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Indian Society of Analytical Scientists

ABSTRACT BOOK

J. ISAS Meet (IAAS-24) on the theme

Interdisciplinary Approaches in Analytical Science (IAAS)

organised by

Indian Society of Analytical Scientists (ISAS) Headquarters

In association with

ISAS Pune Chapter and RJSPM's ACS College, Bhosari

30th July 2024

at

RJSPM's ACS College, Bhosari, Pune

ABOUT ISAS and ISAS PUNE CHAPTER

ISAS is one of the prime societies at national level working in the field of analytical sciences. It has 10 chapters all over India and more than 3000 life members from various disciplines. ISAS aims towards excellence and relevance in science and technology and is committed to the dissemination of knowledge, expertise, and improved scientific temperament of the entire community of analytical scientists. **Website: www.isasbharat.in**

The **ISAS Pune Chapter**, founded in October 2021, aims to reach all sectors of Society to promote excellence and relevance in both routine and innovative work in science and technology. This is achieved through a variety of initiatives, including invited talks by eminent scientists from national and international institutes, universities, and industries and organizing quizzes, poster and lecture competitions for postgraduate students in science and technology, as well as theme-oriented workshops and seminars. The ISAS Pune Chapter has also initiated the publication of a series of booklets on different analytical techniques, which are valuable resources for students, teachers, researchers, and industrial chemists. The chapter has been honoured with the Best Chapter Award for two consecutive years, along with several other accolades for our members.

J. ISAS Meet on the theme" Interdisciplinary Approaches in Analytical Science"
Organized by ISAS Headquarters in association with ISAS Pune chapter and RJSPM's ACS college, Bhosari

Program Schedule: 30 July 24
Venue: Seminar Hall, RJSPM's ACS College

Time	Activity	Person
9.30 -10.00 a.m.	**Registration**	All participants
10.00 a.m.	Welcome	Prin. Dr. K. G. Kanade
10.03 a.m.	Deep prajwalan	At the hands of dignitaries
10.06 a.m.	ISAS Geet	AV film
10.10 a.m.	About ISAS and Meet	Dr.Nilima Rajurkar
10.13 a.m.	Introduction of Dr. Saran	Dr. K.G.Kanade
10.15 a.m.	**Address by National President**	**Dr. Raghaw Saran**
10.25 a.m.	Introduction of Guest of Honour	Dr. Manisha Bora
10.27 a.m.	**Inaugural Speech by Guest of Honour:**	**Prof. S.F.Patil**
10.30 a.m.	Introduction of Chief Guest	Dr. Santosh Terdale
10.32 a.m.	**Release of J. ISAS**	**At the hands of Dr. Acharya**
10.34 a.m.	**Release of Abstract Book**	**At the hands of Prof. Patil**
10.36 a.m.	**Keynoteaddress by Chief Guest:** "Chemical Quality Control of Materials by Neutron and Proton Based Nuclear Analytical Methods"	**Dr. Raghunath Acharya** Head, Isotope and Radiation Applications Division, Bhabha Atomic Research Centre, Mumbai.
	Presentation of sponsors	
11.16 a.m.		Knowchem Lab Pvt. Ltd.
11.19 a.m.		Ormecon Pvt. Ltd.
11.22 a.m.		Lab systems & Biotech India Pvt. Ltd.
11.25 a.m.		Anand Agencies
	Scientific Session With Question- Answer	
	Introduction of Dr. Dhakephalkar	Dr. Parag Adhyalak
11.30 a.m.	"From Biology to Energy: The New Manufacturing Frontier"	**Dr. Prashant Dhakephalkar** Director, Agharkar Research Institute, Pune
	Introduction of Zinjarde	Dr. Geeta Sharma
12.00 noon	"Understanding Catabolic Versatility of Microorganisms: The Gordonia Case Study"	**Dr. Smita Zinjarde** Director, School of Life Sciences, SPPU, Pune
	Introduction of Dr. Bikash	Dr. Mohini Gupte
12.30 noon	"Promotion and Marketing of Analytical Services"	**Dr. Bikash Aich** Managing Director, Aavanira Group, Pune.
	Introduction of Dr. Grover	Dr. Narendra Gokarn

1.00p.m.	"Safety Seedlings"	**Dr. G. S. Grover** Safety Advisor and Former Chief Scientist, CSIR-NCL, Pune
1.30 - 2.15p.m.	**Group photo followed by Lunchbreak**	
2.15 p. m.	**Inauguration of poster session**	**Dr. Raghaw Saran**
2.15 – 4.30 p.m.	**Poster session**	Participants
4.30-5.00 p.m.	**Valedictory function**	
	Overview of Meet	Dr. Nilima Rajurkar
	Introduction and Felicitation of Judges	At the hands of Dr. Saran and Dr. Rajurkar
	About Poster presentation	Dr. V. C. Adya
	Declaration of results and distribution of prizes	At the hands of dignitaries
	Feedback of participants	Few representative participants
	Vote of Thanks	Dr. Rutika Jagtap
Compering:	Dr. Manisha Bora and Dr. Suvarna Tikle	

Message by Dr. Raghaw Saran

It is heartening to note that Pune Chapter of Indian Society of Analytical Scientists (ISAS) in association with its HQ and RJSPM's ACS College, Bhosari is organising J. ISAS meet on the theme "Interdisciplinary Approaches in Analytical Science".

The event is organized in order to commemorate completion of two years of momentous journey of e-published journal of ISAS, J. ISAS (with ISSN and DoI for each individual article of the issue) in the service of scientific community. Theme of the topic is highly relevant in the accelerating interdisciplinary hyphenation of science and technology opening new vista of analytical sciences.

The endeavour is noble to streamline and enrich the thought process in the field of analytical sciences and comprises of five invited talks from highly eminent scientists with expertise par excellence in the respective fields besides poster presentation of papers.

I extend my greetings to the learned academicians, scientists, researchers and students and congratulate the organizers for hosting the meet and express my best wishes for success of the 2nd annual meet of J. ISAS.

ISAS National President and

Advisor J. ISAS

Address from Principal's Desk

RJSPM's ACS College Landewadi, Bhosari Pune, is delighted to welcome ISAS (Indian Society of Analytical Scientists) team to our campus and grateful for the chance to learn from their expertise and experiences. It is a privilege to host such an esteemed group of researchers and scientists. Thank you for selecting our college as the platform for sharing your ground-breaking research and ideas through J. ISAS Meet on topic **"Interdisciplinary Approaches in Analytical Science".**

As you embark on your research endeavours, I want to extend my warmest wishes for success, innovation. ISAS team's dedication to advancing scientific knowledge and solving real-world problems is truly commendable. May your collaboration and teamwork continue to foster a spirit of creativity and intellectual curiosity.

Future generations will be inspired by the work of the ISAS team, which will undoubtedly influence lives and enhance communities. I am honoured to support and lead such a talented and passionate group of individuals.

Wishing you all the best in your scientific pursuits! May your research be filled with excitement, curiosity, and breakthroughs.

To an amazing team of ISAS, I wish you boundless energy, creative ideas, and remarkable achievements. Keep pushing the frontiers of knowledge!

I commend each of you for your tireless efforts and collaborative spirit. ISAS team's contributions not only elevate our college reputation but also inspire future generations of scientists and thinkers.

Please accept my warmest wishes for continued success and impactful discoveries in your future endeavours. ISAS team's passion and determination serve as a guiding light for all of us.

Best wishes for a productive and fulfilling research journey.

Dr. K.G. Kanade
Principal

Editorial

As we mark the second anniversary of the Journal of Indian Society of Analytical Scientists (J. ISAS), it is both an honour and a privilege to welcome you to this significant gathering. This meet symbolizes not just the passage of time but the remarkable strides we have made in fostering collaboration and innovation within the analytical sciences. The theme, "Interdisciplinary Approaches in Analytical Science", resonates deeply with the ethos of our community, where the convergence of diverse fields paves the way for ground-breaking discoveries and applications.

Our meet is graced with a series of invited talks by eminent scholars, each a beacon of excellence in their respective domains. The breadth of topics they cover exemplifies the interdisciplinary spirit that we aim to celebrate and propagate. These presentations cover diverse and cutting-edge topics. One explores advanced neutron and proton-based nuclear analytical methods for analysis of various samples and chemical quality control, offering unparalleled precision. Another bridges biology and energy, highlighting sustainable energy solutions through biological principles. A case study on Gordonia microorganisms reveals their biodegradation potential and ecological benefits. Effective promotion and marketing strategies for analytical services in a competitive market are also discussed. Lastly, innovative approaches to safety in biological and chemical processes are emphasized, promoting a culture of precaution and responsibility.

The conference also features 31 abstracts spanning the physical, chemical, life, and environmental sciences. The diversity of topics is truly inspiring, encompassing areas such as nanosynthesis, dye degradation, diffusion, ayurvedic bhasma, medicinal plants, and more. Each abstract represents a unique intersection of ideas and disciplines, reflecting the rich tapestry of research that defines our society.

As we embark on this journey of exploration and discovery, let us celebrate the interdisciplinary approaches that enrich our understanding and application of analytical sciences. The collaborations and insights gained here will undoubtedly propel us towards a future where science transcends boundaries, fostering innovation and excellence.

We extend our heartfelt gratitude to all speakers, contributors, sponsors and participants for their unwavering commitment to advancing analytical science. I am grateful to National President, ISAS: Dr. Raghaw Saran for his constant support in all the activities. Thanks are due to all committee members of “IAAS 24” meet and special thanks to Dr. Anupa Kumbhar, Dr. Manisha Bora, Dr. sunil Hande, Management of RJSPM’s ACS College, Principal Dr. K. G. Kanade and Dr. Rutika Jagtap for their continuous cooperation in organizing this meet.

Dr. Nilima Rajurkar
Chairperson, ISAS, Pune Chapter
EC member, ISAS Headquarters
Editor in Chief, J. ISAS

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BIOSKETCH

Dr. Raghunath Acharya
Head, Isotope and Radiation Application Division (IRAD), Radiochemistry and Isotope Group, BARC, Mumbai and
Professor in Chemical Sciences, Homi Bhabha National Institute, DAE

Dr. Raghunath Acharya joined Radiochemistry Division, Bhabha Atomic Research Centre, DAE in 1994 after successfully completing one year BARC Training School Course in Chemistry (37th Batch). He has contributed significantly in the R&D work on Nuclear Analytical Chemistry utilizing research reactors and particle accelerators for the chemical characterization of materials by neutron and proton based nuclear analytical techniques. For the first time in India, he has developed and utilized k 0 -based NAA, PGNAA and in-situ current normalized IBA (PIGE). He has successfully completed several collaborative projects with Academic Institutes under BRNS, UGC-DAE-CSR and BARC-Pune university MoU Schemes. He obtained his PhD degree from University of Mumbai in 2000 and pursued his Postdoctoral studies in Dalhousie University, Canada during 2000-2002. His R&D work reflected in about 185 Journal Publications and more than 300 conference presentations. Presently, He is working as a Task Force Member for Utilization of BARC Facilities by University Faculties and Students through UGC DAE CSR Project Scheme.

He is a recipient of IANCAS Dr. Tarun Datta Memorial Award 2003, Young Scientist Award 2008 (YSA 2008) of the International Committee of Activation Analysis (ICAA) and "Scientific and Technical Excellence Award of DAE (2009) and Group Achievement Award of DAE in 2019. He is an Executive Committee Member of various national and international professional bodies like IANCAS, ASSET, ICS, SPAN and Life Member of ISAS. Presently, He is Secretary, Indian Chemical Society, ICS (Mumbai Branch), Editor, IANCAS Bulletin, Elected Member of k 0 -International Scientific Committee (k0 -ISC) since 2009, Elected Member (since 2008) and Secretary (from 2019 to 2028)) of International Committee of Activation Analysis (ICAA) and Editorial Borad Member of Journal of Radioanalytical and Nuclear Chemistry (JRNC, Springer) since 2023.

IT-1

CHEMICAL QUALITY CONTROL OF MATERIALS BY NEUTRON AND PROTON BASED NUCLEAR ANALYTICAL METHODS

Raghunath Acharya

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ABSTRACT

Chemical characterization of a material of interest is the first and most important step in chemical quality control (CQC) exercise. It involves quantitative estimation of total elemental and/or isotopic concentrations at major to trace levels by suitable analytical techniques with adequate accuracy and precision. Compared to various conventional analytical techniques, neutron and proton based Nuclear Analytical Techniques (NATs) like Neutron Activation Analysis (NAA), Prompt Gamma-ray NAA (PGNAA) and Ion Beam Analysis (IBA) techniques like Particle Induced Gamma-ray (PIGE) are unique due to their advantageous properties like non-destructive analysis of solid or as received samples, simultaneous multielement capability from major to trace concentration levels, quantitative information on total elemental concentration along with isotopic or chemical species for specific elements, negligible or less matrix effects and spectral interference. Since 1994, Conventional Instrumental NAA, k 0 -based (Single Comparator) NAA, Internal Monostandard Neutron Activation Analysis (IM-NAA) and Prompt Gamma-ray NAA (PGNAA) methods utilizing neutron flux/beam from research reactors (Dhruva and Apsara-U) at BARC for analysis of small and large size samples for determination of H to U as well as *in situ* and external current normalized Particle Induced Gamma-ray Emission (PIGE) method utilizing low energy (2-5 MeV) proton beam from Folded Tandem Ion Accelerator (FOTIA), BARC for low Z elements. These methods have been applied to various fields like nuclear technology, materials science, geology, environment, biology, water, food & agriculture, archaeology and forensic science having important industrial and societal applications. IM-NAA using in situ detection efficiency was successfully employed for standard-less compositional characterization of large size reactor structural materials like zircaloys, stainless steels, Ni-based alloys for CQC, impurities in high purity materials like 1S-Al and nuclear grade graphite as well as archaeological clay potteries for provenance studies. INAA, Epithermal NAA and Chemical

NAA methods were suitably utilized for total and species concentration of As in water, I in food, food products and total and bio-accessible concentration Se in soil and/or crop products. PGNAA method was utilized for non-destructive analysis of samples like various alloys, cement and glass as well as for total boron and 10 B content in boron-based ceramics. PIGE methods were utilized for simultaneous quantification of low Z elements namely Si, B, Al, Na, Li and F in Ba-borosilicate glass, Li, Ti in lithium titanate and total B and its isotopic composition (IC) (10 B/ 11 B atom ratio) in boron-based ceramic/refractory neutron absorbers including B 4 C. External (in air) PIGE facility at FOTIA developed using thin tantalum window is extensively utilized for rapid analysis of "as received" samples of glass, ceramics and alloys as well as liquids (water) for low Z elements and IC of Boron in B4C for commercial application, for the first time, to certify B-10 isotope content in industrial samples relevant as shielding or control material for Indian nuclear power reactors. Additionally, INAA and PIGE methods have been utilized for forensic studies of real-case automobile (car) windshield glass samples under an IAEA CRP as well as for quality assessment food samples and examining quality of Indian coal through ash content and quality of cement via Ca/Si value. The results indicate potentials of Nuclear Analytical Techniques like NAA, PGNAA and IBA are suitable Chemical Quality Control (CQC) methods mainly for solid samples like oxides, carbides, metal;s, alloys, glass and ceramics that are difficult to be analyzed by conventional wet-chemical or spectroscopic techniques.

Acknowledgments: Author sincerely thanks all contributors/collaborators from BARC, DAE Units as well as Academic Institutes / Universities under collaborative project schemes and authorities and operation crews of research reactors and particle accelerators of BARC, DAE.

BIOSKETCH

Dr. Prashant K. Dhakephalkar
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Dr. Dhakephalkar is a distinguished microbiologist and is currently the Director of Agharkar Research Institute (ARI), an autonomous institute under the Department of Science and Technology (DST).

Following his Ph.D. in Microbiology from the University of Pune in 1994, Dr. Dhakephalkar gained valuable industry experience before joining ARI in 1995. His research career has been enriched by a two-year sabbatical (1998-2000) at the University of Virginia, where he delved into the field of Molecular and Cellular Immunology.

Dr. Dhakephalkar's research focuses on 'Exploration of Microbial Diversity of Extreme, Pristine and other Environments for Taxonomic Novelty and Industrial Applications'. He has demonstrated exceptional leadership by leading 27 extramural research projects and contributing as Co-PI on four others. His dedication to scientific advancement is evident through his impressive publication record. Dr. Dhakephalkar has authored over 100 publications in highly regarded international journals, garnering 4328 citations with an h-index of 34 and an i10-index of 53.

Beyond research, Dr. Dhakephalkar actively fosters innovation. He has successfully developed and transferred eleven technologies in collaboration with industrial sponsors. His commitment to intellectual property protection is reflected in his filing of 12 Indian patents, a US patent, two PCTs, and a German patent.

Dr. Dhakephalkar is a dedicated mentor, guiding 20 students to complete their Ph.D.s successfully. His expertise is further evident as a reviewer for numerous international scientific journals. In summary, Dr. Dhakephalkar's distinguished career exemplifies scientific excellence, leadership, and a drive for impactful research with real-world applications.

IT-2

FROM BIOLOGY TO ENERGY: THE NEW MANUFACTURING FRONTIER

Prashant K. Dhakephalkar

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ABSTRACT:

Lignocellulosic biomass, Earth's most abundant renewable carbon source, holds significant potential for sustainable energy production as a feedstock. This presentation will examine the promising dark fermentation approach, which utilizes the unique capabilities of anaerobic fungi to convert lignocellulosic materials into valuable biofuels such as methane, hydrogen, and

ethanol. In contrast to traditional thermochemical pretreatment methods, the dark fermentation process eliminates the need for energy-intensive biomass preprocessing. Anaerobic fungi possess specialized enzymes and mechanisms that enable the direct hydrolysis and fermentation of cellulose and hemicellulose within the lignocellulosic matrix. These fungi efficiently access and convert sugars into biofuels by physically penetrating the biomass structure with their rhizoid structures.

The presentation will discuss the comparative advantages of methane, hydrogen, and ethanol production from lignocellulosic feedstocks. While each biofuel has distinct merits, methane production via anaerobic digestion emerges as an exceptionally efficient and environmentally friendly option, featuring a lower carbon footprint than other bioconversion processes.

Insights into the mechanisms and optimization strategies for employing anaerobic fungi in dark fermentation systems will also be discussed. The potential of this biological approach to transform the manufacturing landscape and contribute to the renewable energy transition will be highlighted. Collaborative efforts required across academia, industry, and government to realise the full promise of lignocellulosic biomass as a sustainable energy source will be emphasized.

BIOSKETCH

Dr. Smita Zinjarde
Director, School of Life Sciences, Savitribai Phule Pune University, Pune

Dr. (Mrs.) Smita Sachin Zinjarde completed her M.Sc. and Ph. D. in Microbiology from University of Pune. Since 1998, she is working at SPPU in various capacities such as Research Associate, Lecturer, Associate Professor and Professor at Institute of Bioinformatics & Biotechnology (IBB) at Savitribai Phule Pune University (SPPU). She handled different administrative responsibilities at SPPU as the Head of the Department of Microbiology (2016-2020), Director, IBB (2018-2021), Head of the Department of Biotechnology (2021-2024) and Ditector, School of Life Sciences since December 2020 till date.

She is a recipient of Young Scientist from DST and also received a travel grant from INSA.

She is a Member of Board of studies in Microbiology, SPPU.

Dr. Zinjarde has completed many projects over 2.5 crores funded by DST, DBT, CSIR, UGC, Naval research Board and Industry. So far eleven students have been awarded Ph.D. degree under her able guidance and four are working towards it. Apart from that she has mentored six post-doctoral fellows. Her research has resulted in 99 publications in the journals of national and international repute, 15 review articles, 12 book chapters and 5 patents. Her name was featured in top 2% scientists in the world consecutively in 2020 and 2021 as per Stanford ratings.

IT-3

UNDERSTANDING CATABOLIC VERSATILITY OF MICROORGANISMS: THE *GORDONIA* CASE STUDY

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ABSTRACT

The genus *Gordonia* comprises variedly pigmented aerobic, non-motile, non-sporulating Gram positive coccoid forms and rods. Members of this genus display distinguishing physiological traits, biochemical properties and catabolic potential. *Gordonia* species are inherently prevalent in soils, seawater, sediments and wastewaters. They can degrade hydrocarbons, hexahydro-1,3,5-trinitro-1,3,5-triazine, cholesterol, pyridine derivatives, fuel oxygenates, thiodiglycol, bis-(3-pentafluorophenylpropyl)-sulfide 6:2 fluorotelomersulfonate and nitriles. Some species (*Gordonia amarae, Gordonia westfalica* and *Gordonia amicalis*) produce surface active agents such as glycolipids. Wild-type and recombinant strains of *Gordonia* mediate biodesulfurization (BDS) of polyaromatic sulphur heterocyclic compounds. A variety of phthalic acid esters, rubber and RDX are also are catabolised by different *Gordonia* species. Several members of this genus are significant in treatment of wastewaters including those that are rich in steroids and lignin. They interact with metals and mediate synthesis of nanoparticles that have varied applications. Certain species (*G. alkanivorans, G. polyisoprenivorans, G. amicalis, G. terrae, G. westfalica and G. nitida*) are metabolically more versatile and capable of detoxifying more than one type of pollutants. This Actinomycete thus has promising applications in bioremediation of the environment.

BIOSKETCH

Dr. Bikash A. Aich M.Sc. (Medical), PhD. MBA
Founder member- GeneOmbio Technologies (Pune) and
Managing Director- Aavanira Biotech Pvt. Ltd. (Pune)

Dr. Bikash Aich started his scientific career as a student of Medical Pharmacology from BJ Medical College of Pune and completed his M.Sc. in (Medical). He initiated research in the area of herbal antibiotics from University of Pune and completed his Ph. D. from Department of Chemistry, University of Pune. He also was conferred with the degree of MBA in marketing from Institute of Management Education, Pune.

Dr. Aich has substantially contributed to other research programs including molecular characterization of microbes participating in degradation of rocket fuel wastes. He has Long experience in bio-organic and herbal research. His expertises are experimental pharmacology and lab management, bio-organic chemistry analysis for small molecule elucidation, toxicological and xenobiotic studies, preclinical and animal modelling experimentation and microbiological screening.

Dr. Aich had served the academic community as a lecturer in Pharmacology for Pharmacy as well as various Medical Colleges. In his capacity as an MBA, he has provided valuable guidance to several pharmaceutical companies. He was closely involved in Science and Technology Park's incubation activity as incubatee for more than 6 years and joined as Jt. CEO, Growth Lab Business Incubator.

Dr. Aich as an entrepreneur initiated a Biotechnology company called GeneOmbio Technologies (Pune) and his passion for the chemical and pharmaceutical analysis have helped him to achieve another successful land mark by setting up Aavanira Biotech Pvt. Ltd. (Pune) which is a highly equipped with latest analytical and development instrumentation, totally dedicated to the development of Environmental analysis and biotechnologies related to the environment and small molecule developments.

His achievements

- Dr. Bhadkamkar's award for best paper and research by Research Society, western India (1995).
- First ISBA award (Indian STEPS and Business Incubator's Association) for the best entrepreneurship in the biotech segment 2008-09.

IT-4

PROMOTION AND MARKETING OF ANALYTICAL SERVICES

Dr. Bikash Aich

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ABSTRACT

Marketing in analytical chemistry is crucial for translating scientific innovations into practical, marketable solutions. It bridges the gap between complex analytical techniques and their industrial applications, ensuring that products meet market needs and regulatory standards. Knowledge-based industrial marketing is vital as it helps companies position their analytical products effectively, communicate their unique value propositions, and address industry-specific challenges. This approach fosters trust and credibility, driving adoption and facilitating advancements in various sectors like pharmaceuticals, environmental monitoring, and food safety.

Understanding chemical analysis is essential for handling high-end clients in production and research due to several reasons:

1. Quality Assurance: High-end clients demand precise and reliable data to ensure product quality and consistency. Knowledge of chemical analysis techniques ensures that products meet stringent quality standards and specifications.
2. Problem Solving: Advanced analytical skills enable professionals to identify and solve complex production and research problems, leading to improved processes and product development.
3. Regulatory Compliance: High-end clients often operate in highly regulated industries. Proficiency in chemical analysis ensures compliance with regulatory requirements, avoiding legal issues and ensuring market access.
4. Innovation and Development: In research, deep understanding of chemical analysis drives innovation by enabling the exploration of new materials, processes, and technologies.
5. Effective Communication: Knowledge of chemical analysis allows for clear and precise communication with clients about technical aspects, fostering trust and stronger business relationships.
6. Customization: It enables tailored solutions to meet specific client needs, enhancing satisfaction and loyalty.

BIOSKETCH

Dr. G. S. GROVER
Safety Advisor and Former Chief Scientist at CSIR-NCL Pune

Dr. Grover has been a Chief Scientist (Scientist G) at National Chemical Laboratory (NCL), Pune. He earned his BSc and MSc in Chemistry from Delhi University, MS Chem. Eng. from University of Salford, UK and PhD from Pune University. He has more than 30 years of experience in R & D activities related to development of processes for high-pressure catalytic hydrogenation, carbonylation and oxidation reactions. Dr. Grover has several research papers and patents to his credit. Besides undertaking scientific research, he also aided the organisation in management, as the Head, Research Planning & Audit Unit and also Head, Safety Management. He has obtained specialized training in Safety Management from the UK (1997) & Denmark (2008). As a Safety Manager, he has represented NCL & CSIR at many safety meetings and conferences both in India and abroad. He had been an active member of the Pune District Crisis group for Emergency management".

Dr. Grover has delivered lectures on various aspects of chemical and laboratory safety, at National Safety Council and in various educational and industrial organizations. He has also conducted full day workshops / training courses on the subject. Dr. Grover has also held training camps and brought awareness on chemical and general safety to school and college children in rural and non-urban areas in western India. He continued to conduct safety orientation programmes in virtual mode as webinars for several colleges during COVID period.

Dr. Grover retired from active services of CSIR-National Chemical laboratory Pune in 2015. Subsequently he helped IISER Pune in toning up and adding value to their Safety Group. At present, he is associated as a Safety Advisor with educational, technical and research institutes in Pune.

Dr. Grover is a Safety Training Program Fellow of IUPAC (International Union of Pure and Applied Chemistry) and has its mandate to undertake safety awareness programmes and to improve safety, health and environment in academic and research laboratories in India. He was the Task Group Chair of the IUPAC Safety Training Program –India Regional Project 2018.

He is an ardent champion of laboratory safety and as an IUPAC fellow continues to be active in lecturing and offering safety training programme to universities and colleges in India under the "IUPAC Safety Training Program–ASIA Project 2024".

IT-5

SAFETY SEEDLINGS

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ABSTRACT

Safety & health is an important aspect of an organization's smooth and effective functioning. In an environment of a routine analytical setup, the processes and procedures may not have a high hazard index, but any place where chemicals are in use is prone to mishaps and accidents and a syndrome of being safe is an illusion. It has to be understood and accepted that ignorance of hazards, unsafe conditions and incorrect work practices is one of the main causes for the accidents. Although practice of chemistry poses intrinsic and unforeseen hazards, but the notion that small accidents will continue to happen is also wrong. All chemicals and processes can be rendered safe by a systematic and proper education, learning and training. It must be recognized that all accidents can be prevented. The brief presentation will review some of the unsafe conditions and practices commonly encountered in a laboratory and highlight the application of simple principles in safety management with suitable examples to practice chemistry safely.

P-1

ECO-FRIENDLY SYNTHESIS, CHARACTERIZATION AND PHOTO-CATALYTIC DYE DEGRADATION STUDY OF MOF-5

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ABSTRACT

Metal–Organic-Frameworks (MOFs) are highly tunable to design and functionalize, hence they are recognized as materials of interest in applied sciences. MOF-5 is a well-known metal organic framework due to its distinctive porosity and thermal stability. In the present work MOF-5 was synthesized successfully by modifying known eco-friendly method. The synthesized material was characterized by various analytical techniques such as FTIR, XRD

and FESEM to confirm the formation of MOF-5. In this study the photo catalytic properties of d10-based MOFs have been developed as a potential technology in the photo-degradation of organic dye. It was observed that MOF-5 was synthesized successfully and it showed excellent photo-catalytic dye degradation activity towards methyl orange.

P-2

A STUDY ON DEGRADATION OF CIGARETTE BUTTS AND ITS USE IN PREPARATION OF ENERGY STORAGE MATERIAL

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ABSTRACT

This study investigates the degradation processes of cellulose acetate in cigarette filter and a one-step method for preparing nitrogen, phosphorous, sulfur, and boron doped (N/P/S/B/-doped) meso-/micro porous hybrid carbon material via the heat treatment of used cigarette filters. The used cigarette filter, which is mostly composed of cellulose acetate fibers, can be transformed into a porous carbon material that contains both the mesoporous and microporous material spontaneously. This research employs a multidisciplinary approach to elucidate the degradation mechanisms of used cigarette butts. Through systematic laboratory experiments and characterization techniques such as FTIR, XRD and SEM the desired material formation was confirmed. The unique self-developed pore structure allowed a favorable pathway for electrolyte permeation and contact probability, resulting in the extended rate capability for the supercapacitor. The doped material exhibited a better rate capability and higher specific capacitance (153.8 F g^{-1}) compared to that of conventional activated carbon (125.0 F g^{-1}) at 1 A g^{-1}. It explores their potential utilization in diverse applications, including the preparation of supercapacitors, batteries, water filtration systems, carbon nanomaterial's, and production of polymers.

Overall, this study aims to demonstrate the potential of degraded cigarette butts as valuable resources for advanced applications, addressing environmental challenges while fostering innovation and sustainability in diverse sectors.

P-3

STUDY OF DIFFUSION OF Fe^{3+} IONS IN AGAR GEL MEDIUM CONTAINING $Fe_2(SO_4)_3$

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ABSTRACT

The present paper deals with diffusion of Fe^{3+} ions in 2.5% agar gel medium containing ferric sulfate. The diffusion coefficients for Fe^{3+} ions were measured for different concentrations ($5x10^{-4}$ - $2.5x10^{-1}$M) at 25ºC using the zone diffusion technique. The diffusion coefficients were calculated from activity measurements of ^{59}Fe ($t_{1/2}$=44.5days). The experimental values of diffusion coefficients were compared with the theoretical diffusion coefficients where an experimental minimum was observed at $1.0x10^{-1}$ M while it was absent in the theoretical ones. Although agar gel provides a good stationary medium for diffusion studies, it affects the rate of diffusion and the deviations in theoretical and experimental values of diffusion coefficients are explained on the basis of different effects arised due to the presence of macromolecules of the gel which causes mechanical obstruction in the diffusion path.

P-4

ANALYSIS OF ADSORBED METHYLENE BLUE DYE USING ASH PREPARED FROM FRUIT WASTE

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ABSTRACT

Technology keeps on growing daily and new techniques are designed and implemented in various fields for making our life simple and interesting. This has led to increased generation of wastes. But all countries are facing difficulty in treating these wastes generated from various industries as the materials used are mostly non-biodegradable. Dyes are considered as one of the most difficult to degrade. To cater these needs, we are experimenting to find an

environmentally viable and cheap natural materials for removal of dye by using the adsorption method. In the present work we are trying to achieve removal of methylene blue dye with the help of ash prepared from fruit waste.

P-5

REMOVAL OF INDIGO CARMINE DYE USING ASH PREPARED FROM FRUIT WASTE

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ABSTRACT

Technology keeps on growing daily and new techniques are designed and implemented in various fields for making our life simple and interesting. This has lead to increased generation of wastes. But, all countries are facing difficulty in treating these wastes generated from various industries as the materials used are mostly non-biodegradable. Dyes are considered as one of the most difficult to degrade. To cater these needs we are experimenting to find an environmentally viable and cheap natural materials for removal of dye by using the adsorption method. In the present work we are trying to achieve removal of indigo carmine dye with the help of ash prepared from fruit waste.

P-6

EFFECT OF WATER QUALITY PARAMETERS ON HEALTH OF FISHES

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ABSTRACT

Pune District is known for its water bodies, including Khadakwasla, Panshet, Mulshi, Bhigwan, Pawan, and Temghar. Overall, there are 29 dams, lakes and reservoirs constituting around 17,347 hectors land. Different varieties of fishes are cultivated in water reservoirs. The water quality

of adjacent water bodies was analysed, as water quality is a critical factor when culturing any aquatic organism. Optimal water quality varies by species and must be monitored to ensure growth and survival. The quality of the water in the production systems can significantly affect theorganism's health and the costs associated with getting a product to the market. Water quality parameters that are commonly monitored in the aquaculture industry include temperature, dissolved oxygen, pH, alkalinity, hardness, ammonia, nitrites and specially metals that can lead to toxicity.

P-7

INVESTIGATION OF METAL CONTENTS IN MEDICINAL PLANTS BY ATOMIC ABSORPTION SPECTROSCOPY

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ABSTRACT

Medicinal plants have been integral to traditional medicine system for centuries due to their therapeutic properties. However, contamination of these plants with metal poses significant health risks to consumers. This study highlights the importance of metal analysis in medicinal plants and its relevance in ensuring the safety & efficacy of herbal remedies. The levels of metal namely Pb, Cd, Cu. Zn & K were assessed in three medicinal plants to determine the plant mineral contents. Atomic absorption Spectroscopy was used for the analysis & contents of minerals per sample was expressed in ppm. The levels of minerals compared to their limit specifications for daily intake of these minerals. The metals like Pb. Cd, Cu, Zn & K were found in these plants. The presence of metals like Pb & Cd in medicinal plants can lead to the adverse health effects such as indigestion, neurological disorders & Carcinogenesis. The findings generally suggest variation in mineral level in plant. Thus, our study has shown the validation of these medicinal plants with respect to the accumulation of heavy metals. Further research directions are proposed to enhance metal analysis techniques and establish comprehensive regulatory frameworks for herbal products.

P-8

GREEN SYNTHESIS OF SILVER NANOPARTICLES USING *PISUM SATIVUM L.* OUTER PEEL AQUEOUS EXTRACT AND IT'S, STUDY ON CYTOTOXICITY, AND ANTIBACTERIAL ACTIVITY

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ABSTRACT

The combination of green chemistry with green engineering and nanotechnology has been fostered by the advancements in science and technology. Green nanotechnology has led to numerous innovations in improving both human health and the environment. The current scientific community is concentrating on the green synthesis of nanoparticles utilizing biological components such extracts from different plant sections, algae, fungus, and several helpful microbes. The synthesis of silver nanoparticles using ecologically friendly principles is reported in this study. To minimize the adverse effects of synthetic procedures and to create environmentally friendly methods for the synthesis of metallic nanoparticles, we utilized green methodology. In this study Pisum sativum L. aqueous leaf extract was utilized for the green synthesis of silver nanoparticles. The silver nanoparticles produced were analyzed using UV-Visible Spectroscopy. As part of our ongoing research, the silver nanoparticles (AgNPs) that were synthesized were (AgNPs) showed antibacterial activities against *E. coli*. The cytotoxicity results of the biosynthesized AgNPs showed that the AgNPs had a high cytotoxicity potential against lactobacilli cells with maximum cell death. Using green principles, the study revealed the efficacy of synthesis of silver nanoparticles (AgNPs) and its potential application in health and environment.

P-9

SCREENING FOR AGRICULTURALLY IMPORTANT SYMBIONTS FROM EARTHWORM CASTING

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ABSTRACT

The earthworms are supposed to be ecological engineers as they increase soil fertility. The casting habits of earthworms vary according to species; some form casts on a soil, some within soil and some use castings to line their burrows progress. The cast content built-up progressively by the frequent addition of fresh material, so that different parts of the large casts are of different ages. The sample taken for this experiment forms their casts on soil and it made easy to isolate them. Present study shows the role of micro-organisms present in gut of earthworms for their activities. It can be understood from the present study that many essential microbes are present in gut helps earthworms by various enzymatic activities like cellulase, gelatinase, xylanase, amylase, lipase, lecithinase and protease etc.

P-10

ISOLATION AND SCREENING OF PIGMENT PRODUCING FUNGI

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ABSTRACT

The negative impacts of synthetic dyes, seasonal reliance of pigment production in plants raised interest in micro-organisms derived natural colorants such as fungal and bacterial pigments. Additionally microbial pigment possesses antimicrobial and antioxidant properties. The present study aims to isolate pigment producing fungi from soil and screening its potential use for industrial purpose. In this study we isolated 8 fungi from different soil samples. The fungi were studied morphologically and found to be *Aspergillus* and P*enicillium* sp. producing green, yellow and cream coloured pigments. The mycelia were sub cultured for pigment production and after the incubation period mycelia were harvested and filtered. The pigment extraction was done using ethyl acetate as a solvent. Cotton fabric was treated with the extracted pigment which suggests these pigments can be considered as a good source of natural colorants.

P-11

FLUORESCENCE SENSING APPLICATION FROM GREEN SYNTHESIZED CARBON NANOPARTICLES

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ABSTRACT

Carbon nanoparticles (CNPs), which encompass carbon dots (CDs) and graphene quantum dots (GQDs), offer numerous applications thanks to their distinctive attributes, including large surface area, outstanding biocompatibility, adjustable fluorescence, and easy functionalization. Graphene quantum dots (GQDs), a type of carbon nanoparticle, possess unique characteristics due to their quantum confinement and edge effects. These distinctive properties render GQDs extremely versatile, supporting a diverse array of applications in multiple fields. These field include bio- imaging, and bio-sensing, drug delivery etc. The current project focuses on green synthesis of CNPs using biodegradable material for their application in metal ion sensing. The work includes optical characterization the CNPs such as UV visible spectroscopy and Photo luminescence (PL)spectroscopy. Structural analysis has also been performed including Scanning electron microscopy (SEM), X-ray diffraction (XRD). Energy dispersive X-ray analysis (EDX).

P-12

SPECTROPHOTOMETRIC ANALYSIS OF RHODAMINE B AGGREGATION IN AQUEOUS AND IONIC LIQUID SOLUTIONS

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ABSTRACT:

The self-association or aggregation of rhodamine B (RhB) in aqueous solutions and aqueous solutions containing a phosphonium-based ionic liquid (IL) has been investigated using spectrophotometry. The concentration range of ~2×10^{-4} M to ~5×10^{-4} M was selected to

avoid trimer and higher aggregate formation. Spectral data were processed using chemometric techniques to determine the dimer dissociation constant and individual monomer-dimer spectra. The dimer geometry, twisted angle, and interaction energy between RhB molecules in dimeric species were explained through molecular exciton theory. The effect of adding an ionic liquid on RhB dimerization was studied in a ternary phase system. An aqueous solution of tributyl ethyl phosphonium diethyl phosphate [P 2444][DEP] was prepared, and absorption spectra of RhB at different concentrations in this IL solution were recorded. The dimerization constant in these ternary solutions was compared with that in water. The properties evaluated have been explained in terms of the role of low concentrations of solvent molecules in dye aggregation, thereby affecting the degree of association, interaction energy, and dipole moments in monomer and dimer forms. The results have been explained in terms of bonding between dye molecules and [P 2444][DEP], which affects the arrangement of molecules and, consequently, the extent of aggregation.

P-13

CADMIUM SULFIDE QUANTUM DOTS EMBEDDED POLYTHIOPHENE NANOCOMPOSITE FOR NH_3 GAS SENSING

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ABSTRACT

Quantum dots are zero-dimensional semiconducting nanoparticles whose size ranging from 1 to 10 nm. They show many properties like excellent photoluminescence, high photostability, high quantum yield and size confinement effect. Herein, fluorescent CdS quantum dots (CdS QDs) have been prepared by hydrothermal method with citric acid as capping agent. Polythiophene (PTh) was synthesized with oxidative polymerization method by using thiophene as a monomer. Nanocomposites of CdS QDs and PTh were procured via ex- situ synthesis by loading different volume/volume ratios of CdS QDs with PTh. These synthesized CdS QDs-PTh nanocomposites have been characterized by different characterization techniques like UV- Visible spectroscopy, Photoluminescence spectroscopy and TEM. These characterization techniques confirm the successful formation of CdS QDs-PTh nanocomposites. These nanocomposites were tested for electrical gas sensing. Maximum %

sensitivity was obtained for ammonia gas for equal volume loaded CdS QDs-PTh nanocomposite. The sensor is repeatable and stable in nature with linear response. The response and recovery time lie in between 1-8s.

P-14

CATECHOLASE-LIKE ACTIVITY OF MONONUCLEAR CU(II) COMPLEX OF IMIDAZOPHENANTHROLINE DERIVED LIGAND IN AQUEOUS MEDIUM

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ABSTRACT

A mononuclear Cu(II) complex of the formula $[Cu(CIP)Cl_2]$ (where CIP is an imidazo phenanthroline ligand viz. (E)-2-(2-nitrostyryl)-1H-imidazo[4,5-f][1,10]phenanthroline) was synthesized and characterized using CHNS, H 1 NMR, IR, HRMS, UV-Vis spectroscopy and cyclic voltammetry. CuCIP complex mimics the active site of catechol oxidase enzyme in DMSO-water (5.0-95%) system at ambient temperature with a turnover number of 7.96 $x10^2$ min^{-1} with the production of semiquinone radical and hydrogen peroxide. Cyclic voltametric study of the complex confirmed one electron diffusion controlled redox behaviour. The formed product crystallized over a period of 3h and was isolated and confirmed by X-ray Crystallography.

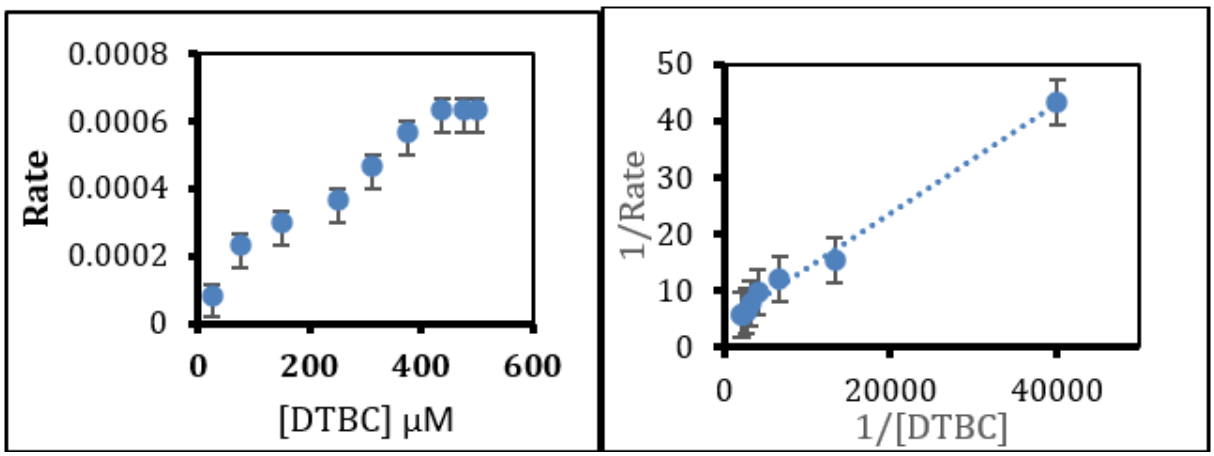

Fig.1. Michaelis Menten kinetics and Lineweaver-Burke Plots of the catecholase activity shown by CuCIP

P-15

REVISITING THE MECHANISM OF ·OH INDUCED OXIDATION OF URACIL TO INVESTIGATE POTENTIAL CATALYTIC ROLE OF GOLD NANOPARTICLES IN THE REACTION

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ABSTRACT:

Nanotechnology has evolved since past, finding its applications in drug delivery, bio-imaging, clinical diagnosis, therapeutics and many more to count. With the intentional and unintentional exposure of NPs in the bio-system, calls for the need of understanding the mechanism of interaction of NPs with the cells and biomolecules like DNA, RNA and proteins. NPs works by increasing concentration of Reactive Oxygen Species (ROS) by boosting metabolism making them a potential tool in oncology. The major radical-initiated target of ROS produced are Pyrimidine bases, where the radical especially •OH gets added on C5-C6 double bond. The resulting products of oxidation are markers of oxidative damage. The present study elucidates the interaction of •OH with Uracil in presence and absence of gold nanoparticles (GNPs) by steady-state and Pulse radiolysis. The formed stable products are quantified by performing HPLC of solutions irradiated for different doses. The studies infer interference of GNP with mechanistic pathway of interaction of Uracil with •OH, by stabilizing the radical cation formed. The oxidative degradation of Uracil calculated in terms of –G value is found to be 28% less in presence of GNPs, concluding its protective nature, making them fit to use in biomedical applications.

P-16

SYNTHESIS AND CHARACTERIZATION OF LAUHA BHASMA

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ABSTRACT:

The rising popularity of Ayurveda in recent years has led to an increased demand for Ayurvedic preparations. Ayurvedic pharmaceutical companies face the challenge of producing standard, authentic, and safe drugs in the required quantities while maintaining the highest quality. The process of preparing bhasma is particularly arduous and time-consuming. Traditionally, Ayurvedic physicians prepared bhasma themselves according to their needs. Nowadays, these preparations are mass-produced in pharmaceutical factories. This shift has introduced several issues, as the new equipment used in production has not been standardized for ensuring the quality of bhasma. Numerous reports have highlighted the presence of toxic mercury and arsenic in the final bhasma products. Therefore, it is essential to standardize the synthesis process by implementing quality control measures at various stages of preparation. This study focuses on the synthesis and characterization of Lauha Bhasma. It was synthesized using traditional methods. The Samanya Shodhana (purification) process involved using sesame oil, buttermilk, cow urine, kanji, and horse gram decoction, while Vishesh Shodhana (special purification) used Triphala Kwatha. For the Marana (incineration) process, cinnabar, aloe vera, cow urine, and Triphala decoction were employed. Finally, the obtained product underwent Amrutikaran with aloe vera extract by heating at 700°C. Lauha Bhasma was characterized using both ancient procedures and modern analytical techniques such as FTIR (Fourier Transform Infrared Spectroscopy), AAS (Atomic Absorption Spectroscopy), XRD (X-ray Diffraction), BET (Brunauer-Emmett-Teller), SEM (Scanning Electron Microscopy), PSD (Particle Size Distribution), and EDX (Energy Dispersive X-ray).The final product after the Amrutikaran process passed all classical Ayurvedic tests, indicating proper formation of bhasma. XRD analysis of Lauha Bhasma showed the formation of rhombohedral α-Fe_2O_3, with an insignificant amount of free iron. SEM and PSD analyses indicated the formation of nanosized particles in the synthesized bhasma (50-200 nm), with a specific surface area of 12.55 m^2/g as calculated by BET studies. The Amrutikaran process completely removed Hg from the bhasma, as indicated by EDX analysis.

P-17

QUANTITATIVE KINETICS OF THE RAPID BROMINATION OF ISOXAZOLE IN BROMIDE-FREE AQUEOUS MEDIUM USING HYDRODYNAMIC VOLTAMMETRY

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ABSTRACT

The rapid kinetics of bromination of isoxazole by molecular bromine at pH 4.7 has been studied quantitatively. Bromination of isoxazole is an electrophilic substitution reaction where reactivity is controlled by inductive effect and orientation by resonance effect. Isoxazoles are an important class of heterocycles that are largely employed in the area of pharmaceuticals and therapeutics. Hence the quantitative kinetic study will help in these applications. The bromination reactions are rapid electrophilic substitution reactions with a half-life of a few seconds therefore the kinetic data regarding the halogenation was lacking thus far. A special technique known as hydrodynamic voltammetry was introduced for the kinetic study. Molecular bromine is the only electro-reducible species in the reactions. As the solution was devoid of bromide ions, a decrease in bromine concentration was measured in terms of diffusion current using a rotating platinum electrode and a saturated calomel electrode (SCE) as a reference electrode. Bromination of isoxazole followed second-order kinetics with an equal initial concentration of reactants. Thermodynamic parameters were obtained based on rate constants at five different temperatures. The obtained rate constants and energy of activation were used to comment on the mechanism of the electrophilic substitution reaction. Thus, the present work quantitatively verifies the reactivity of the isoxazole in the bromination reaction.

P-18

TEXTURAL ANALYSIS OF ANCIENT ARCHAEOLOGICAL DEPOSITS

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ABSTRACT

Soil textural analysis plays a vital role in predicting the origin of the ancient soil deposit by comparing it with the parent material and/or virgin soil of ancient archaeological sites. In the present study, the pipette analysis method [Piper (1965), Day (1965) and Carver (1971)] was used to determine the texture and consequently the origin of the soil deposits at ancient sites. A total 54 soil samples from the Early Historic site of Bhon and the Early Medieval site of Paturda in Sangrampur taluka, Buldhana District, Maharashtra were analyzed. Soil samples are

collected from the ongoing excavations at both sites from the exposed vertical section and horizontally excavated deposits. The modern soil samples and virgin soil samples are also collected for reference purposes. The textural analytical results of these soil deposits shows that parent alluvium material plays an important role in the formation of habitational and non-habitational deposits of the respective ancient sites.

P-19

FACILE SYNTHESIS OF Zn-DOPED BIOI NANOPARTICLE AS AN EFFICIENT ADSORBENT FOR THE REMOVAL OF INORGANIC WATER POLLUTANT

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ABSTRACT

Heavy metals water pollution has remained to be a challenge to the world of industrialization in recent decades. Steel production, leather tanning and electro-plating, textile and paint industries have been releasing massive chromium and other toxic metal containing waste water in water sources. Recently, studies have focused on reduction of hexavalent chromium (Cr^{6+}) using photocatalyst semiconductor as the environmentally friendly technology. Among many semiconductors, TiO_2 has been researched widely, but it remains constrained with its inability to utilize the visible light energy due to its large band gap energy ~3.2 eV. Synthesis of photocatalyst semiconductor with high visible light absorptivity remains a hot research topic in waste water treatment. The development of bismuth based photocatalysts in response to emerging demand for solving the environmental problems has attracted immense interest over the last few years. This enthusiasm stems from their low cost, non-toxicity and high stability. In the present study we synthesized 3D flower-like BiOI microspheres and Zn doped BiOI microspheres using simple chemical route and examined their photocatalytic activity. Various characterization tools such as scanning electron microscopy (SEM), transmission electron microscopy (TEM) and X-ray diffraction (XRD) have been used to investigate the morphology and crystallinity of the photocatalyst. Our interest is to examine the role of as-synthesized doped nanoparticle for the removal of inorganic (hexavalent chromium/ Cu^{2+}) water pollutants.

P-20

DETERMINATION OF THE HEAVY METAL CONTENT OF THE PLANT *BALANITES AEGYPTIACA* BY ATOMIC ABSORPTION SPECTROSCOPY

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ABSTRACT

Due to its extensive use in the traditional medical system and the significance of its chemical components, *Balanites aegyptiaca* were chosen for elemental analysis. *B. aegyptiaca* has been traditionally used for 4000 years in Ayurveda. Various parts of *B. aegyptiaca* are used for the treatment of leprosy, poisoning ulcers, worm infection, leukoderma, anorexia, and constipation. Atomic Absorption Spectroscopy (AAS) techniques were used to analyze the elements in *Balanites aegyptiaca* plants. The results of the elemental analysis of the medicinal plants collected showed that varied concentrations of cadmium, zinc, cobalt, potassium, and lead were found in plant species. Zinc is found in high concentration (0.9753 ppm) while cadmium is in low concentration (0.0033 ppm). Fruits of *B. aegyptiaca* are reported to be used in a cathartic, whooping cough, skin disease, dysentery, diarrhoea, and fever. Metal complexes can be created by these metals joining forces with other plant proteins and phytochemicals. These complexes could exhibit various phytochemical properties. In this study, we sought to ascertain the presence of the true nutritious content of the medicinal plants in terms of the necessary trace elements.

P-21

INFLUENCE OF CAPPING AGENTS ON SYNTHESIS OF ZINC OXIDE FOR IMPROVED DYE-SENSITIZED SOLAR CELL PERFORMANCE.

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ABSTRACT

This study investigates the synthesis of zinc oxide (ZnO) nanomaterials with diverse morphologies using hydrothermal methods and various capping agents. The synthesized ZnO has been used as a photoanode for dye-sensitized solar cell application reveals intriguing results. The synthesized ZnO powders exhibited variety of morphologies such as nanoparticles, microspheres and other hierarchical nanostructures. The ZnO powder obtained from oxalic acid precursor has demonstrated the highest performance in solar cells. This study highlights capping agents' significant influence on morphology and surface area and overall impact on the energetics and recombination kinetics which is crucial for solar cell operation. These results highlight the pivotal role of ZnO nanomaterials morphology and film texture in determining dye adsorption characteristics, thereby influencing the overall efficiency of dye-sensitized solar cells.

P-22

P- CYMENE: A GREEN SOLVENT FOR OLEFIN METATHESIS AND ORGANIC TRANSFORMATIONS

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ABSTRACT

p- Cymene is a naturally occurring aromatic organic compound. It is classified as an alkylbenzene belongs to monocyclic monoterpenes. It's structure contains a *para*- substituted benzene ring with methyl and an isopropyl group. *p*– Cymene is insoluble in water, but miscible in organic solvents. It is also known as 4- Methylcumene, 4- Isopropyltoluene and 1-Methyl-4-(propan-2-yl)benzene. *p*- Cymene is a nontoxic compound that can be obtained in large amounts as a side product of the cellulose and citrus industry. *p*- Cymene is conventionally produced via Friedel-Crafts alkylation of toluene with *propene* or 2-propanol. In the extraction of limonene from citrus processing waste with particular attention to benign-by-design extractive processes, and its catalytic dehydrogenation for the production of p-cymene. For the cross-metathesis of estragole with methyl acrylate, this solvent prevents the consecutive double-bond isomerization of the product and affords the best yield of all solvents. (Fig. 1) Undesired consecutive isomerization is a major challenge for many substrates in olefin

metathesis, including pharmaceutical precursors, and the use of *p*-cymene as a solvent may be a way to prevent it.[1]

For over a decade, Direct Arylation Polymerization (DArP) has been demonstrated to be an eco-friendly, facile, and low-cost alternative to conventional methodologies such as Stille polymerization for conjugated polymer synthesis. By accessing through a C−H activation pathway, DArP offers a reduction of synthetic steps while eliminating the generation of stoichiometric, highly toxic organotin by products. While aromatic solvents are superior in solubilizing conjugated polymers, very little has been done in searching for more sustainable, benign alternatives for this class of solvent. Herein, we report the application of a sustainable, naturally sourced, high-boiling aromatic solvent, *p*- cymene, for DArP for the first time. (Fig. 2) *p*- Cymene was found to display excellent solubilizing ability in the synthesis of a broad scope.[2]

Structure of p-cymene

Fig. 1 Olefin Cross Metathesis using *p*-Cymene

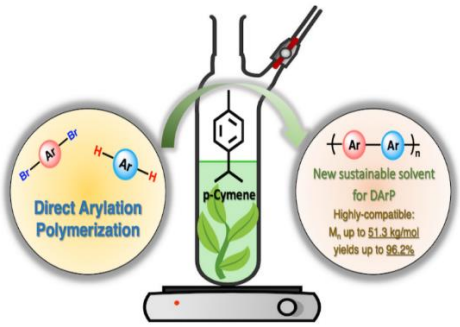

Fig. 2 Direct Arylation Polymerization using *p*-Cymene

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P-23

SYNTHESIS OF Co-Al LAYERED DOUBLE HYDROXIDE USING 2-DIMENSIONAL REACTION-DIFFUSION FRAMEWORK

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ABSTRACT

Layered double hydroxides (LDHs) are a class of layered materials with a general formula of

$[(M^{II})_{1-x}(M^{III})_x(OH)_2]^{x+}(A^{m-}_{x/m})\cdot nH_2O]$. The layers contain divalent (MII) and trivalent (MIII) metal ions, and the interlayer region is occupied with charge-balancing anions. LDH has gained much attention from the research community owing to its applications in the fields of energy storage, removal of pollutants from waters via adsorption, novel drug delivery systems, and with sensing of the materials. Given this, developing synthetic methods of LDH with less resource consumption is an area of the scientific community. The present work deals with the synthesis of Co-Al LDH by employing reaction-diffusion (RD), which is emerging as a green, easy, cost-effective route for synthesizing novel materials with hierarchical crystal geometries and structures. Typically, nitrates of cobalt, aluminum, and urea were dissolved in water, and agar powder (1% v/v) was added to it. The warm solution was transferred to a test tube (h=14 cm and d=1.7 cm) and kept overnight for the gelation. The next day, the NaOH solution was poured above the gel and diffused for about six days. During the diffusion, the OH- molecules met the Co and Al ions in the tube, forming the Co-Al LDH. The product was separated from the gel and characterized using FT-IR and SEM-EDX CV XRD.

P-24

INVESTIGATION OF ANTIBIOTIC RESISTANCE AND TOLERANCE IN *LACTOBACILLUS* SPECIES ISOLATED FROM PROBIOTIC FOOD

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ABSTRACT

Probiotics are live bacteria that can help a host's health when consumed in proper quantities. Ideally these probiotic microorganisms should be normal organisms sensitive to antibiotics, not carrying any resistance genes or virulence factors but these probiotic microorganisms are getting exposed to antibiotics on a large scale due to over-consumption of self-prescribed antibiotics. The aim of our study was to isolate probiotic bacteria from commercial samples, identify and characterize these isolates, study their antibiotic susceptibility/ resistance pattern and also their ability to form biofilm and persister cells. Time kill assay was performed to check in vitro killing efficiency of antibiotics. Isolation of probiotic bacteria was done from the commercial samples and 5 strains were obtained which were further

identified by performing Gram staining, biochemical tests and metachromatic granule staining. Percentage of biofilm formed by all five isolates was analysed with ELISA reader. Antibiotic susceptibility and MIC values of 12 antibiotics were tested for 5 LAB isolates. All isolates were phenotypically susceptible to augmentin, amikacin and trimoxazole. The resistance to norfloxacin, amoxycillin and colistin was seen in three isolates. The time kill curve showed a biphasic pattern typical of persister cells. The stationary phase population of isolate 1 and 2 was reduced to 3 $\log_{10}$ by augment within 6 h after which the colony count remained constant till 24 h. The plateau obtained due to the constant C.F.U represents the surviving population that are actually persister cells in presence of the antibiotic.

P-25

PHYSICO-CHEMICAL CHARACTERISTICS OF HONEY PRODUCED BY STINGLESS BEES (*MELIPONULA BECCARII*) FROM WESTERN MAHARASTRA

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ABSTRACT

Stingless bee honey samples were collected from various regions within western Maharashtra. A total of 4 samples were obtained. In Western Maharashtra, there are several areas where stingless bees (*Meliponini*) can be found. When searching for stingless bee colonies in Western Maharashtra, it's essential to respect natural habitats, obtain necessary permissions for accessing protected areas, and follow ethical guidelines for interacting with wildlife. Collecting stingless bee honey samples from Western Maharashtra would typically involve locating colonies of stingless bees, which are often found in natural habitats such as forests, woodlands, or gardens. The samples were stored in sterilized glass containers at 4°C until analysis. The physico-chemical and biological properties of 4 samples of honey were investigated obtained from western Maharashtra, India. The physicochemical properties evaluated were Colour Analysis and Free Acidity, Electrical Conductivity, Moisture content, Ash content, phenol content, HMF content, and antioxidant activity. Results showed a range of honey colours from light amber to dark amber. The pH values ranged from 3.3 to 4.5. The low pH of honey inhibits the presence and growth of microorganisms. The moisture content (%) in the investigated

samples range from 11 -19% Moreover, free acidity of samples is within the limits(50meq/kg). Ash content 0.03 to 0.05 % reflecting the purity of the sample and the electrical conductivity values ranged from 0.05 to 1.7mS/cm, consistent with the mineral content of the honey. The HMF content was below the maximum allowable limit, indicating that the honey samples were fresh and had not undergone excessive heating. The total phenolic content ranged from 50 to 150 mg GAE/100 g, demonstrating the presence of bioactive compounds. Antioxidant activity showed a positive correlation with phenolic content, indicating the potential health benefits of the honey. Samples have shown antibacterial activity for both Gram positive *Staphylococcus aureus* and Gram negative *Escherichia coli* got the same results for Antibiofilm activity. Antibiofilm activity was high at 50 µg/mL concentration in comparison with Standard which contain antibiotic.

P-26

APPLICATION OF MATHEMATICAL MODELLING AND REMOTE SENSING TECHNIQUES IN WATER QUALITY ANALYSIS

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ABSTRACT

Numerical and AI-ML-based water quality prediction models have known advantages over traditional water quality assessment methods that require extensive fieldwork involving water sample collection and instrumentation-based chemical analysis. Earth's water cycle and its physicochemical interaction with atmospheric processes will be the basic framework for our research. The numerical model-based simulation results thus presented will incorporate gas–liquid equilibriums, gas-phase mass transfer, and catalyzed SO_2 oxidation with uptake of gases and particulate matter of various chemical species in aqueous phase. The one-dimensional time-variant model results will depict relative ionic concentrations of various chemical species in water. The model results will be based on aqueous concentrations of $(SO_2)_L$ and $(NH_3)_L$ and their ionic components. The AI-ML models will be trained on historical water quality data. The calibration of these models and validation of their results will be performed with observational data. It must be noted that the accuracy of the model results has to be verified against analysis of data gathered by remote sensing tools. The variety of predictive AI-ML models available for implementation in water quality analysis will be discussed.

Remote sensing enables more efficient mapping of water quality parameters compared to traditional sample collection and chemical analysis. Such fast and accurate analysis will be useful in water usage-related decision-making processes. A comparative analysis of the results of numerical and AI-ML models and the remote sensing data will be presented. This numerical and AI-ML-based water quality analysis augmented with remote sensing and image processing techniques will be useful for environmental planning with regard to water quality management and prevention of water pollution.

P-27

PRECISE CONTROL ON POLYMORPHISM & MORPHOLOGY VIA REACTION-DIFFUSION PATHWAY FOR SYNTHESIS OF MoS_2 & MoO_3 AT AMBIENT-TEMPERATURE

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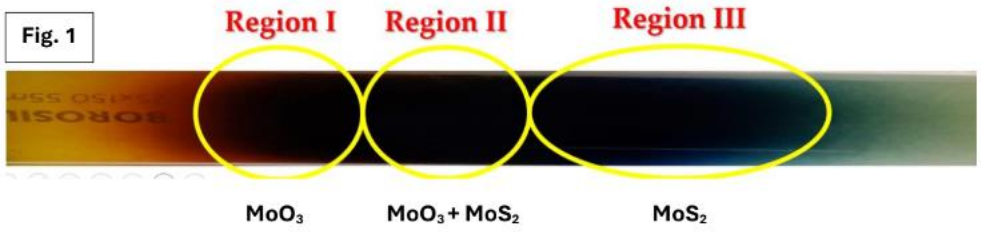
ABSTRACT

The synthesis of layered materials has garnered significant interest because of their unique properties and potential applications across various fields.1Various methods, such as hydrothermal and liquid phase synthesis, have been employed for the synthesis of these materials. Recently, a reaction-diffusion (RD) framework has been utilized to synthesize materials with tailored properties.2-4 The RD method provides clear advantages over traditional synthesis techniques by offering precise control over the shape and size of nano- to microstructures.3 Given this, our research has focused on synthesizing molybdenum disulfide (MoS_2) and molybdenum trioxide (MoO_3), a two-dimensional layered material. In this study, a three-component 1D classical RD methodology was used to synthesize MoS_2 and MoO_3 in the same reactor. The process involved clamping a test tube containing agarose gel immobilized with the inner electrolyte vertically, allowing the outer electrolyte to diffuse into the gel over time to produce the product via the RD phenomenon. This methodology has the advantage of yielding MoS_2 and MoO_3 at room temperature in the same tube but in different regions (Fig. 1), depending upon the concentration gradient created. The formed regions were cut into

separate regions and were calcined to remove the water. Material characterization techniques such as XRD, SEM-EDS, and IR were used to confirm the formation and purity of the products. XRD confirmed the formation of MoS_2 and MoO_3, while SEM imaging showed spatially segregated hexagonal sheets based on their size and shape. This suggests that the RD methodology provides a promising and environmentally friendly approach for synthesizing layered materials like MoS_2 and MoO_3, making it suitable for various applications in material science.



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P-28

SYNTHESIS AND CHARACTERIZATION OF ENVIRONMENTALLY FRIENDLY NANO-CRYSTALLINE N-DOPED-TiO_2 CATALYST FOR WITTIG REACTION

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ABSTRACT

In this research, nitrogen-doped titanium dioxide (N-doped TiO_2) was synthesized using the sol-gel method. Titanium isopropoxide was employed as the titanium precursor, while triethylamine served as the nitrogen source. The resulting N-doped TiO_2 powder was calcined at various temperatures ranging from 150°C to 550°C. The structural properties of the N-doped TiO_2 were characterized using X-ray diffraction (XRD), Fourier transform infrared (FTIR) spectroscopy, thermogravimetric analysis (TGA), energy dispersive X-ray analysis (EDX), and scanning electron microscopy (SEM). The material was oven dried at 60°C for 6 hr and used as green catalyst Wittig reaction. It was observed that the N-doped TiO_2 exhibited significantly

higher catalytic activities compared to commercial TiO_2 for Wittig reaction. After the completion of reaction catalyst was recovered and oven dried to recycle for the same synthesis. It shows that almost same yield of for Wittig reaction. The formation of organic Wittig product was confirmed by using ^{1}H-NMR, ^{13}C-NMR and HRMS technique. The overall methodology used in present work is green, environmentally friendly, easy for handling and scale-up and can being an alternative source for olefination reaction.

P-29

MoS_2 –POLYANILINE THIN FILM FOR AMMONIA GAS SENSING APPLICATION

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ABSTRACT

Nanostructured Molybdenum disulphide (MoS_2) successfully synthesized by the hydrothermal method. As synthesized material characterized by FTIR, XRD and SEM techniques. Polyaniline (PANI), MoS_2- PANI and MoS_2- Fe_2O_3- PANI thin films screened for ammonia (NH_3) gas sensing. The study showed that MoS_2-PANI film exhibits excellent sensitivity to ammonia gas than pure PANI and MoS_2- Fe_2O_3- PANI films.

P-30

SIMULTANEOUS DETERMINATION OF IMPURITIES AND DEGRADATION PRODUCT IN FLURALANER ANTIPARASITIC DRUGS USING REVERSE PHASE HIGH-PERFORMANCE LIQUID CHROMATOGRAPHY METHOD

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ABSTRACT

A simple, selective and fast Reversed-Phase High-Performance Liquid Chromatographic (RPHPLC) approach for identifying related compounds in fluralaner, an Active Pharmaceutical Ingredient (API), has been developed and validated. The chromatographic system consisted of LC-2030C 3D with PDA detector and auto-sampler. The chromatographic separation was performed by gradient elution method using Hypersil BDS C18 column (250 mm×4.6 mm, 5 µm) as a stationary phase and mobile phase comprising of phosphate buffer (pH 4.0), acetonitrile (60:40) v/v in phase A and acetonitrile and methanol (50:50) v/v as phase B at a flow rate of 1.0 mL min-1. Using an ultraviolet absorbance detector, the samples were detected and quantified at 264 nm. The method was found selective and a peak of the fluralaner was well separated with other impurities. For fluralaner the proposed method is linear ($r^2 = 0.999$), accurate (with 99.0% recovery) and precise (%RSD <2%). The method has been utilized to determine related substances in commercial products and was found to be accurate within a limit.

P-31

MACHINE LEARNING-BASED ESTIMATION OF PM2.5 LEVELS IN MAHARASHTRA USING MODIS SATELLITE DATA

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ABSTRACT

Accurate and high-temporal-resolution predictions of fine particulate matter (PM2.5) are crucial for epidemiological studies, climatological research, and air quality assessments. This study aims to forecast PM2.5 levels in Maharashtra, India, for the year 2020 with a spatial resolution of 1 km by leveraging data from ground monitoring stations, MODIS Aerosol Optical Depth (AOD), and meteorological variables, using a Random Forest (RF) machine learning approach. The results demonstrate that the RF model effectively captured the spatio-temporal variability of PM2.5 concentrations, achieving notable performance metrics with an R^2 value of 0.95, an RMSE of 8.81 μg/m^3, and an MAE of 6.54 μg/m^3. The estimated PM2.5 model indicates elevated concentrations in the western, northwest, and central regions of the study area, with an annual average of 57.86 μg/m^3. Seasonal variations reveal a reduction in PM2.5 levels during the monsoon, while winter months show higher concentrations. This research highlights the application of a sophisticated computational model to produce high-resolution PM2.5 distribution maps, which can aid in developing effective regional air pollution management strategies.

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Second Anniversary Celebration: J. ISAS Meet:

To mark the second anniversary of J. ISAS, the ISAS headquarters, in collaboration with the ISAS Pune Chapter, and RJSPMC is organizing a one-day meet on the theme "Interdisciplinary Approaches in Analytical Science (IAAS)" for authors, researchers, reviewers, editors, teachers and students, on 30 July 2024 at RJPMS's ACS College. The event will include 5 invited lectures in the morning session following the inaugural function, and poster presentations in the afternoon session. Awards will be presented to the best poster presentations during the valedictory function. Join us in celebrating this milestone and contributing to the advancement of analytical science through your valuable research and participation. You are requested to send your abstract of paper by 22 July 2024 on email ID isasmeet24@gmail.com. The selected abstracts will be considered for full length papers for publication in J. ISAS.

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