated and they are approximately similar to that of the polarizability values evaluated` by modified Lippincott δ-functionmodel.

By using the Vuks and Neugebauer method the orientational order parameter is found to be between 0.3 and 0.7, which is in agreement with literature data available.The evaluated value of order parameter Neugebauer method is always less when compared to all othermethods. Thus, our investigations yielded same results.

Acknowledgments

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References

[1]A. K. Srivastava, R. Manohar and J. P. Sukla, Mol. Cryst. Lq. Cryst., 454, p. 225(2006).
[2] M. Roushdy, Mol. Cryst. Lq. Cryst., 457, p. 151 (2006).
[3]Chandrasekhar, S. (1977). *Liquid Crystals,* Cambridge University Press: Cambridge, U K. Kim, W.S., Elston, S. J., &Raynes, F. P. (2008).*Displays*, *29*, 458.
[4] Rajesh, G., et al. (2008). *Chem. Pharm. Bull.*, *56*, 897.
[5] Jahng, Y., et al. (2004). *Bioorg. Med. Chem. Lett.*, *14*, 2559.
[6] Chizu Sekine, Kazunori Iwakura, Naoto Konya, Masayoshi Minai and Koichi Fujisawa, Liquid Crystals, 28, p.1375 (2001).
[7] Haller, I., Huggins, H. A., &Freisner, M. J. (1972). *Mol. Cryst. Liq. Cryst.*, *16*, 53A.
[8] M. Roushdy, Mol. Cryst. Lq. Cryst., 457, p. 151 (2006).
[9] De Jeu,W. H. (1980). *Physical Properties of Liquid CrystallineMaterials*, Gordon and Breach: NewYork.
[10] C. L. Toh, J. Xu and C.He, Liq. Cryst., 35, p. 241 (2008).
[11] S. K. Pal, V. A. Raghunatha and S. Kumar, Liq. Cryst. 34, p. 135 (2007).
[12] Haller, I., Huggins, H. A., Lilienthal, H. R., & McGuire, T. R. (1973). *J. Phys. Chem.*, *77*, 950.
[13] Fakruddin, K., Jeevan Kumar, R., Datta Prasad, P. V., &Pisipati, V. G. K. M. (2009). *Mol. Cryst. Liq.Cryst.*,*511*, 146.
[14] E. R. Lippincott, J. Chem. Phys., 23, p. 603(1955).
[15] R. Centore, Liq. Cryst., 34, p. 729 (2007).
[16] VenkataRao, D., Pardhasaradhi, P., Pisipati, V. G. K. M., &Datta Prasad, P. V. (2015). *Mol. Cryst.Liq. Cryst.*, *623*, 87.
[17] R. N. Shimizu and N. R. Demarquette, Liq. Cryst., 28, p. 1855 (2001).
[18] LalithaKumari, J., Datta Prasad, P. V., MadhaviLatha, D., &Pisipati, V. G. K. M. (2012). *Phase Transitions*, *85*, 52.
[19] Murthy, V. R., Naidu, S. V., &Ranga Reddy, R. N. V. (1980). *Mol. Cryst. Liquid Cryst.*,*59*, 27.
[20] Adamski, P., &DylikGromisc, A. (1976). *Mol. Cryst. Liq. Cryst.*, *35*, 171.
[21] Subhan, C. M., Jeevan Kumar, R., PanduRanga, P., Jayashree, B., &Fakruddin, K. (2016). *Acta PhysicaPolonica A.*, *129*, 284.
[22]Pardhasaradhi, P., Datta Prasad, P. V., MadhaviLatha, D., Pisipati, V. G. K. M., &Padmaja, Rani (2012). *G. Phase Trans.*, *85*, 1031.

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Electrical Studies on Silicon BJTs of Different Base Width Irradiated with Heavy Ions

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Abstract

Silicon <111> *npn* power transistors are irradiated with 50 MeV Li^{3+}, 60 MeV B^{4+}, 108 MeV O^{8+}, 110 MeV Si^{8+}, and 120 MeV Ni^{8+} – ions. The electrical measurements made on these devices show decrease in forward saturation current (I_{CEsat}) measured before and after irradiation at a fluence of 1×10^{11} ions/cm^2. These values are found to be decreased from one to three orders of magnitudes. The variation in I_{CEsat} is more pronounced for Li^{3+} – ions and B^{4+} – ions compared to other heavier ions. At reverse breakdown voltage the leakage current has been increased to two orders of magnitude. The influence of width of base on electrical measurements has been studied. It is observed that, transistors having larger base width with low electrical resistivity are of most resistant towards ionizing radiation. Hence device fabrication technology may play an important role in designing radiation hard devices.

Key words: Transistor, Irradiation, Defects, Junction

INTRODUCTION

Silicon is a cheap material, cost effective, plays crucial role in modern microelectronics. Bipolar junction transistors made of silicon have significant applications in the circuits for space, military, medical, high energy particle accelerators and other radiation rich environments. BJTs are sensitive to both trapped charged particles and solar cosmic rays, and can suffer displacement damage. Generally, heavy ions can be used to investigate the displacement effects of the BJTs [1].

Most of the earlier work reported that, displacement damage produced due to these radiations, results in production of complex defects in the BJTs [2] which reduces minority carrier lifetime, reduce mobility, resulting in the changes of device properties such as gain, saturation voltage and leakage currents.

When the PN junction of the device is under reverse – biased condition, diode current is due to minority charges is given by

$I = I_S\left[\exp\left(\frac{V}{V_T}\right)-1\right]$ where I_S is saturation current, V, V_S are forward bias and thermal voltages. In reverse bias ($V<0$) the minority – carrier densities at the depletion layer edges are reduced with respect to their equilibrium values. The minority – carrier densities therefore decrease towards the respective depletion – layer edge. Since thermal generation steadily produces minority carriers, a diffusion current will flow towards the depletion layer, causing the reverse saturation current. If the reverse voltage applied to a pn junction exceeds a critical value, breakdown occurs, which may be either due to internal field emission or due to impact ionization. Both phenomena require the electric-field strength to reach a critical value and are therefore strongly related to the maximum value of electric field strength in the junction [3]. Since this value is determined by the doping concentration and the applied voltage, the breakdown voltage will decrease if the doping concentrations increase. The variation in doping concentration in the collector base junction are studied for various ion irradiated devices.

This study gains importance, as there is no considerable radiation response study for a spectrum of ion induced damage in indigenous commercial grade BJTs of different base widths. Also, there is a need to use more and more indigenously made devices for advanced space and radiation rich applications. In the present work effect of heavy ion irradiation on gain, OFF leakage current, saturation voltage and doping concentration of transistors studied for different ions.

EXPERIMENTAL

The radiation induced effects on electrical characteristics of commercial type *n-p-n* BJTs of type 2N 3055, and 2N 6688 of BEL, Bangalore, India, have been studied. Four different devices of each type from the same batch (date code) are exposed to each ion and all measurements are carried out on each device, to verify the reproducibility of the results. The transistor 2N 3055 has an emitter thickness of 22.28 µm and base thickness of 14.96 µm while the transistor 2N 6688 has an emitter thickness of 34.97 µm and base thickness of 32.37 µm.

Table 1: Device specifications of 2N 3055 and 2N 6688

Device Code	2N 3055	2N 6688	Region
Structure	*<111 > P/N/N+*	*< 111 > N-/N/N+*	
Doping Substrate	*Sb/525 μm / 0.01 – 0.02 Ω – cm*	*Sb/525 μm / 0.01 – 0.02 Ω - cm*	*Collector*
Dopants/Thickness *μm / Electrical Resistivity* Ω-*cm*	*B*(epilayer1) 14.96 μm / 5.930* Ω-*cm*	*P** (epilayer1) 32.370μm / 2.820* Ω *cm*	*Base*
	*P** (epilayer2) 22.28 μm / 14.790* Ω-*cm*	*p** (epilayer2) 34.970μm / 26.63* Ω-*cm*	*Emitter*
Application	*Power Switching*	*Power switching / Amplification*	

**B-boron and **P-phosphorus*

These transistors are exposed to (i) 50 MeV Li^{3+}-, (ii) 60 MeV B^{4+}- (iii) 108 MeV O^{8+}- (iv) 110 MeV Si^{8+}- and (v) 120 MeV Ni^{8+}-ions. All the irradiation experiments are carried out at Inter University Accelerator Center (IUAC), New Delhi.

The electrical measurements are carried out by Computer interfaced Keithley 2400 Source Meter Units (SMUs) un-irradiated and irradiated BJTs. The forward current gain of the devices is measured for ion fluence 0f 1×10^{11} ions/cm^2. The output; I_C - V_{CE} characteristic curve of a transistor is a plot of collector current (I_C) versus collector-emitter voltage (V_{CE}) at constant base current (I_B = constant). From these characteristic curves, the collector saturation current (I_{Csat}) has been extracted [4]. Leakage current is extracted from Gummel plots of the devices.

SRIM calculations

SRIM simulations were used to compare the degradation effect on different base width BJTs due to irradiation, and listed in table 1. Using SRIM range R, electronic energy loss S_e, nuclear energy loss S_n, and average displacements/ion are calculated [5]. It shows $S_e < S_n$ of the order of 4 to 5 magnitudes. Hence nuclear energy loss plays a crucial role in the degradation of the device compared to electronic excitations. For each ion average displacements increases with increase in Z and R decreases. Based on the R calculations in the silicon target, different ions get implanted in the different regions of the device i.e., Ni ion get implanted in emitter region, Si ion penetrate up to base and B and O ions penetrate up to collector regions of the devices. Li ion get implanted in the substrate of collector region. Figure 2 shows the current degradation due to different ion irradiation. It is observed that damage on emitter region directly reduced

the output current gain. It is observed that total dose on a device plays an important role as gain degradation do not depend on these fig (3). It may be because that the selected device is of npn where emitter is of n – type and the charge type of heavy ions are positive. Hence the majority charge carriers are recombined with the charge of incoming particle. Which may result in gain degradation.

TABLE 2. Relative effects on the BJT devices due to variations in ion species, their mass, energy, energy loss mechanisms, range, damage produced by each ion and the implantation of each ion in the respective devices

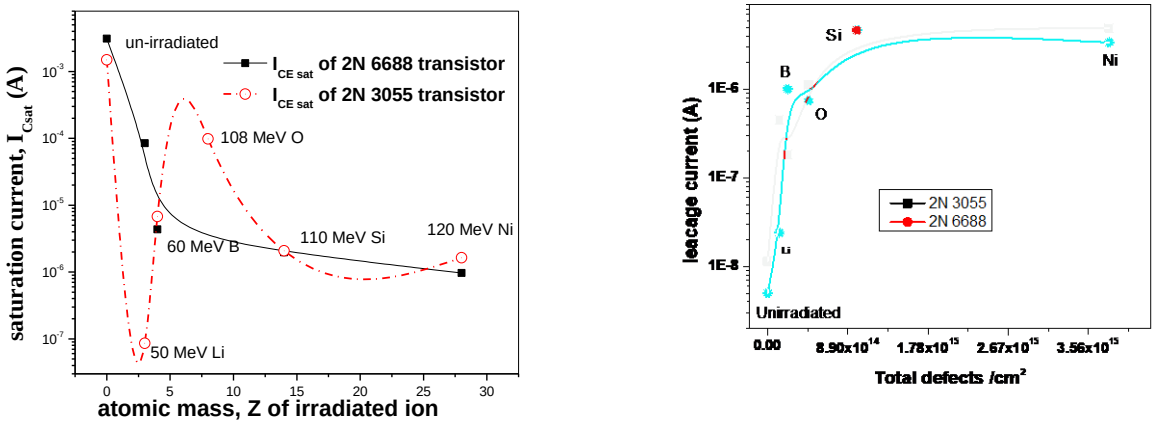
Ion	Z	Energy (MeV)	S_e (MeV cm^2/mg)	$S_n \times 10^4$	Range, R (µm)	Average displacements /ion	Region of ion gets implanted in each transistor	
							2N 3055	2N 6688
Li	3	50	0.408	2.293	310.24	1296.8	Collector	Collector
B	4	60	1.422	7.89	116.34	2220.2	Collector	Collector
O	8	108	2.948	16.21	106.6	4549.7	Collector	Collector
Si	14	110	10.21	76.98	39.62	9925.7	Base	Base
Ni	28	120	31.39	501	22.93	37889.17	Emitter	Emitter

RESULTS AND DISCUSSIONS

Figure 1 depicts that transistors 2N 3055 and 2N 6688 appear to be sensitive to ionizing radiation. Exposure of the transistors to 50 MeV Li-ions results in considerable degradation of the electrical characteristics leading to reduction in the forward current gain. Transistor with larger base width (2N 6688) appear to be less sensitive compared to smaller base width transistor (2N 3055) indicating the significance of the base width. The increase in the base current through multi-phonon recombination leads to degradation of the forward current gain of the transistors. Lithium ion irradiation causes increase in forward resistance of the collector-emitter region with the decrease in conductivity. The increase in built-in voltage and decrease in doping density reflects the production of new defects in emitter-base region.

It is also observed that there is a decrease in I_{Csat} with increase in Z. The decrease in I_{Csat} is mainly due to the production of Si ion induced displacements, vacancies and interstitials [2]. These MeV ion induced defects reduce the minority carrier lifetime and are responsible for the increase in series resistance [4] in

turn in the shift of I_{Csat}. The atomic displacement damage due to induced ion in the semiconductor causes an increase in the collector-emitter saturation voltage $V_{CE(SAT)}$. The decrease in I_{Csat} is roughly the same as that with which gain decreases (Fig. 1 and 3). It can be concluded that the increase in BJT base current is caused by the recombination current in emitter–base depletion region and neutral base region and the heavy ions mainly produce displacement damage. The other main cause of gain degradation is ionization in the oxide passivation layer, particularly that part of the oxide covering the emitter-base junction region [6]. From figure 3, it is clear that device with high, it is observed that the change in the reciprocal of current gain ($\Delta(1/\beta)$) increases with increasing displacement dose, but the change trend is different for different ions. During the heavy ion irradiation, the base current degradation mainly originates from the displacement damages. In the forward-Gummel measurement, the neutral base recombination in bulk base region contributes to the increased base current, I_B [7]. When a drift BJT is subjected to displacement damage, the base current increases results in the current gain decreases. The excess base current in the drift region depends on the doping gradient, which reduces the excess recombination rate induced by the bulk traps [8].



(a) (b)

FIGURE 1. (a) Variation of I_{CEsat} for 2N 6688 and 2N 3055 transistors at a fluence of 1×10^{11} ions/cm^2 as a function of mass number of irradiating ion. (b) Leakage current of 2N 3055 transistor corresponds to reverse breakdown voltage versus the total induced defects equivalent to the fluence of 1×10^{11} ions/cm^2 for each irradiated ion (Total induced defects = fluence × defects produced in silicon per ion).

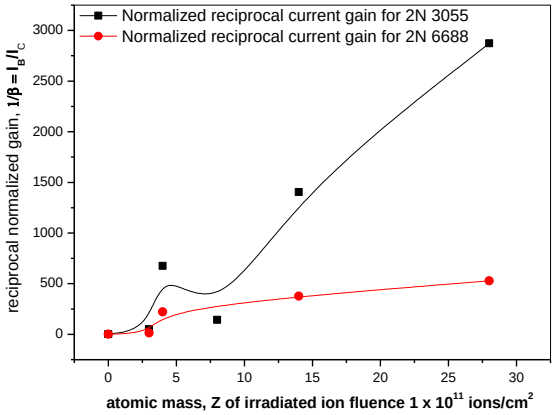


FIGURE 2. Normalized current gain β versus atomic mass of irradiated ions for 2N 3055 and 2N 6688 transistors for irradiation fluence of 1×10^{11} ions/cm^2., as in the above example, helps you control the layout

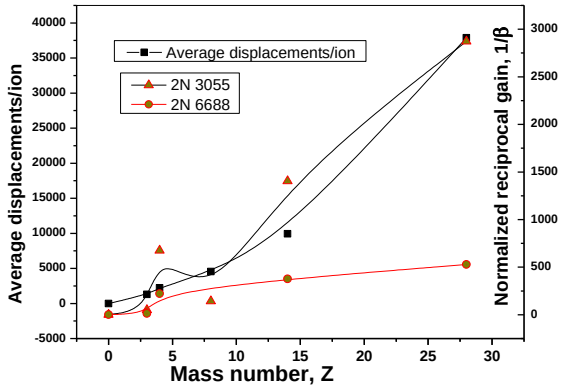


FIGURE 3. Normalized current gain β versus atomic mass of irradiated ions for 2N 3055 and 2N 6688 transistors for irradiation fluence of 1×10^{11} ions/cm^2., as in the above example, helps you control the layout

CONCLISIONS

The degradation of the devices under study is sucessfully tested for heavy ion radiation response. The results may be used for theoretical simulations. It is observed that, transistors having larger base width with low electrical resistivity are of most resistance for ionizing radiation. From table 2 and fig. 3 it seems that 2N 6688 is more radiation resistant compared to 2N 3055, device degradation do not depends on the depth or region of ion implantation in the device. Hence device fabrication technology plays an important role in designing radiation hard devices. Based on these results a BJTs radiation response model may be developed

which may be applied for indigenous devices. The decrease in I_{Csat} is roughly the same as that with which gain decreases. This gives major contribution in the field.

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REFERENCES

[1] X. Li, J. Yang, C. Liu, P. Li, Y. Zhao, and G. Liu, "Characteristic of Displacement Defects in n-p-n Transistors Caused by Various Heavy Ion Irradiations," *IEEE Trans. Nucl. Sci.*, vol. 64, no. 3, pp. 976–982, Mar. 2017, doi: 10.1109/TNS.2017.2657540.

[2] K. S. Krishnakumar *et al.*, "Carbon Ion Irradiation Damage Effects on Electrical Characteristics of Silicon PNP Power BJTs," *IEEE Trans. Device Mater. Reliab.*, vol. 15, no. 1, pp. 101–108, Mar. 2015, doi: 10.1109/TDMR.2015.2402212.

[3] M. Reisch, "An Introductory Survey," in *High-Frequency Bipolar Transistors: Physics, Modeling, Applications*, M. Reisch, Ed. Berlin, Heidelberg: Springer, 2003, pp. 3–116.

[4] C. M. Dinesh, Ramani, M. C. Radhakrishna, R. N. Dutt, S. A. Khan, and D. Kanjilal, "Effect of 50MeV Li3+ ion irradiation on electrical characteristics of high speed NPN power transistor," *Nucl. Instrum. Methods Phys. Res. Sect. B Beam Interact. Mater. At.*, vol. 266, no. 8, pp. 1713–1718, Apr. 2008, doi: 10.1016/j.nimb.2008.02.048.

[5] J. F. Ziegler and J. P. Biersack, "The Stopping and Range of Ions in Matter," in *Treatise on Heavy-Ion Science*, D. A. Bromley, Ed. Boston, MA: Springer US, 1985, pp. 93–129.

[6] J. Yang, X. Sun, X. Yu, Z. Qin, and X. Li, "Characteristics of displacement defects in PNP transistors caused by heavy ion irradiation," *Nucl. Instrum. Methods Phys. Res. Sect. B Beam Interact. Mater. At.*, vol. 467, pp. 86–90, Mar. 2020, doi: 10.1016/j.nimb.2019.12.001.

[7] Y. Sun *et al.*, "Irradiation effects of 25MeV silicon ions on SiGe heterojunction bipolar transistors," *Nucl. Instrum. Methods Phys. Res. Sect. B Beam Interact. Mater. At.*, vol. 312, pp. 77–83, Oct. 2013, doi: 10.1016/j.nimb.2013.07.013.

[8] L. Li *et al.*, "Current Gain Degradation Model of Displacement Damage for Drift BJTs," *IEEE Trans. Nucl. Sci.*, vol. 66, no. 4, pp. 716–723, Apr. 2019, doi: 10.1109/TNS.2019.2905866.

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Influence of Recombination Current on Gain of Irradiated Silicon Transistors.

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ABSTRACT

Current gain degradation in irradiated bipolar junction transistors is primarily due to excessbase current caused by enhanced carrier recombination in theemitter-base space -charge region (SCR).Trapsat oxide passivation layer of BJT leads to increase in surfacerecombination current. This recombination current leads to decrease in gain of a transistor. In the present work effected of temperature in the V_{CSat}(Saturation voltage) and I_{CSat}(Saturation current) due to ion irradiation has been reported. We have also study the effect of irradiation on switching properties of the transistors these studies help to test the device for its functionality in radiation hard environment. These studies may also helpful in development the modelfor similar applications.

Introduction:

Bipolar junction transistor (BJTs) is a key component in many applications such as linear mixed signal circuits, military, space exploration programs and high energy physics experiments. In space systems, space craft electronics are exposed to different types of a radiation such as protons, electrons, particles from solar events and particles from galactic cosmic rays [1-4]. When Si BJTs are exposed to ionizing radiation, trapped oxide charge and interface states accumulate in the oxides that lie over the surface of the intrinsic base, leading to an increase in surface recombination current in the emitter-base diode consequently, there is an increase in the base current of the devices, and the bipolar transistor suffers from a loss of dc current gain. The high-energy radiation can also create different trap levels in the band gap of silicon which reduces the minority carrier life time and in turn degrades the current gain of transistors [5].The devices used in radiation-rich environments over mission life time have to with stand long-term radiation effects such as Total Dose Displacement Damage and single event effects. Among the intense particular space radiation environment, trapped protons and electrons are potential candidates for that lead

to an long term radiation effects in the devices. The high flux of trapped charged particles is a possible hazard to spacecraft devices, because they can penetrate shielding material. In fact, at a geosynchronous orbit, the total dose that a device can receive inside the space craft with typical shielding may approach 1Mrad (Si) per year [6]. The main interest of this study is to analyze total dose effects and displacement damage in silicon BJTs. The dc I-V characteristics of silicon NPN rf power transistors were systematically analyzed.

2.0 Experimental

The radiation induced effects on electrical characteristics of commercial type *n-p-n* BJTs of type 2N 6688 of BEL, Bangalore, India, have been studied. Three different devices of each type from the same batch (date code) are exposed to 110 MeV Si^{8+} ion and all measurements are carried out on each device, to verify the reproducibility of the results. The transistor 2N 6688 has an emitter thickness of 34.97 µm and base thickness of 32.37 µm.

Radiation testing was performed at Inter University accelerating Centre (IUAC) New Delhi, India. The devices were irradiated at room temperature (RT) LDR keeping a beam current at 1PNA (particle nano ampere current) to get desired irradiation fluence. The energy of irradiating ion as choosing so that it could penetrate upto emitter base junction.

The fluence has been calculated by counting the charge collected at the Faraday cup placed at the target. The advantage of selecting low irradiation current is that BJTs are not damage due to the loss of irradiated ion energy (110 Mev Si^{8+} heavy ion)in the BJTs,(Heating effect will not be produced/the heat produced during the irradiation get transferred to the target).

RESULTS AND DISCUSSIONS

Results of Transfer Characteristics

Table 1: Variation of gain at room temperature, 50^{0}C and at 100^{0}c temperature for un-irradiated and 110 MeV Si^{8+} ion irradiated transistor.

Device	Name and fluence in ions/cm^2	Gain at room temperature (27 ^{0}C)	Gain at 50 ^{0}C	Gain at 100 ^{0}C)
2N6688	Un-irradiated	66.4776	53.70467	59.21622
	SiEL , 5x 10^9	0.73905	0.85097	0.00113
	SiFL, 1 x 10^{11}	0.03126	0.09547	0.19963
	SiGL, 1 x 10^{12}	0.05137	0.00678	0.00776

From the table 1 shows the variation of gain at room temperature, 50^0c and 100^0c for un- irradiated and 110MeV si^{8+}ion irradiated transistor. From the table it is clear that the gain of un-irradiated transistor at room temperature of 66.4776 it has decreased drastically with irradiation to a fluence of $5x10^9$,$1x10^{11}$and $1x10^{12}$ions/cm^2. With increased device temperature and repeating the characterization the gain of the transistor increased significantly. From the table it also clears that the performance of the device irradiated with fluence$1x10^{13}$ ions/cm^2 has been improved significantly.

This increased gain may be due to the annihilation of induced defects at higher temperatures. The correlation of gain is as follow. This variation in gain may be attributed to the variation base current. The enhabced I_B is related to an increase in the surface recombination velocity, as the density of electrons and holes is coming more comparable, due to base neutralization. An increase in the midgap-lavel interface-trap density in the low-field, thick oxide over the p-type base increases the recombination current.

2.1. Out Put Characteristics

The output; I_C-V_{CE} characteristic curve of a transistor is a plot of collector current (I_C) versus collector Emitter voltage (V_{CE}) at constant base current (I_B=constant). The I_C of un irradiated and irradiated transistor has been measured by varying V_{CE}=4V. For different I_B (I_B=0, 50, 100,150µA). From these characteristic curves, the collector saturation current (I_{Csat}) and the corresponding collector-emitter saturationvoltage.

Output characteristics are taken by varying Collector characteristics are obtained at constant base current (I_B=50µA) by varying collector emitter voltage V_{CE}=4V. Fromtheseplots, the collector saturation current (I_{Csat}). And the corresponding collector-emittersaturation voltage. (V_{CEsat}) for the 110MeV Si^{8+} ion irradiated fluence of 5×10^9 ions/cm^2 is measured.

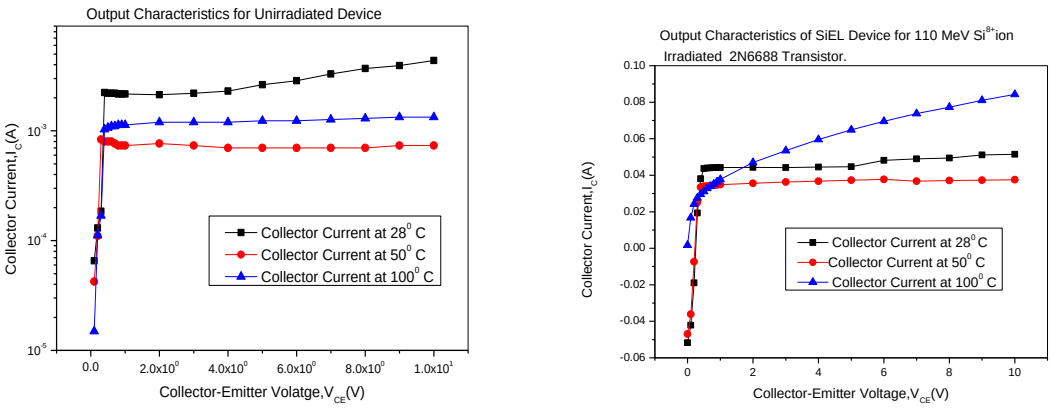

Figure 1. Output characteristics for Un-irradiated ,SiEL2N6688 transistor at I_B=50µA room temperatures 27^0,50^0, 100^0C.

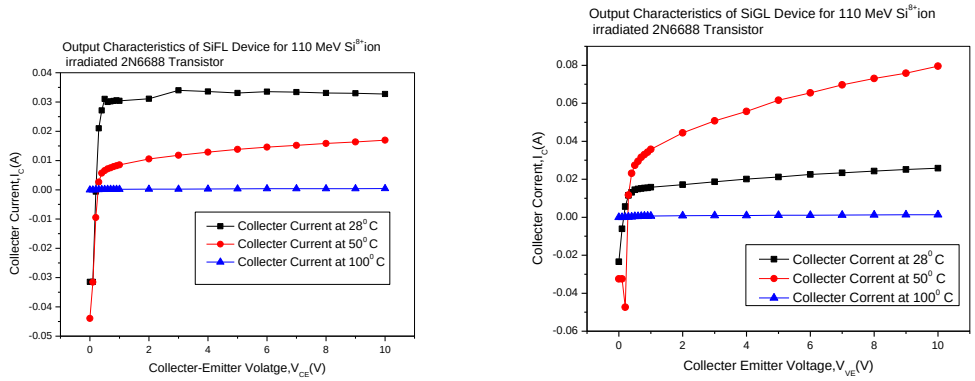

Figure 2. Output characteristics for SiFL, SiGL and 110MeV Si^{8+} irradiated 2N 6688 transistor at I_B=50µA room temperatures 27^0,50^0, 100^0C.

Table:2Variation of saturation current and voltage for transistors under tested at 27^0c,50^0c,100^0c.

Device/ fluence	27^0c		50^0c		100^0c	
	V_{CEsat}(v)	I_{CEsat}(A)	V_{CEsat}(v)	I_{CEsat}(A)	V_{CEsat}(v)	I_{CEsat}(A)
Unirradiated	0.66018808	2.213984	0.6827584	0.792726762	0.813166144	1.12327998
SiEL	0.727899687	4.35551×10-5	0.6601880 8	3.4122×10-5	0.64012539 2	3.3493×10-5
SiFL	0.727899687	3.04711×10-5	0.7278996 8	7.7688×10-6	0.74796238 2	1.7969×10-4
SiGL	0.574921633	1.41449×10-5	0.6827586 2	3.1067×10-5	0.682758681	5.1370×10-4

The output characteristics, shows the following variations in the un-irradiated and irradiated device. A parametric shift has been observed inV_{CEsat}andI_{CEsat}.

V_{CEsat}=0.66018 forun-irradiated device and it has shifted to 0.72789,0.727899 and 0.574921 volts in SiEL,SiFL and SiGL devices.

At room temperature, if the device temperature is increased the saturation voltage is 2.21398 for un-irradiated device and it has shifted to 4.35551×10^{-5},3.040719×10^{-5}and1.41449×10^{-5}volts at 50^0c temperature.

V_{CEsat}=0.8131661 for un-irradiated device and 0.640125,0.7479623 and 0.68275 for SiEL,SiFL and SiGL, These shifts in V_{CEsat} is important to know, it may also vary the switching parameters, $I_{CEsat}$is 2.213984 for un-irradiated device and for irradiated device its values are 4.355518×10^{-5},$3.0407189\times10^{-5}$and 1.414490×10^{-5}A for SiEL, SiFL and SiGL, When the device temperature is 27^0c. At the device temperature is 50^0c $I_{CEsat}$is 0.792726 for un-irradiated device, 3.41224×10^{-5}, $7.76888\times10^{-6}$and

3.10671116×10^{-5}A for SiEL, SiFL and SiGL,. At 100^0c I_{CEsat}=1.12327A for un-irradiated device and 3.3493410^{-5},1.79696710^{-4} and 5.1370410^{-4} A for SiEL, SiFL and SiGL, These variations in I_{CEsat} shows the desired current is not only affect the gain on the transistor, the switching characteristics may vary.

Switching Characteristics

For a transistor in the CE-mode when V_i=0V the base emitter junction act as open circuit. The emitter collector supply voltage(V_{CC}) appear across the output hence V_0 is the maximum when V_i=5V. The base emitter junction acts a short circuit maximum drop occurs across R_C.Hence V_0 is the minimum this describes the action a transistor as a switch. When V_i is varied in steps V_0 also increases after the barrier voltage is crossed at this stage with a small increase in input voltage (V_i) .and the output voltage increases appreciably hence the input is amplified.This describes the transistor as **Switch** and an active device.

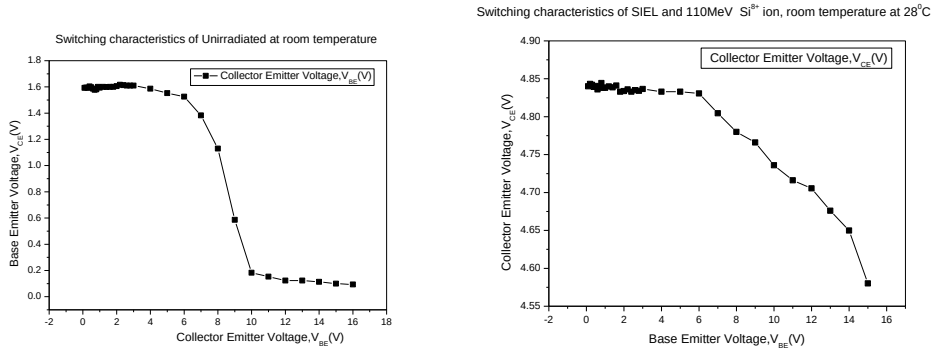

Figure 3.Switching characteristics for Un-irradiated and 110MeV Si^{8+} ion irradiated SiEL2N 6688 transistor at V_{CE}=5V room temperature 28^0C.

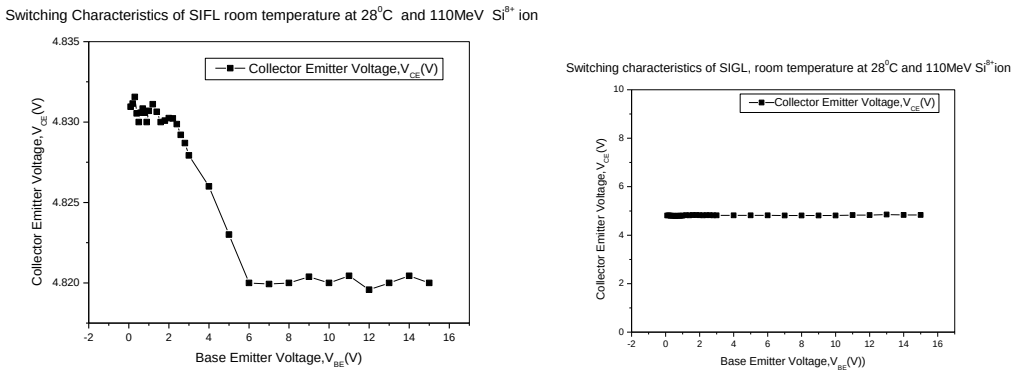

Figure 4 Switching characteristics for SIFL, SiGL110MeV Si^{8+} ion irradiated 2N 6688 transistor at V_{CE}=5V room temperature 28^0C.

Switching characteristics are taken by varying collector emitter voltage and base emitter voltage are obtained at constant input voltage (V_{CE}=V_I=5V).

Kept input voltage constant at 5V, varying Base emitter voltage 0.1 to15V we get collector emitter voltage and base current.

Plot graph V_{BE} versus V_{CE}.

Figure 3 & 4 shows Switching characteristics for un-irradiated, SIEL, SIFL, SIGL and 110MeV Si^{8+} ion irradiated 2N 6688 transistors at V_{CE}=V_I=5V room temperature at(27^0C).

From figure 3 it shows the switching characteristics of un irradiated and irradiated transistors tested at room temperature. From figure 4 it is clear that the transistor function as switch and active device. At voltage 0-16V the device acts on active device that it is in the ON state and above 18V it reaches to saturation, the device said be OFF state hence the un irradiated transistor works as normal switch and irradiated device to a fluence 5×10^{9} ions/cm^{2} shows that the device functioning is not working as a switch and it cannot be rectied with increase in fluence as shown in the figure4.

Conclusion

Bipolar transistorsare used extensively for analogy circuits utilize in a space applications.This device can be affected by a radiation exposure due to an increase of the bipolar base current.|During a mission temperature variation on board can have significant impact on circuit parameters examples input bias current,gain,active region of the devices etc.The behaviour of irradiated liner bipolar circuit over temperature is largely a function if the response of its transistors .The base current of a NPN BJT can increase by three order of magnitude with increase in irradiation fluence from 5×10^{9}ions/cm^{2} to 1×10^{12}ions/cm^{2}.The base current of an NPN BJT can increase by two order of magnitude when temperature is increase from 30^{0}C to100^{0}C after 1×10^{11}ions/cm^{2}(110 MeV Si^{8+} ion). In this paper we have investigated linear bipolar component can be employed in onboard with temperature for the space application.

References

[1] Barnaby HJ, Schrimf R D, Sternberg A L, Berthe V, Cirba C R & Pease R L, IEE Trans NulSci, 48 (2001)2074.

[2] Galloway K F, Schrimpf R D, Emily D W & Pease R L, IEEE Trans NuclSci, 60(2013)1731.

[3] Gnana Prakash A P, Pradeep T M, Vinayakprasanna N H, PushpaN, Bajpai P K, Patel S P, Tarkeshwar Trivedi &Bhushan K G, RadiatEff Defects Solids, 172 (2018) 922.

[4] Pushpa N, Praveen K C, Gnana Prakash A P, Gupta S K &Revannasiddaiah D, CurrApplPhys, 13 (2013) 66.

[5] Krishnakumar K S, Dinesh C M, Madhu K V, DamleR,Radhakrishna M C, Khan S A, &Kanjilal D, IEEE Trans Device Matter Rel, 15(2015) 101**.**

[6] H.J. Barnaby, R.D. Schrimpf, R.L. Pease, P Cole, T.Turflinger, J.Krieg, J.T.Titus, D. Emily, M. Gehlhausen, S.C. Witczak, M.C. Maher, D.VanNort, Identification of degradation mechanisms in a bipolar linear voltage comparator throughcorrealation of transistor circuit response, IEEE Trans, Nucl. Sci. 46(6)(Dec.1999) 1666-1673.

[7] X.Li,W.Lu, Q.Guo, D.M. Fleetwood, C.He, X.Wang, X.Yu, J.Sun, M.Liu, S.Yao, Temperature-switching during irradiation as a test for ELDRS in linear bipolar devices, IEEE trans. Nucl. Sci.66(1)(Jan. 2019)199-206.

[8] H.J. Barnaby, B.Vermeire, M.J. Campola, Improved model for increased surface recombination current in irradiated bipolar junction transistors, IEEE Trans Nucl. Sci.62(4)(Aug.2015) 1658-1664.

[9] B.S. Tolleson, P.G. Adell, B.Rax, H.J. Barnaby, A.Privat, X.Han, A.Mahmud, I.Livingston, Improved model for excess base current in irradiated lateral PNP bipolar junction transistors, IEEE Trans. Nucl.sci, Aug,2018.