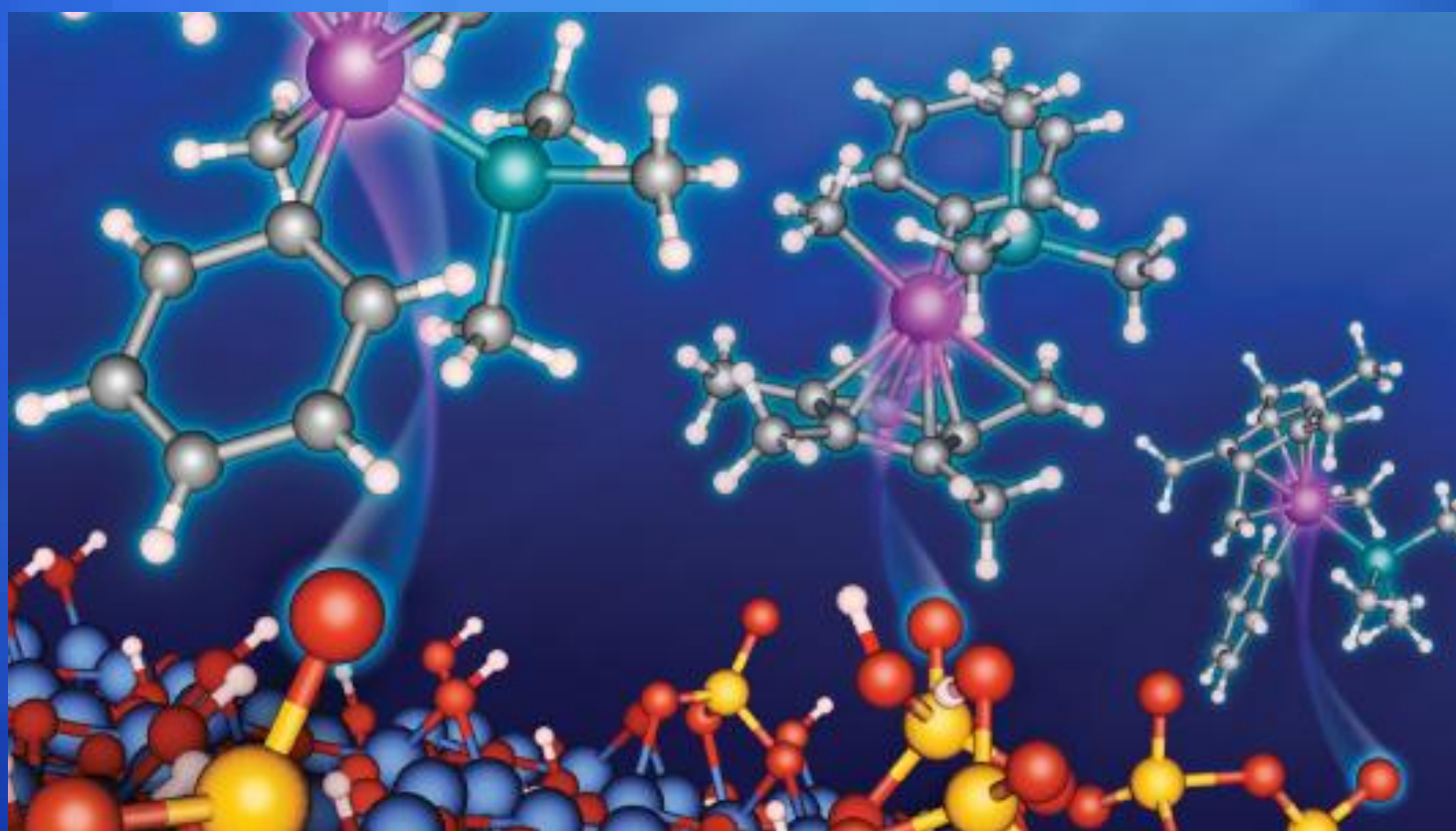


CATALYST

VOLUME-1

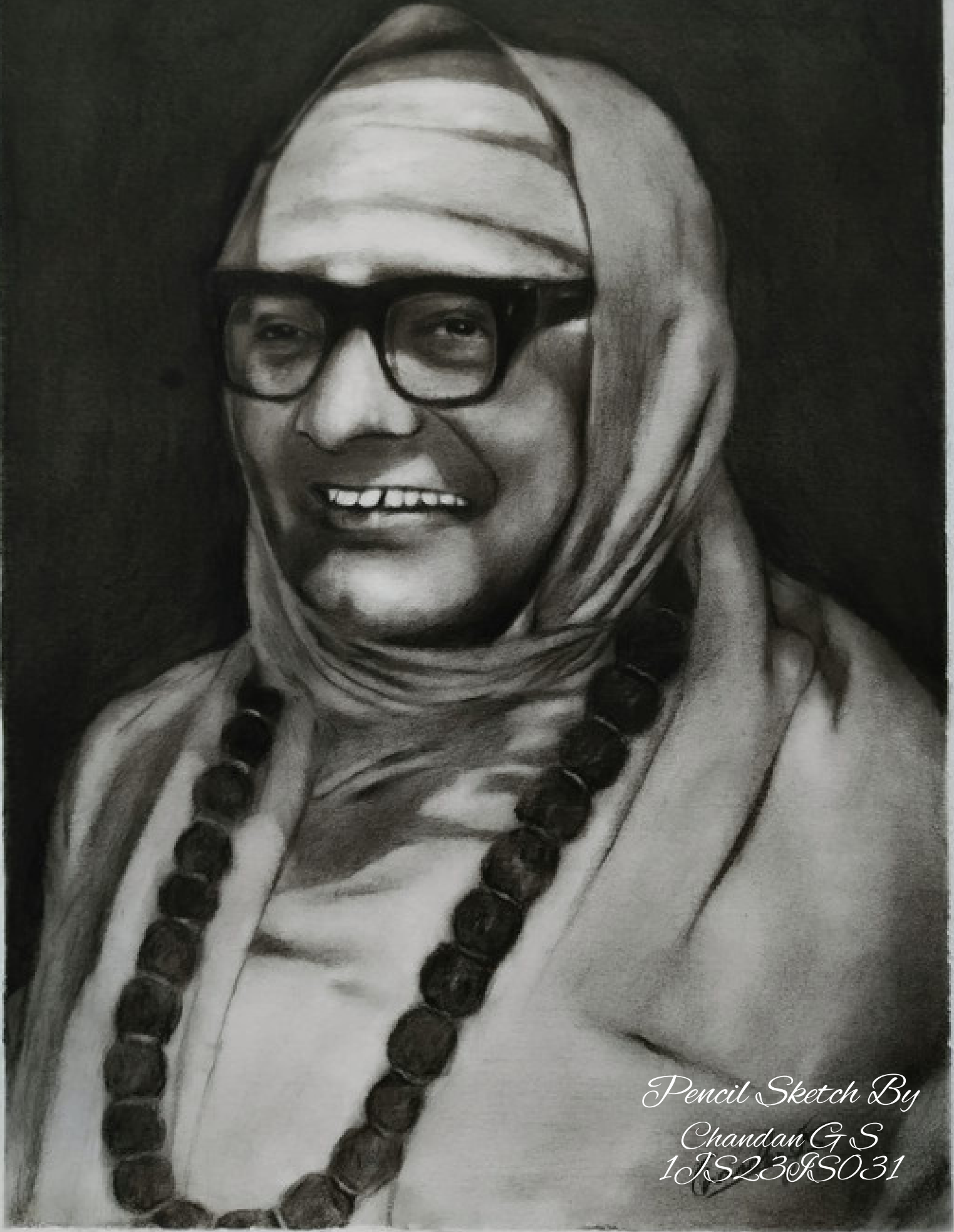
2023-2024



DEPARTMENT OF CHEMISTRY

**JSS ACADEMY OF TECHNICAL EDUCATION,
BENGALURU**

WITH THE BLESSINGS OF HIS
HOLINESS



Pencil Sketch By
Chandan G S
1JS23JS031



Department of Chemistry

CATALYST

2023-2024

VOL.1

EDITORIAL BOARD

From Editorial Desk

The Department of Chemistry is excited to present the first edition of the Chemistry Newsletter, CATALYST, dedicated to the latest updates and insights from the vibrant world of chemistry. This issue features profiles of our accomplished professors, shedding light on their current cutting-edge research, publications, and contributions to the academic community. The students have excelled inside and outside the classroom, showcasing a dedication to scholarly excellence. The CATALYST reports about seminars, workshops, and conferences conducted in the department. This newsletter is a platform for celebrating the achievements and fostering the collaborative spirit that defines the Department of Chemistry. The department acknowledges your continued support and looks ahead to building vibrant activities and an informed community through 'CATALYST'.

Dr. Kathyayani D



Dr. Bhimasen Soragaon
Editor in Chief



Dr. Mahesh B
Executive Editor



Dr. Roopashree B
Executive Editor



Dr. Kathyayani D
Editor

JOINT DIRECTOR



My Heartfelt Congratulations on the launch of the Chemistry Inaugural Newsletter!

I am immensely proud of the dedication and hard work that has gone into bringing this vision to life. The Newsletter embodies a commitment to excellence, innovation, and collaboration. It serves as a platform for sharing knowledge, celebrating achievements, and fostering connections.

I would like to express my appreciation to all the contributors, editors, and staff members who have poured their time, energy, and expertise into making this Newsletter a reality. The passion and enthusiasm are truly inspiring. As we embark on this exciting journey, I encourage each of you to continue to share your insights, ideas, and experiences.

I look forward to the continued success and growth of chemistry newsletter.

Best Wishes

Dr.H.R.Mahadevaswamy

Joint Director

Technical Education Division,

JSS Mahavidyapeetha

Mysuru

EDITOR-IN-CHIEF



With immense delight and a sense of pride I extend a warm welcome to all of you as we launch the inaugural issue of the Chemistry Department Newsletter - CATALYST. I am filled with a sense of pride and optimism about the collective journey we are undertaking as a community committed to excellence in education.

Our Institution has always stood for academic rigor, fostering a holistic learning environment, and nurturing the talents and aspirations of our students. In this newsletter, the Department of Chemistry celebrates the achievements and milestones that define our shared commitment to learning and growth. The newsletter is designed to serve as a platform for sharing knowledge, experiences, and accomplishments that define our shared journey in education and research.

May 'CATALYST' remain a record of our voyage, encapsulating the core of our successes and goals. Cheers to the newsletter's continued success and the Department of Chemistry's promising future at our organization.

Dr. Bhimasen Soragaon

Principal

JSS Academy of Technical Education

DEAN ACADEMICS



Dear Esteemed Colleagues and Students,
The Chemistry Department at JSS Academy of Technical Education, Bengaluru has always been a beacon of academic excellence, fostering innovation, critical thinking, and a passion for scientific inquiry. As we embark on another academic year filled with opportunities for growth and discovery, it is imperative to reflect on the journey undertaken by the department.

First and foremost, I would like to express my heartfelt appreciation to the dedicated faculty members whose unwavering commitment to teaching, research, and mentorship has been instrumental in shaping the academic landscape of the department. Their tireless efforts in the classroom, laboratory, and beyond have inspired generations of students to pursue excellence in the field of chemistry. I am immensely proud of the collective achievements of the department and am filled with optimism for the future.

Thank you for your continued dedication and support and my hearty congratulations to the faculty, students and editorial board for the perfection of the magazine. I hope this edition of CATALYST 2024 would be a reading pleasure to all!

Dr. Naveen N C
Professor and Dean Academics
JSS Academy of Technical Education

DEAN RESEARCH



I am glad to share with you a significant landmark for our academic community: the release of our inaugural newsletter, "Catalyst!"!

This newsletter portrays the culmination of our collective efforts, showcasing the exuberance and deeds in the Department of Chemistry. It functions as a medium to mark our conquests, share inspiring tales, and keep everyone apprised about the most delinquent outcomes.

Inside this inaugural edition, you will find:

- i. Highlights of academic accomplishments and accolades**
- ii. Insights into research and academic efforts**
- iii. Engaging parables about student feats and attempts**
- iv. Updates on impending occurrences, workshops, and seminars**
- v. Spotlights on faculty and staff members making a difference**

I encourage each of you to take a moment to examine the newsletter. Your contributions, whether through accomplishments, insights, or support, have played a crucial role in shaping our community and enriching our academic landscape.

A heartfelt thanks to every contributor for the inaugural edition of Catalyst. Your devotion, expertise, and dedication have made this newsletter an existence, and I look forward to many more editions that will persist in preserving our excellence.

Dr. Mahesh B

Professor & Dean Research

JSS Academy of Technical Education

DEAN STUDENTS WELFARE



Dear Colleagues and Students,

As a Dean of Students Welfare, I have had the privilege to witness the transformative power of education, and it is a privilege to share a few words with you today.

Our college stands as a beacon of knowledge, innovation, and progress, and each of you, as students, faculty, and staff, are integral components of this journey toward excellence.

I congratulate the Department of Chemistry on the inaugural edition of the Chemistry Newsletter CATALYST. This newsletter aims to be a valuable resource for professionals, enthusiasts, and curious minds alike. In this issue, you will find insightful articles penned by the faculty members, updates on ongoing research, student spotlights, upcoming events, and much more.

I extend my heartfelt gratitude to everyone who has contributed to the creation of this newsletter, whether through their written submissions, editorial assistance, or design expertise.

Wishing you all continued success and fulfillment in your academic and research endeavors.

Dr. D Mahesh Kumar

Professor & Dean Students Welfare

JSS Academy of Technical Education

HEAD OF THE DEPARTMENT



Dear Colleagues and Friends,

It is with great pleasure and excitement that I welcome you to the inaugural issue of “CATALYST”, our Chemistry Newsletter. This initiative reflects our commitment to fostering a vibrant community of scholars, researchers, and enthusiasts in the field of chemistry. Chemistry is not just a scientific discipline; it is a vibrant mosaic of elements, reactions, and transformations that shape the world around us.

In this newsletter, we have an opportunity to showcase the breadth and depth of our department's expertise and accomplishments. From highlighting the latest research breakthroughs to profiling the achievements of our faculty and students, this platform will serve as a beacon of knowledge and inspiration for all who are passionate about chemistry.

I extend my heartfelt thanks to the Dr. Kathyayani D, Editor of this newsletter for the hard work and dedication in bringing this vision to life. Your efforts are truly commendable, and I am confident that this newsletter will become an invaluable resource for our community.

As we embark on this journey together, I am filled with optimism for the future of our department and the boundless possibilities that await us. Thank you for your support, and here's to many more enlightening issues of the Chemistry Newsletter.

Dr. Roopashree B

HOD-Chemistry & Associate Professor

JSS Academy of Technical Education



JSSATE
BENGALURU

Department of Chemistry

CATALYST



Vision of the Institute:

To be among the finest Institutions providing Engineering and Management Education empowered with research, innovation, and entrepreneurship.

Mission of the Institute:

- Strive towards Excellence in teaching–learning process and nurture personality development.
- Encourage Research, Innovation & Entrepreneurship.
- Train to uphold highest ethical standards in all activities.

Vision of the Department

To empower the students with the fundamentals of chemistry for an active career in technical education and research.

Mission of the Department

- To contribute quality education in applied chemistry.
- To inculcate the significance of chemistry for research and innovation.



JSSATE
BENGALURU

Department of Chemistry

CATALYST

Faculty Details



Dr. Mahesh B

Professor & Dean Research

Area of Interest: Synthetic Organic Chemistry, Natural Chemistry, Nanomaterials, Peptide-based materials



Dr. Roopashree B

Associate Professor & HOD

Area of Interest: Coordination chemistry, Bioinorganic Chemistry and Solar cells



Dr. Kathyayani D

Assistant Professor

Area of Interest: Polymer, Synthetic Organic Chemistry and NanoChemistry



JSSATE
BENGALURU

Department of Chemistry

CATALYST

Faculty Details



Dr. Puneetha J

Assistant Professor

**Area of Interest: Nanomaterials,
Photocatalysis and Dye degradation**



Dr. Chamaraja N A

Assistant Professor

**Area of Interest: Bio- Analytical Chemistry,
Environmental Chemistry, Pharmaceutical
Chemistry and Nanochemistry**



Ms. Bindhu S

Assistant Professor

**Area of Interest: Polymer, Nanomaterials and
Medicinal Chemistry**



JSSATE
BENGALURU

Department of Chemistry

CATALYST

Non-Teaching Staff



Mr. Basavaraju B.R
MSc., (Chemistry), PGDCA
Lab Instructor



Mr. Manjunatha
DME
Lab Instructor



Mr. Suresha C.S.
B.A., B.Lib.
Lab Helper



CATALYST

Research Scholars

The department has been recognized as a research center by VTU in the year 2016 and there are 3 approved guides as resource persons. Two are awarded with Ph.D. Currently, 06 research scholars are working on their Ph.D. and Two funded projects from DST and VGST have been completed successfully.



Mrs. Kokila N R

Phytochemical investigation and pharmacological screening of selected medicinal plants.

Guide: Dr. Mahesh B



Mr. Lokesh H R

Design and synthesis of polypeptide: A study on physicochemical characteristics and their blends with commercially available polymers for wound therapeutic applications.

Guide: Dr. Mahesh B



Mr. Siddegowda K S

A Study on synthesis, Characterization, antimicrobial and electro-catalytic activity of metal oxide Nanoparticles.

Guide: Dr. Mahesh B



Mrs. Preethi G

Study on Polymer-Metal Complex Composites containing Substituted Benzimidazoles for Optical and Electrical applications

Guide: Dr. Roopashree B

Co-Guide: Dr. Mahesh B



Mrs. Asha S C

Development of Smart food packaging materials

Guide: Dr. Mahesh B



Mr. Praveen Kumar C

Development of new analytical methods for the assay of some biologically important enzymes.

Guide: Dr. Chamaraja N A



CATALYST

LAB INFRASTRUCTURE



CATALYST

LAB INFRASTRUCTURE- R&D



FTIR spectrophotometer



Deep Freezer



Rotavapor



Refrigerator

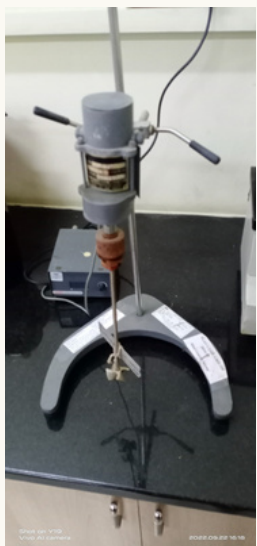


Soxhlet extractors



CATALYST

LAB INFRASTRUCTURE- R&D



Geard Stirrer



UV-viewing cabinet



Hot Air Oven

Fume Hood



Wrist-Action Flask Shaker



UV-Visible Spectrophotometer

CATALYST

VOL.1

2023-2024

DEPARTMENT ACTIVITIES



An expert talk on “University of Miyazaki and the Indian Academic Fiduciary Outreach” by Dr. Harishkumar Madhyastha on 4th February 2023.



DEPARTMENT OF CHEMISTRY

“National Science Week -2023” Celebration from 21.02.2023 to 03.03.2023 and expert talk by Shri Hemanth Kumar Reddy N, Group Director, Space Navigation Group, URSC/ISRO on 03.03.2023



DEPARTMENT OF CHEMISTRY



DEPARTMENT OF CHEMISTRY

5th Popular Lecture series on the topic “Understanding and Managing Stress Effectively” by Dr. Paulomi M Sudhir, Professor at Department of Clinical Psychology, NIMHANS, Bengaluru on 22.07.2023.



DEPARTMENT OF CHEMISTRY

"National Science Fair-23" was conducted between 31st August to 2nd September 2023 and was inaugurated by Padmashri Dr. Ayyappan S, Chairman Karnataka Science & Technology Academy, Bengaluru, Chancellor Central Agricultural University, Imphal, Former Secretary, DARE & Director General, ICAR; President, National Academy of Agricultural Sciences, New Delhi. National Science Fair-23 Exhibition, Technical Talk, Hands-on activity on Science, Technology, Education, Arts, Maths, Skywatch and HAM radio



DEPARTMENT OF CHEMISTRY

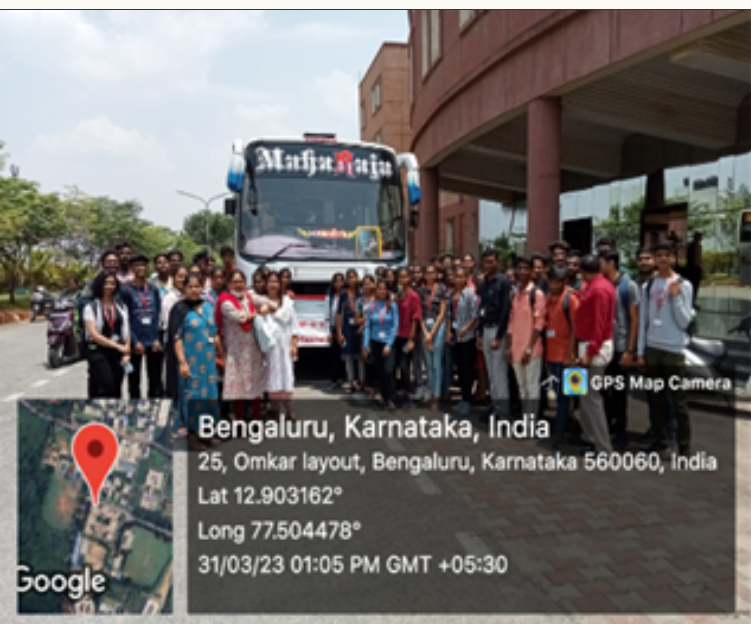


DEPARTMENT OF CHEMISTRY



DEPARTMENT OF CHEMISTRY

Lab Visit to “Centre for Nanoscience & Engineering lab (CeNSE)”, IISc, Bengaluru on 31st March 2023 for 1st Year BE & B.Sc (H) Chemistry Major Students.



**FACULTY
ACCOMPLISHMENTS**

DEPARTMENT OF CHEMISTRY

Ph.D. AWARDEES



Dr. Puneetha J
Assitant Professor

Dr. Puneetha J. is conferred with a Ph.D. in chemistry on the thesis title "Synthesis and Characterization of Visible Light Metal Oxide and Their Composites for Photocatalytic Applications" from Visvesvaraya Technological University in 2023 under the Guidance of Dr. Nagaraju Kottam, Associate Professor, Department of Chemistry, MSRIT, Bengaluru, and Dr. Rathna A, Former Professor, Department of Chemistry, JSSATE, Bengaluru.



Dr. Kathyayani D
Assitant Professor

Dr. Kathyayani D. is conferred with a Ph.D. in chemistry on the thesis title "Synthesis and Characterization of polypeptides: Examination on the miscibility of their blends with commercially available polymers for therapeutic applications" from Visvesvaraya Technological University in 2023 under the Guidance of Dr. Mahesh B, Professor of Chemistry & Dean Research, JSS Academy of Technical Education, Bengaluru.

VISIT TO FOREIGN UNIVERSITY



Dr. Mahesh B
Professor & Dean Research

Dr. Mahesh B., Professor of Chemistry, Dean Research, was invited as a Research Scientist at the Department of Chemistry of Biomaterials and Cosmetics, Faculty of Chemistry, Nicolaus Copernicus University, Torun, Poland, in 2023.

DEPARTMENT OF CHEMISTRY

AWARD

"Silver Medal" is awarded to Dr. Mahesh B and Mrs Kathyayani D, for the project titled "Design of innovative wound healing materials from synthetic polypeptides with Collagen" under the category of invention and technology called "Healthy Society" at the annual International Exhibition of Inventions and Technology InnoWings held on June 15-16, 2023, at Lublin University, Poland.



RESEARCH PUBLICATIONS

1

Divakara, S. G., & **Mahesh B.** (2023) A comprehensive review on current trends in greener and sustainable synthesis of ferrite nanoparticles and their promising applications, *Results in Engineering*, 101702

2

Kathyayani, D., Mahesh, B., Gowda, D. C., Sionkowska, A., & Veeranna, S. (2023) Investigation of miscibility and physicochemical properties of synthetic polypeptide with collagen blends and their wound healing characteristics, *International Journal of Biological Macromolecules*, 125704. <https://doi.org/10.1016/j.ijbiomac.2023.125704>

3

Mahesh, B., & Mruthunjaya, K Aathira, P. Suresh., Nallupillai Paramakrishnan. (2023) A Comprehensive Review on *Cardiospermum halicacabum*, *Journal of Natural Remedies*, 23(2), 284–293. <https://doi.org/10.18311/jnr/2023/29382>

4

Mahesh, B., Lokesh, H. R., **Kathyayani, D.,** Sionkowska, A., Gowda, D. C., & Adamiak, K. (2023). Interaction between synthetic elastin-like polypeptide and collagen: Investigation of miscibility and physicochemical properties. *Polymer*, 272, 125833. <https://doi.org/10.1016/j.polymer.2023.125833>

5

Lakshminarayana, Shilpa Madhugiri, **Roopashree Boregowda,** and Gayathri Virupaiah. (2023). "Reusable palladium–quinolyl benzimidazole complex immobilized on a polymer for the hydrogenation of organic substrates." *Chemical Papers*, 1-13. <https://doi.org/10.1007/s11696-023-02721-7>

6

Roopashree, B., Mahesh, B., Ramu, R., Rekha, N. D., Manjula, S. N., Preethi, G., & Gayathri, V. (2023). An insight into the cytotoxic, antimicrobial, antioxidant, and biocontrol perspective of novel Iron (III) complexes of substituted benzimidazoles: Inhibition kinetics and molecular simulations. *Journal of Biomolecular Structure and Dynamics*, 1-17.

RESEARCH PUBLICATIONS

7

Shubha, J. P., **Roopashree, B.**, Patil, R. C., Khan, M., Shaik, M. R., Alaqarbeh, M., & Adil, S. F. (2023). Facile synthesis of ZnO/CuO/Eu heterostructure photocatalyst for the degradation of industrial effluent. *Arabian Journal of Chemistry*, 16(3), 104547. <https://doi.org/10.1016/j.arabjc.2023.104547>

8

Kokila, N. R., **Mahesh, B.**, Ramu, R., **Roopashree, B.**, & Mruthunjaya, K. (2023). α -Amylase inhibitory potential of *Thunbergia mysorensis* leaves extract and bioactive compounds by in vitro and computational approach. *Journal of Biomolecular Structure and Dynamics*, 1-17. <https://doi.org/10.1080/07391102.2023.2190408>

9

Siddegowda Kathrikenahalli Somashekarappa, **Mahesh Basavaraju, Chamaraja Nelligere Arakeshwaraiyah**, Roopa Kotthathi Papanna, Kumara Swamy Ningappa, Divakara Soorly Gopala, Jayarame Gowda (2023). Rapid Electrochemical Investigation of Gemfibrozil Using NiONPs/Multiwalled Carbon Nanotube Modified Carbon Paste Electrode: Analysis of Human Urine Sample and Antimicrobial Activity. *Chemistry Select*, 8(48), e202302407.

10

Bindhu, S., Raj, V., Nanjundaswamy, S., Hemavathi, M., Sandeep, S., Renganathan, R. A., & Rai, V. R. (2023). Insight into the conformational analysis of 3-phenyl-N-(3-(trimethoxysilyl) propyl) prop-2-en-1-imine (PTP) as a biocidal candidate: In-silico and quantum computational approach. *Results in Chemistry*, 5, 100685.

11

Surendra, D. M., **Chamaraja, N. A.**, Yallappa, S., Bhavya, D. K., Joseph, S., Varma, R. S., & Patel, B. B. (2023). Efficacy of phytochemical-functionalized silver nanoparticles to control Flacherie and Sappe silkworm diseases in *Bombyx mori* L. larvae. *Plant Nano Biology*, 5, 100048.

12

Yaidikar, Lavanya, Pydiraju Kondrapu, Astha Mishra, Pramod Bhaskar Kumar, Arshad Ahmad, K. A. Shaima, **N. A. Chamaraja**, and Shubhangi Tripathi. (2023) "Screening and discovery of novel carbamate compounds for cancer therapy." *Journal of Cardiovascular Disease Research*, 678-697.

CATALYST

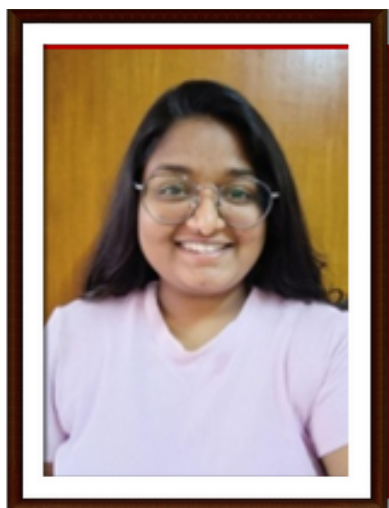
VOL.1

2023-2024



STUDENTS CORNER

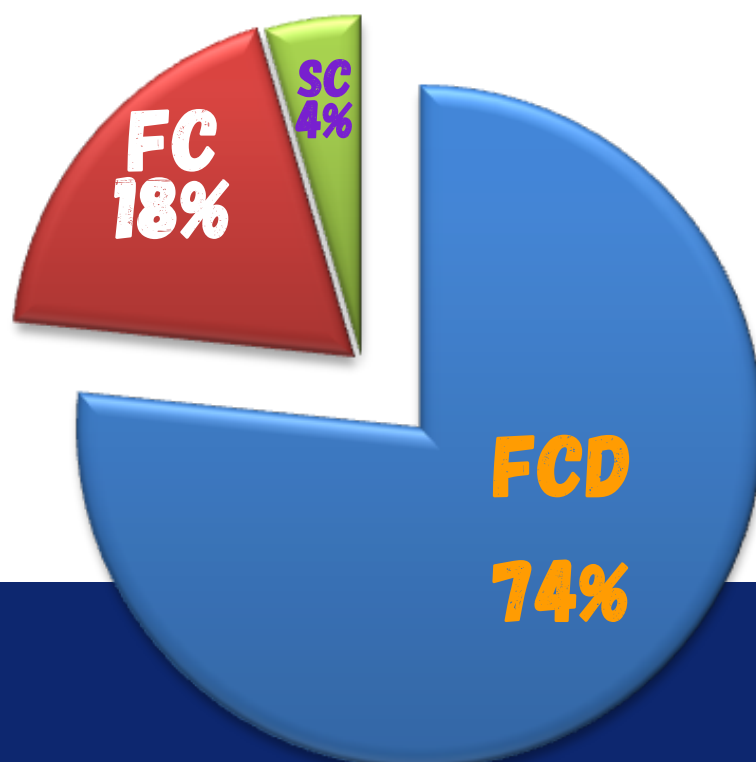
Chemistry toppers in VTU exam-2023



VINUTHA V HALLUR
1JS22CS185

POOJA SHREE T S
1JS22EC092

Chemistry Results in VTU exam-2023



CATALYST

VOL.1

2023-2024

ART GALLERY



Srujana M R
1JS23CS171

CATALYST

VOL.1

2023-2024

THE NOBEL PRIZE IN CHEMISTRY - 2023



Alexei I. Ekimov



Louis E. Brus



Moungi G. Bawendi

Chandan

Chandan G S
1JS23IS031

CATALYST

**Scientific Articles
From
Faculty and Students**

Nanotechnology: Shaping the Future of Engineering

Innovations frequently result from the merging of different scientific fields in the dynamic field of engineering. Nanotechnology, the study of materials and devices at the nanoscale, has become a potent force causing revolutionary shifts in many engineering fields. This newsletter article examines the various ways that nanotechnology is influencing the future of our industry and discusses its significance in the engineering area.



Dr. Puneetha J
Assistant Professor

Nanomaterials Revolutionizing Structural Engineering

Nanotechnology has introduced a new era in structural engineering by providing materials with unprecedented strength, flexibility, and durability. Nanocomposites, created by integrating nanoscale reinforcements into traditional materials, offer exceptional mechanical properties. These advanced materials are revolutionizing the construction industry, allowing for the development of lighter yet stronger structures that can withstand extreme conditions and contribute to sustainable design practices.

Electronics and Nanoelectromechanical Systems (NEMS)

In the realm of electronics, nanotechnology is a driving force behind the development of nanoelectromechanical systems (NEMS). These tiny devices, operating at the nanoscale, hold the promise of faster, smaller, and more energy-efficient electronic components. From nanoscale transistors to ultra-sensitive sensors, nanotechnology is paving the way for the next generation of electronic devices that are not only more powerful but also consume less energy.

CATALYST

VOL.1

2023-2024

Energy Harvesting and storage

Nanotechnology plays a pivotal role in addressing energy challenges by enabling the development of advanced materials for energy harvesting and storage. Nanomaterials are enhancing the efficiency of solar cells, improving the capacity of batteries and supercapacitors, and revolutionizing the way we generate and store energy. These advancements are crucial in the transition towards sustainable and renewable energy solutions.

Nanomedicine and Biomedical Engineering

In the field of biomedical engineering, nanotechnology has opened up new frontiers with applications in drug delivery, diagnostics, and imaging. Nanoscale particles can be designed to target specific cells, tissues, or even individual molecules within the body. This precision in drug delivery minimizes side effects and enhances the efficacy of treatments. Additionally, nanoscale imaging technologies provide unprecedented insights into biological systems, enabling earlier and more accurate diagnoses.

Environmental Engineering and Nanoremediation

Nanotechnology is also making significant strides in environmental engineering through the development of nano remediation techniques. Nanomaterials can be tailored to efficiently remove pollutants from soil, water, and air. From cleaning up contaminated sites to improving water purification processes, nanotechnology offers innovative solutions to environmental challenges, contributing to a cleaner and more sustainable planet.

In conclusion, nanotechnology is a driving force that is reshaping the engineering landscape. Its applications are diverse, ranging from structural advancements to transformative breakthroughs in electronics, energy, healthcare, and environmental sustainability. As we continue to explore and harness the potential of nanotechnology, the engineering field stands on the brink of a new era filled with unprecedented possibilities.

Revolutionizing Health: The AI Prescription for a Smarter Future

In numerous sectors, AI has emerged as a game-changer, and healthcare is no exception. A brand-new era of innovation and performance is emerging from the integration of artificial intelligence into healthcare packages. So, what is the profound effect of AI on healthcare and what are the advantages and potential challenges related to its integration?



Mahi Singh

1JS23IS081

Artificial intelligence is permitting personalized care and tailor-made remedy plans for every affected person. AI algorithms can pick out the most appropriate remedies and drugs for precise patients based totally on the evaluation of gene records, medical history or lifestyle elements. This method is not only useful for sufferers but also reduces unfavorable reactions and healthcare prices. With AI, the generation of one-length-suit medicinal drugs is changing step by step with a more private and focused approach.

Diagnostic equipment is one of the key areas in which AI is making massive advances. Traditionally, the diagnosis of diseases and illnesses has been based closely on clinical information and experience. But, with the purpose of correctly and timely diagnosing sufferers, AI-enabled systems can read a massive amount of healthcare statistics together with fitness facts, laboratory effects, or imaging. AI can discover patterns and anomalies that may be disregarded by healthcare experts, resulting in more powerful and accurate diagnoses through the use of device-getting-to-know algorithms. Patient outcomes and survival costs may be notably stepped forward with the aid of the use of artificial intelligence to detect diseases in advance.

CATALYST

VOL.1

2023-2024

Within the realm of affected person care, AI is improving the efficiency of healthcare structures. Chatbots and digital assistants powered by AI can offer on-the-spot responses to patient queries, provide medication reminders, or even reveal patient vitals remotely. This now not only improves affected person engagement but additionally alleviates the load on healthcare companies, allowing them to be cognizant of more complex tasks.

Despite these exquisite improvements, the mixing of AI in healthcare is not without demanding situations. Moral issues, record protection and privacy issues must be carefully addressed. Making sure that AI algorithms are obvious and unbiased and observing privacy regulations is vital to maintaining acceptance as true within these technologies.

Furthermore, there is a need for ongoing collaboration among healthcare experts and AI builders. The successful integration of AI calls for deep information on each of the technological talents and the nuances of medical exercise. Bridging the gap between these two nation-states is vital for the effective and accountable deployment of AI in healthcare.

In conclusion, mixing AI into healthcare holds massive potential to revolutionize the industry. However, the impact of synthetic intelligence on healthcare is transformative and multifaceted. From diagnostic tools to personalized medicine and patient care, AI is remodeling how we approach healthcare. However, it is critical to cope with the challenges associated with AI integration consisting of affected personal privacy and professional training to make certain that AI-powered healthcare structures are helpful, honest and safe. We can say that AI can make or destroy us with careful consideration and responsible implementation, AI can make considerable contributions to improving affected person effects and advancing the sphere of healthcare.

CATALYST

VOL.1

2023-2024

Corona Imaging: Unravelling the Sun's Outer Atmosphere

In the vast expanse of our solar system, the Sun, a luminous celestial entity, continues to bewilder scientists with its complex and enigmatic outer atmosphere — the solar corona. The intrigue surrounding this outermost layer hotter than the Sun's surface itself is now the focal point of exploration thanks to missions like India's Aditya-L1.



Anurag Jaiswal

1JS23IS015

The solar corona a delicate shroud of plasma extending into the cosmic void poses a scientific puzzle that Aditya-L1 aims to unravel. By capturing high-resolution images of this elusive region the mission aspires to provide unprecedented insights into solar dynamics.

At the core of Aditya-L1's endeavors lies a suite of advanced instruments designed for corona imaging. These tools including specialized cameras and spectrographs operate on the principles of solar spectroscopy. By analyzing the wavelengths of light emitted by the corona they unveil the chemical composition and temperature intricacies of this ethereal outer layer.

Beyond the visual allure, corona imaging carries profound implications for our understanding of space weather. By deciphering the corona's behavior scientists can predict solar flares and geomagnetic storms, crucial information for the functioning of space-based technologies and satellites. Yet the path to unveiling the secrets of the solar corona is fraught with challenges. The stark contrast between the Sun's surface and the corona's faint light demands technological innovations. Aditya-L1 rises to the occasion showcasing the engineering prowess of the Indian Space Research Organisation (ISRO). Advanced optics and exposure control mechanisms ensure the capture of precise data from this cosmic ballet of light.

CATALYST

VOL.1

2023-2024

Corona imaging, however, is not a solitary pursuit. It is a collaborative venture drawing scientists from around the world into a shared exploration of the Sun's outer atmosphere. Aditya-L1 stands as a testament to the power of international cooperation in advancing our understanding of the cosmos.

As Aditya-L1 prepares to turn its instruments toward the solar corona, humanity stands on the brink of a new era in solar exploration. The images to be captured by this mission represent not just a collection of pixels but a visual journey into the heart of the Sun, a cosmic odyssey revealing the interplay of light, heat, and chemistry in the vastness of space.

In unlocking the secrets of the solar corona Aditya-L1 transcends the boundaries of scientific inquiry. It becomes a testament to our insatiable curiosity, our collective quest to comprehend the cosmic wonders that shape our existence. As the mission unfolds, each image transmitted from the depths of space becomes a pixel in the grand mosaic of human understanding, connecting us to the cosmic ballet that has played out for eons.

So, as Aditya-L1 embarks on its celestial voyage, we find ourselves not merely observing the Sun but participating in a journey of discovery. The solar corona, once a distant mystery, now beckons us to decipher its secrets inviting us to be co-authors in the unfolding narrative of the universe. In these images lies not just the story of the Sun but a chapter in the ongoing saga of human exploration a testament to our relentless pursuit of knowledge in the boundless reaches of space.

Unraveling the Atomic Enigma A Chemical Insight into Nuclear Bombs

As I delve into the intricate world of nuclear bombs, the underlying chemistry reveals a staggering tale of unimaginable power harnessed at the atomic level. The fundamental principle behind the destructive force lies in the process of nuclear fission, a reaction that splits the nucleus of an atom into smaller fragments, releasing an immense amount of energy.



Dhruv S Jain
1JS23IS041

Chemistry of Destruction: Nuclear Fission Unveiled

Nuclear bombs primarily rely on isotopes of heavy elements, such as uranium-235 or plutonium-239. These isotopes are inherently unstable and under the right conditions, they can undergo nuclear fission. The process begins when a neutron collides with the nucleus of a fissile atom, causing it to split into two smaller nuclei, accompanied by the release of more neutrons and an enormous amount of energy. This chain reaction continues exponentially leading to the devastating explosion associated with nuclear weapons.

The energy released during nuclear fission is a manifestation of Einstein's famous equation;

$$E=mc^2$$

where a small amount of mass is converted into a significant amount of energy. This immense energy release is what makes nuclear bombs exceptionally powerful and destructive.

The Conundrum of Nuclear Weapons: A Personal Reflection

Expressing an opinion on the utility of nuclear bombs is a complex endeavor. On one hand, these weapons have been a deterrent during times of geopolitical tension, preventing large-scale conflicts due to the fear of mutually assured destruction. The delicate balance maintained by nuclear deterrence has arguably contributed to global stability in some instances.

However, the catastrophic consequences of a nuclear detonation cannot be ignored. The sheer scale of destruction, the long-lasting environmental impact and the potential loss of countless lives raise profound ethical concerns. The use of nuclear weapons in warfare remains a morally contentious issue, as the devastating aftermath extends far beyond the immediate conflict.

A Call for Responsible Stewardship: Charting a Safer Course

In contemplating the chemistry behind nuclear bombs, it becomes evident that the power they wield demands responsible handling and international cooperation. Striking a balance between national security concerns and global safety is imperative. Vigilance in preventing the proliferation of these weapons and pursuing disarmament initiatives are crucial steps towards a safer world.

In conclusion, the chemistry of nuclear bombs unveils a double-edged sword, a scientific marvel capable of both preserving peace through deterrence and unleashing unparalleled destruction. The path forward requires a thoughtful and collective effort to ensure that the power inherent in these weapons is wielded responsibly for the greater good of humanity.

Exploring the Role of Artificial Intelligence in Chemistry

The latest developments in artificial intelligence have introduced new possibilities and potential for the field of chemistry. The integration of AI in chemistry research can revolutionize the field by accelerating the discovery process, improving accuracy, and enabling more efficient use of resources. In addition, AI has also played a crucial role in advancing environmental sustainability in chemistry.



Sameeksha Muralidhara.

1JS23IS141

Here are several ways in which AI contributes to the field of chemistry:

Computational Chemistry:

Computational chemistry is a branch of chemistry that uses computers to assist in solving chemical problems. It uses the result of theoretical chemistry, incorporated into an efficient computer program to calculate the structures and properties of molecules and solids. AI algorithms, coupled with machine learning techniques, enable efficient sampling of chemical spaces and reduce the computational cost of electronic structure evaluations, allowing for rapid exploration of new molecules and longer timescales for molecular dynamics simulations.

Molecular Modelling and Simulation:

Molecular modeling describes the generation, representation and/or manipulation of 3-D structure of chemical and biological molecules, along with the determination of physicochemical properties that can help to interpret the structural activity relationship (SAR) of the biological molecules. Molecular modeling is used to simulate molecular behavior in chemical or biological systems. Molecular modeling provides scientist with five major types of information:

1. The 3D structure of molecules .

2. The chemical and physical characteristics of the molecules.
3. Comparison of the structure of a molecule with other different molecules.
4. Visualization of complexes formed between different molecules/macromolecules.
5. Prediction about how new related molecules might look.

Drug Discovery and Design:

- **Virtual Screening:** AI algorithms can analyze large databases of chemical compounds to identify potential drug candidates by predicting their interactions with biological targets.
- **Structure-Based Drug Design:** AI-aided design tools help researchers optimize the structure of drug molecules for improved efficiency and reduced side effects.

Chemoinformatics :

- **Data Mining and Analysis:** AI techniques can be applied to analyze vast chemical databases, extracting patterns and trends that aid in drug discovery, toxicity prediction, and material design.
- **Chemical Informatics:** Algorithms and software tools help organize and manage chemical data, facilitating efficient data retrieval and their analysis.

CATALYST

VOL.1

2023-2024

Plastic waste = Electrical energy

“Be a part of the solution not the plastic pollution”

In the face of escalating plastic pollution, exacerbated by the rising demand for electrical energy, the innovative conversion of plastic waste into a power source emerges as a crucial solution. The scarcity of electrical energy, driven by global demand, underscores the urgency of finding sustainable alternatives. Plastic waste has become a pervasive threat, with approximately annually, over 300 million tons of plastic waste produced globally, and 8 million metric tons entering our oceans annually and impacting marine life and ecosystems.



Shreyas A
1JS23IS158

The process of converting plastic waste into electrical energy involves thermal depolymerization or pyrolysis. This method subject plastic to controlled heating in the absence of oxygen, breaking it down into gases, oils, and char. The generated gases can then be harnessed for electricity production, offering a two-fold solution by addressing both plastic pollution and energy scarcity. Remarkably, this approach can potentially transform 1 ton of plastic into 7,000 kWh of electricity.

Beyond mitigating environmental hazards, the conversion of plastic waste into electrical energy holds the promise of a sustainable future. It not only provides a clean energy source but also reduces dependence on traditional fossil fuels, aligning with global efforts to combat climate change and reduces environmental harm by recycling non-biodegradable materials. This process helps generate clean electricity, mitigating reliance on traditional power sources. Additionally, it addresses the global plastic pollution crisis, this innovative process offers a beacon of hope for a more sustainable and energy-abundant world.

CATALYST

VOL.1

2023-2024

Nanotechnology's importance in medical research and treatments

Nanotechnologies are new areas of research focusing on affecting matter at the atomic and molecular levels. It is beyond doubt that modern medicine can benefit greatly from it; thus, nanomedicine has become one of the main branches of nanotechnological research. Currently it focuses on developing new methods of preventing, diagnosing and treating various diseases. Nanomaterials show remarkably high efficiency in destroying cancer cells and are already undergoing clinical trials.



Chirag S
1JS23CS039

Potential application of nanotechnology in cancer therapy

Nanotechnology holds significant promise in revolutionizing cancer therapy by addressing challenges associated with traditional treatments. In the fight against cancer where neoplasms remain a leading cause of premature deaths the exploration of innovative therapeutic approaches is crucial. Nanomedicine, a burgeoning field in cancer therapy, focuses on improving drug delivery methods to enhance efficacy and minimize side effects on healthy tissues. Nanoshells, tiny gold-enveloped nanoparticles currently in clinical trials, show promise by specifically targeting cancer cells deep within tissues, causing tumor ablation when exposed to near-infrared lasers. In breast cancer therapy, studies involving nanoparticles bound with antibodies demonstrate selective cell death through photothermal ablation in response to near-infrared light. Drug delivery mechanisms using organic compounds, especially protein polymers like gelatine and albumins, exhibit potential in building effective nano-carrier systems. Clinical trials confirm the superiority of albumin-bound paclitaxel formulations over conventional ones.

CATALYST

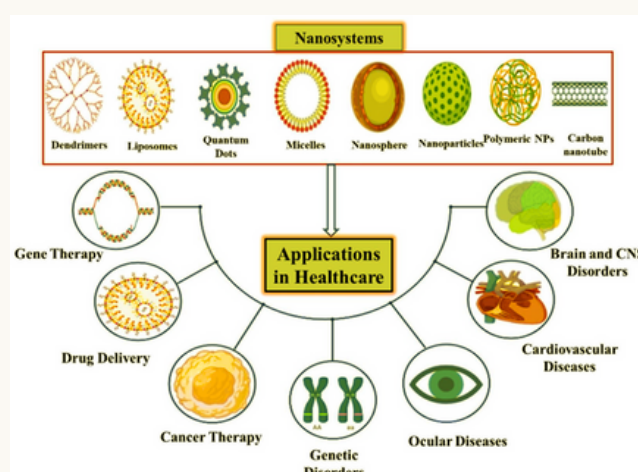
VOL.1

2023-2024

Despite these advancements, challenges such as high costs and limited legal regulations hinder the widespread adoption of nano-compounds, underscoring the need for concrete indications of their necessity and clinical improvement. Researchers continue to navigate these challenges, recognizing nanotechnology as a transformative force with the potential to reshape cancer therapy and offer more effective and targeted treatments

Conclusion

In the dynamic field of medical sciences, nanotechnologies emerge as a beacon of hope, presenting vast possibilities on a minuscule scale. Leading this transformative movement is nanomedicine, a pioneering discipline poised to revolutionize disease prevention, diagnosis, and treatment. In the battle against cancer, nanomaterials demonstrate exceptional precision in targeting cancer cells, showcasing promising outcomes in clinical trials. Gold-adorned nanoshells, designed to minimize harm to healthy tissues, offer a notable alternative to conventional cancer treatments. The versatility of nanomaterials, from precise imaging with quantum dots to enhanced drug delivery via nanotubes, positions them at the forefront of medical innovation. Even in diagnostics, nanomaterials, including magnetic nanoparticles, quantum dots, and nanotubes, show the potential to revolutionize techniques on a microscopic level. However, as we embrace these transformative possibilities, careful consideration of safety and ethical implications is essential. This article serves as a guide to understanding the impactful role of nanotechnology in reshaping the landscape of medicine.



CATALYST

VOL.1

2023-2024

STUDENT
CENTRIC
ACTIVITIES

STUDENTS
PROJECT



**Up-Coming
Events
2024**

OUTREACH
PROGRAM

CATALYST

VOL.1

2023-2024

Thank you