ONLINE

INTERNATIONAL CONFERENCE

on

ENVIRONMENT, WATER, AGRICULTURE, SUSTAINABILITY AND HEALTH (EWASH-2022): STRATEGIZING A GREENER FUTURE

&

4th Annual Meet of STE

12th - 13th January, 2023

Protect the blue and green
Make the Earth pristine

Abstract Book & Souvenir

Jointly organized by

HINDU COLLEGE
UNIVERSITY OF DELHI, DELHI

SAVE THE ENVIRONMENT
A Society for Research Awareness and Social Development

Co-organized by

CSIR-National Environmental Engineering Research Institute
Delhi Zonal Centre (DZL)

Royal Society of Chemistry London
North India Section

ONLINE INTERNATIONAL CONFERENCE ON

ENVIRONMENT, WATER, AGRICULTURE, SUSTAINABILITY AND HEALTH (EWASH-2022): STRATEGIZING A GREENER FUTURE

&

4th Annual Meet of STE

12th - 13th January, 2023

Sumedha Kataria
IAS (Retd)

Helevetia House
#1221 Sector 7, Urban Estate
Thanesar, Kurukshetra 136118

MESSAGE

Ref. No. Spl 1/23

Date 6.1.2023

I feel privileged to be part of the International Conference on "Environment Sustainability and Health (EWASH-2022): Strategizing a Greener Future" organized jointly by Hindu College, University of Delhi and Save The Environment (STE) on January 12-13, 2023.

The issues of sanitation, waste management and water resources management have gripped the global attention and adversely impacted many of the Sustainable Development Goals (SDGs). This also results in Greenhouse Gas (GHG) emissions and triggers climate change. I feel the people and organisations/ institutions engaged in addressing environmental issues are doing a great service and giving rays of hope amidst despair. These voices are imploring and exhorting all stakeholders to join hands, lead and fight for a safe, healthy, hygienic environment. I am of the considered view that NGOs like STE are a beacon light for mankind to survive and they do not only dream of the better world but also have the guts and grit to move in the direction of making this world a better, healthier place to live in even if it means *'jodi tore daak shune keu na aase, tobe ekla chalo re'*.

It is very heartening to note that eminent academicians, young researchers, environmental scientists, industry personnel and policy makers have joined hands to deliberate and take forward the message of EWASH 2022 as to how each individual, community of people, state and national governments can contribute effectively to ensure an environment-friendly and greener future, so that 'no one is left behind'.

This conference lends the positive start of 2023 and I wish the organizers all success. Undoubtably, the efforts made by STE would go a long way in imparting the spirit of 'we shall overcome' to 'Protect the Blue and Green and Make the Earth pristine.'

(Sumedha Kataria)

ONLINE INTERNATIONAL CONFERENCE ON

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4th Annual Meet of STE

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MESSAGE

We in India have a tradition which professes that every living being is inexorably linked with the surroundings that consists of living and non-living organisms. Our *Vedas* proclaim that the ecosystem is the very basis on which life sprouted. It has paid to obey to every aspect of the environment. Our tradition also teaches us that life consists of the five elements – earth, air, water, fire and space. It is within this traditional framework that our consciousness on environment has emerged over the past centuries. On the other hand, it is also a fact that environmental consciousness in the developed countries is an offshoot of the way of life which has spelt disaster on the ecosystem. No doubt, the radical innovations in the fields of science and technology have brought about new avenues for the control of the earth's resources. Yet, it has done so at the expense of the life-sustaining environment.

In the above context, Save The Environment and Hindu College, Delhi is jointly organizing International Conference on Environment, Water, Agriculture, Sustainability and Health (EWASH-2022) on 12th and 13th January 2023. In two days conference scientists, academicians, research scholars, experts and policy makers will deliberate on various issues and challenges in the field of sustainable development, conservation of nature and environment, balanced use of natural resources and protection of public health.

I convey my best wishes to all.

Prof Arunabha Majumder

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हिन्दू महाविद्यालय
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MESSAGE

"We do not inherit the earth from our ancestors, we borrow it from our children"- As aptly expressed by David Browser, the realization that we need to protect our mother earth in order to render a cleaner and safer planet for our forthcoming generations has grown stronger especially in light of the pressing environmental challenges we are facing today.

Just a few years ago, the world came on a common platform agreeing on a set of universal goals- the 17 sustainable development goals that carry a vision for the planet as a world of good health, quality education, gender equality, safe drinking water, clean energy and decent work for all and with not even 10 years left to accomplish these goals which will define our future into this century, large-scale innovations and solutions will be required to transform our commitments into action. Indeed this calls for united efforts and this is where conferences such as E-WASH, focusing on Environment, Water, Agriculture, Sustainability and Health play a pivotal role in not just spreading awareness around, but also in providing a collaborative platform to build upon research endeavours and interdisciplinary deliberations to address various global challenges. This is this third time that we are all uniting for the E-Wash with strategized goals for the furtherance of our mission of greening the planet earth. Undeniably, the outcomes of the previous years had been magical and had set the bar high with meaningful and impactful lectures, excellent scientific deliberations where we came up with efficient and sustainable solutions for mitigating some of the current environmental challenges.

This year is even more special as there are a few student-centric workshops (Herbs to Health & Anthelia) have been planned on an offline mode at the Research Centre, Hindu College where students will not only get an opportunity to acquire hands-on experience in product development (making environmentally friendly household products and herb derived therapeutics) and but also develop entrepreneurship skills.

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I would like to take this opportunity to express my heartfelt gratitude to Dr. Kshipra Misra, the president of STE who has been instrumental in organizing this conference and taking it to a higher level. Also, my deep gratitude goes for Prof. R. K. Sharma, Co-ordinator of GCNC and Honorary Secretary, RSC London North India Section, who has always supported us extensively in all our endeavours. I congratulate the entire organizing team in advance for their relentless efforts in making this conference meaningful and fruitful.

I feel elated to be welcoming all the delegates and participants to this event who will play a pivotal role in contributing to the success of E-Wash 2022! I am hopeful that the outcomes will be taken forward and through united collaborative efforts, we will be able to accomplish the sustainable development goals by 2030, ultimately leaving a healthier planet for all!

Wishing all the success for E-WASH 2022!

With best wishes,

Prof Anju Srivastava
Principal
Hindu College

ONLINE INTERNATIONAL CONFERENCE ON

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4th Annual Meet of STE

12th - 13th January, 2023

Green Chemistry Network Centre (GCNC) Laboratory

(Setup under the grant from Ministry of Textiles, Govt. of India)

Prof. R. K. Sharma

Ph.D., CChem FRSC
Coordinator, Green Chemistry Network Centre
Honorary Secretary
Royal Society of Chemistry London, North India Section
http://greenchem.du.ac.in/

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MESSAGE

It is a matter of great delight that Hindu College, University of Delhi and Save The Environment (A Society for Research Awareness and Social Development) are jointly organizing a virtual International Conference on Environment, Water, Agriculture, Sustainability and Health (EWASH-2022): Strategizing A Greener Future & 4th Annual Meet of STE from 12th -13th January, 2023 in association with the CSIR-National Environmental Engineering Research Institute (NEERI) Delhi Zonal Centre (DZL) and Royal Society of Chemistry (RSC).

In recent times, environmental awareness and sustainable development has become a pre-requisite. Though there have been considerable advancements, there is still immense scope for improvement. The current need of the hour is to develop strategies and policies for environmental protection, water management for agricultural usage and an overall up-gradation in the health sector. The conference will provide an opportunity and an international platform to the eminent scientists, academicians, policy makers, researchers, industrialists and young professionals to exchange their creative ideas, experiences and research findings which in turn will lead to achieve the desired goal of strategizing a sustainable environment.

I greatly appreciate the efforts directed by the organizing committee members and congratulate them in advance. I wish the conference a great success and I am confident that it will be a memorable event. May this conference be characterized by fruitful thought provoking discussions, which will lead to the betterment of the society!!

Professor R. K. Sharma

ONLINE INTERNATIONAL CONFERENCE ON

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MESSAGE

"E-Wash 2022"- As we all unite once again for this International Conference which has been so special for us i.e. the entire organizing team of Hindu College as well as STE, we have all indulged ourselves once again in taking the noble initiative towards protecting our environment through strategic solutions and ultimately contributing towards a sustainable planet!

Certainly, now in our post pandemic period, as we retrospect, we realize that the spread of the undesirable SARC COVID-19 virus has been a repercussion of our own actions. We have certainly contributed towards technological advancements and in this process, we have caused a massive harm to our environment including the flora, fauna, hydrosphere, lithosphere- almost every section of the environment has been affected severely. Time calls for urgent action, we need to transform our one track progressive mind and include the need to assess environmental impacts. We need to provide clean water, render clean air (free of any destructive virus) to the 1 billion population across the world. We need to accomplish the 17 sustainable development goals highlighted in the blueprint of the U. N. 2030 Agenda of SDGs well within the stipulated time period. All this requires a lot of proactive efforts and all steps taken so far in this regard still seem at infancy. The urgency to meet the SDGs would require more deliberations, collaborations and research endeavours and this may seem possible by bringing the government, scientists, budding researchers and other stakeholders at a common platform and strategizing the efforts.

With E-Wash 2022, we aim to achieve a safer world and disclose all the latest research findings which can be ultimately utilized to come up with rational solutions for the major environmental threats and challenges.

My special thanks to Prof. Anju Srivastava, Principal, Hindu College who has dedicated herself completely towards the upliftment of the college as well as the environment, being a green chemistry herself. She has always supported all the faculty members as well as students in working towards the furtherance of the seventeen sustainable development goals. I also take this opportunity in thanking Dr. Kshipra Misra, President, STE who has also committed herself towards environmental remediation and worked relentlessly towards the conduct of E-Wash 2022! My gratitude also goes to Prof. R. K. Sharma, Co-ordinator Green Chemistry Network Centre and Honorary Secretary, Royal Society of Chemistry London North India Section who has always supported us in our endeavours and played a crucial role towards the popularization of Green Chemistry in India.

Lastly, I would like to congratulate the entire organizing committee for their contributions towards this conference.

With best wishes,

Prof Reena Jain
Vice-Principal
Hindu College

ONLINE INTERNATIONAL CONFERENCE ON

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4th Annual Meet of STE

12th - 13th January, 2023

सी.एस.आई.आर.- राष्ट्रीय पर्यावरण अभियांत्रिकी अनुसन्धान संस्थान
दिल्ली क्षेत्रीय केंद्र, ए – 93, 94, फेज –1
नारायणा ओद्योगिक क्षेत्र, नई दिल्ली – 110 028, भारत
मुख्यालय: नेहरू मार्ग, नागपुर – 440020, महाराष्ट्र

From:
Dr. S.K. Goyal
Chief Scientist & Head

CSIR-National Environmental Engineering Research Institute, Delhi Zonal Centre, A-93/94, Phase-I, Naraina Industrial Area, **New Delhi – 110 028, India**
Headquarter: Nehru Marg, Nagpur - 440020, Maharashtra

MESSAGE

With continuous increase in population, Worldwide and in India as well, the pace of development required to meet the needs and aspirations of people has put tremendous pressure on the natural resources and in-turn on the mother Earth. Current World population is about 7.9 billion, wherein nearly 1.4 billion (17.7%) people reside in India. As we all know that all the resources shall remain limited in the universe and cannot be enhanced, the only possible way is to continuously evolve new technologies/ processes that use lesser resources and generate more products to meet the continuously increasing requirements, while minimizing/ eliminating the wastes generation. Even the minimal wastes generated need to be managed within safe limits, as these will become resources for future generations.

It is indeed a pleasure that "SAVE THE ENVIRONMENT", a Society for Research Awareness and Social Development, Gurugram along with Hindu College, University of Delhi, Delhi, CSIR-NEERI Delhi Zonal Centre, and The Royal Society of Chemistry, North India is organizing two days International Conference on "Environment, Water, Agriculture and Health (EWASH-2022): Strategizing A Greener Future" during January 12-13, 2023 to discuss and deliberate various challenges and technological solutions pertaining to environment, water, agriculture, sustainability and health to make human life easier. I am sure with the participation and deliberations by various stakeholders including the subject experts, academicians, researchers, students and policy makers in the conference will help positively in addressing the national as well as global challenges aimed at.

I congratulate the Organizers and wish the Conference a Grand Success.

(S.K. Goyal)

07.01.2023

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Jointly organized by

HINDU COLLEGE UNIVERSITY OF DELHI, DELHI

SAVE THE ENVIRONMENT
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4th Annual Meet of STE

12th - 13th January, 2023

MESSAGE

As the new year 2023 unfolds, sustainability, good health and a greener, cleaner earth have already taken centre stage of all brainstorming sessions with the UN announcing the major objectives of this year as 'sustainable development, health and climate'. Several months of lockdown and precautions have taught us that a better life is reliant on harmony between nature and human activities. Indeed, it has to be ensured that proper solutions are devised and implemented to full potential, in order to preserve the green cover and water bodies surrounding us. Policies and environmental economics need to be meticulously designed to realize the targets of 'food and healthcare for all'. Attaining technological advancement while co-existing with biodiversity will need to be addressed.

EWASH 2022 & the 4th Annual Meet of **Save The Environment** will very relevantly be addressing these diverse yet essential aspects, with the expanded vision being '**Strategizing a Greener Future**'.

With immense pleasure, I welcome you aboard **EWASH 2022**, for a highly productive congregation of eminent scientists, government authorities, environmentalists, policy makers, educationists and researchers across the world to share vital knowledge for environment protection and improvement of human health. This conference shall comprise of erudite keynote & invited lectures, oral & poster presentations as well as interesting student activities.

As the Convener of **EWASH 2022** and President of STE, I feel delighted and grateful to welcome all the delegates. I am thankful to Mrs. Sumedha Kataria, Retired IAS officer

of Haryana cadre for accepting our request to grace the event as the Chief Guest of the inaugural session.

I am obliged to our Keynote and Invited speakers who have given their valuable time and have accentuated the conference quotient through their enlightening talks. My gratitude also goes for Prof. Arunabha Majumdar- Chief Patron; Prof. R. K. Sharma, Prof. Anju Srivastava and Dr. S. K. Goyal- Patrons; Prof. Reena Jain - Convener; all our Co-Patrons, Co-Conveners, Organizing Secretaries and the entire Organizing Committee and Conference Secretariat who have persistently worked towards making this event a grand success.

Special thanks are reserved for the participants and audience, especially the young researchers who have contributed their innovative ideas which we shall come across in this abstract book. We hope that the technical sessions in EWASH- 2022 will extensively help towards our larger objectives. I extend my best regards to everyone and welcome you all to EWASH 2022.

With regards,

(Dr. Kshipra Misra)
President, Save The Environment (STE), NGO, Kolkata
www.stenvironment.org;
Former Additional Director & Head
Department of Biochemical Sciences (DBCS)
Defense Institute of Physiology and Allied Sciences (DIPAS), DRDO,
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ONLINE INTERNATIONAL CONFERENCE ON

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4th Annual Meet of STE

12th - 13th January, 2023

MESSAGE

Dr. Devanshi Magoo
Assistant Professor
Department of Chemistry
Hindu College
University of Delhi
Delhi 110007,INDIA
Ph:- 91 11 27667184

Dear Delegates

Warm Greetings!

It gives me immense pleasure to welcome you all to the International Conference on 'Environment, Water, Agriculture, Sustainability & Health (EWASH-2022): Strategizing A Greener Future'. This conference, with a theme which is in tune with the times is the right platform to bring various stakeholders under one roof to discuss and deliberate on contemporary issues that surround today's world. The assembly that this conclave is going to witness ranges from undergraduate students to research scholars to faculty to industry experts and also representatives from government authorities; and interactions among a multifarious audience on such pertinent issues is surely expected to foster awareness and sensitivity towards environment, promote knowledge exchange and bring forth innovative solutions to some of the pressing concerns affecting the environment.

The Annual conference jointly organized by Save The Environment, Kolkata and Department of Chemistry, Hindu College, University of Delhi, in association with CSIR- National Environmental Engineering Research Institute (NEERI) and Royal Society of Chemistry, London North India Section is one of the effective reflections of the scientific, academic, and social contributions of the organizing partners. Not only does it allow us to meet and greet but also provides a unique forum for exchange of ideas, offers, and opportunities.

The organizing team has worked efficiently in charting out a scientific programme that covers a wide spectrum of topics including keynote addresses, invited talks, orations and presentations that would provide a right mix to enlighten the delegates on the recent developments on deep rooted environmental issues. The technical sessions have been interspersed with some exciting activities planned especially for the undergraduate students.

I once again welcome you all to this wonderful gathering and sincerely wish that you are able to take the maximum out of this enthralling opportunity. I thank you all for contributing to the success of the conference and look forward to a great time together!

Best Wishes and warm regards

Dr. Devanshi Magoo
Assistant Professor, Department of Chemistry
Hindu College, University of Delhi
Co-Convenor-EWASH 2022

Jointly organized by

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4th Annual Meet of STE

12th - 13th January, 2023

MESSAGE

Ajai Kumar
Associate Professor
Department of Chemistry
Hindu College
University of Delhi
Delhi 110007,INDIA
Ph:- 91 11 27667184

I am immensely delighted to learn that Department of Chemistry, Hindu College in association with Save the Environment (STE), CSIR- National Environmental Engineering Research Institute (NEERI) Delhi Zonal Centre(DZL) and Royal Society of Chemistry (RSC) London North India Section is organizing 4th online international conference on Environment, Water, Agriculture, sustainability and Health (EWASH-2022) and is going to published research abstracts obtained from eminent research scholars, teachers and scientists.

Environment, Water and Agriculture play one of most important roles for Human beings. In the current environment of changing global agriculture market, agriculture faces three challenges:

1. It has to increase the production of safe and nutritious food.
2. Ihas to generate the jobs and income.
3. It has to play a major role in the sustainable management of natural resources.

Agriculture is the largest water user worldwide; 70% of total fresh water withdrawals on average Agriculture is a major source of water pollution because of the use of huge amount of chemical Fertilizers, Herbicides, Fungicides, Insecticides, Pesticides and other contaminants. The major sources of water pollution are industries.

Pollution reduces water available for beneficial use and also increases the cost of water treatment. Polluted water causes high cost to human health. One-tenth of the global population is suffering from diseases due to the polluted water.

Polluted water and food produced using Fertilizers, Herbicides, Insecticides, Bactericides etc. are really very dangerous to human health.

My best wishes to all the research scholars, teachers and scientists for successful publication of their research abstracts. I congratulate to students and teachers associated with this conference and the publication for all the success.

Best wishes!

A. Kumar

Ajai Kumar
Teacher-in-charge
Co-convener
EWASH-2022

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4th Annual Meet of STE

12th - 13th January, 2023

MESSAGE

Dr. Meenu Srivastava
Associate Professor
Department of Chemistry
Hindu College
University of Delhi
Delhi 110007,INDIA
Ph:- 91 11 27667184

EWASH as the name suggests is a conference that enmarks the initiation of resolving the issues that are prevalent globally. A platform that gives us a chance to assemble , focus and integrate ourselves to work prominently towards environmental challenges that are either unresolved or have an ignorant eye.

The idea of EWASH propagates on pillars that youth is the power and can bring a change with an impact. Hence it is a synergetic effort to offer a stage of brainstorming to our young students and researchers.

It feels delighted that Chemistry Department of Hindu College and its Chemistry society 'TATVA' has joined hands with STE for hosting such an impactul conference since last few years

With a great pride in being part of this event, I look forward to a successful EWASH this year too.

Warm wishes.

Dr. Meenu Shrivastava
Organising Secretary

Jointly organized by
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SAVE THE ENVIRONMENT
A Society for Research Awareness and Social Development

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4th Annual Meet of STE

12th - 13th January, 2023

ORGANIZING COMMITTEE

Chief Patrons

Prof. Arunabha Majumder, Emeritus Professor, Jadavpur University, Kolkata and Former Director, AIIPH, Kolkata

Patrons

Prof. R.K. Sharma, Honorary Secretary, RSC London-North India section
Prof. Anju Srivastava, Principal, Hindu College, University of Delhi, Delhi
Dr. S.K. Goyal, Chief Scientist & Head, CSIR-NEERI, Delhi Zonal Centre

Conveners

Dr. Kshipra Misra, President, STE & Ex Addl. Dir., DIPAS (DRDO), Delhi
Prof. Reena Jain, Vice Principal, Hindu College, University of Delhi, Delhi

Co-conveners

Mr. Ajai Kumar, Associate Professor, Hindu College
Dr. Devanshi Magoo, Assistant Professor, Hindu College
Mrs. Chhanda Basu, General Secretary, STE

Organizing Secretaries

Dr. Meenu Shrivastav, Associate Professor, Hindu College
Dr. Sankha Chakrabortty, Assistant Professor, Kalinga School of Biotechnology/Chemical Technology KIIT Deemed to be University, Bhubaneswar

Co-Organizing Secretary

Dr. Jigni Mishra, Project Associate, IARI & E.C. Member, STE

Student Coordinators

Vansh and Aditi

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ORGANIZING COMMITTEE MEMBERS

From Hindu College, University of Delhi, Delhi

Dr. Charu Kumar
Dr. Geetika Bhalla
Dr. Vinita Narula
Dr. Neha Kapoor
Dr. Hemant Verma
Dr. Sudershan Kumar
Dr. Raghavi Khattar
Dr. Richa Tyagi
Dr. Dinesh Kumar
Ms. Manisha Chawla
Dr. Aman Bhardwaj
Dr. Manoj Chahal
Dr. Sriparna Dutta
Dr. Anupama Saini
Dr. Pragya Naulakha

From STE

Mrs. Shubhra Misra, Vice President, STE
Mr. Sanjit Mitra, Treasurer, STE
Mr. Dipankar Chakraborty, Jt. Secy., STE
Dr. Ratul Kumar Das, RA, STE
Mr. Gian Chand, Conf. Secretariat

From NEERI

Dr. Sunil Gulia, Sr. Scientist
Dr. Papiya Mandal, Sr. Scientist
Dr. Raman Sharm, Sr. Scientist
Er. Ankit Gupta, Sr. Scientist
Dr. Noor A. Khan, Sr. Scientist

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Royal Society of Chemistry London
North India Section

From RSC London, North India Section:

Dr. Sriparna Dutta
Dr. Radhika Gupta
Dr. Sneha Yadav
Dr. Kanika Solanki
Ms. Pooja Rana
Ms. Priyanka

ONLINE INTERNATIONAL CONFERENCE ON

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4th Annual Meet of STE
12 to 13 January, 2023 **(ONLINE MODE)**

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In Association with

CSIR-National Environmental Engineering Research Institute Delhi Zonal Centre (DZL)

The Royal Society of Chemistry North India

PROGRAM SCHEDULE

Inaugural Session	
Co-ordinators: Dr. Vinita Narula, Dr. Richa Tyagi and Dr. Shirsendu Banerjee	
9:30-9:35 AM	**Customary welcome of esteemed guests and delegates to the online conference room.**
9:35-9:40 AM	Introduction of Organizing and Co-organizing Institutions and About the Conference
9:40-9:45 AM	Formal opening of the conference by **Prof. Arunabha Majumder**, Chief Patron (STE), Emeritus Professor, Jadavpur University, Kolkata and Former Director, AIIHPH, Kolkata
9:45-9:55 AM	Welcome of Chief Guest, Guest of Honor and all esteemed dignitaries by **Dr. Kshipra Misra**, Convener, EWASH-2022, President, Save The Environment & Former Additional Director, DIPAS (DRDO), Delhi.
9:55-10:00 AM	Introduction of STE Activities
10:00-10:05 AM	Address by **Prof. Anju Srivastava**, Principal, Hindu College & Co-Patron, EWASH-2022 / Vice Principal and Convener Prof. Reena Jain
10:05-10:10 AM	Address by **Prof. R.K Sharma**, Honorary Secretary, Royal Society of Chemistry London, North India Section & Co-Patron, EWASH-2022
10:10-10:15 AM	Address by **Dr. S.K. Goyal**, Chief Scientist and Head, CSIR-NEERI & Co-Patron, EWASH-2022

10:15-10:35 AM	Address by **Honorable Chief Guest**
10:35-10:45 AM	Release of e-Abstract Book - 2022
10:45-11:15 AM	**STE Annual Awards Ceremony, 2022-Part I. STE Dr. APJ Abdul Kalam Award; STE Dr. Praloy O. Basu Lifetime Achievement Award; STE Fellowship Award; STE Green Excellence Award**
11:15-11:25 AM	**Inauguration of Tatva-The Chemistry Society of Hindu College** by **Mr. Mohit Agarwal**, President, Tatva
11:25-11:35 AM	Vote of Thanks & National Anthem

KEYNOTE SESSION

Chairpersons: **Dr. Laxman Prasad**, Group Advisor, RKGIT Group, Ghaziabad & Former Adviser, Dept. of Science & Technology, Govt. of India
Dr. M. Patri, Dr Raja Ramanna DRDO Distinguished Fellow**,** Former Outstanding Scientist, Director**,** Naval Materials Research Laboratory**,** Shil Badlapur, Addl. Ambernath**,** Ambernath
Co-ordinators: Dr. Meenu Shrivastava & Dr. Anupama Saini

11:35 AM-12:00 PM	**Prof. (Dr.) Pankaj Kumar Roy**, Professor & Director, School of Water Resources Engineering, Jadavpur University – ***Title: Sustainable water resources development and management in rural and urban areas: an introduction***
12:00-12:25 PM	**Dr. Nupur Bahadur**, Senior Fellow & Head, NMCG-TERI Centre of Excellence on Water Reuse - ***Title: Innovation, Science & Technology to align with National Missions: Case study of the development of TERI's TADOX® Technology***
12:25-12:35 PM	Remarks by Chairpersons Vote of Thanks by Coordinator
12:35-2:30 PM	**Lunch break and student activities** • **Reel Making** • **Screenizz**

TECHNICAL SESSION 1

Chairpersons: **Prof. Parimal Pal**, HAG-Professor, Department of Chemical Engineering, NIT Durgapur, West Bengal India
Prof. Sunil Dey, Professor & Head, Department of Geography, North Eastern Hill University, Shillong, Meghalaya
Co-ordinators: Dr. Geetika Bhalla, Dr. Sudarshan Kumar, Dr. Raghvi Khattar

2:30-2:45 PM	**Dr. Ramesh Kumar,** Post Doc Researcher, Department of Earth Resources & Environmental Engineering, Hanyang University, 222-Wangsimni-ro, Seongdong-gu, Seoul 04763, Republic of Korea - ***Title:***

	Sustainable Separation and Recovery of Lithium from Leach liquor of Spent LiBs using Membrane-based Hybrid Technology
2:45-3:00 PM	**Dr. Noor Afshan Khan,** Senior scientist, CSIR-National Environmental Engineering Research Institute, Delhi Zonal Centre - ***Title: Water Contaminants: Fate and existence during treatment process***
3:15-3:30 PM	**Dr. R. K Gupta**, Associate Professor, Department of Chemical Engineering, IIT Kanpur, Kalyanpur, Kanpur, Uttar Pradesh 208016
3:30-3:45 PM	**Dr. Suhel Parvez,** Professor & Head, Department of Toxicology, School of Chemical and Life Sciences, Jamia Hamdard - ***Title: Ecotoxicology and its Role in Understanding Eco-Health***
3:45-4:00 PM	Remarks by **Chairpersons** Vote of Thanks by Coordinator
Chairpersons: *Co-ordinators:*	**Dr. Amrita Mishra,** Associate Professor, KIIT School of Biotechnology, Bhubaneswar; **Dr. Ramesh Kumar**, Post Doc Researcher, Department of Earth Resources & Environmental Engineering, Hanyang University, 222-Wangsimni-ro, Seongdong-gu, Seoul 04763, Republic of Korea *Dr. Pragya Naulakha and Dr. Anupama Saini and Dr. Neha Chaudhary*
4:00-5:00 PM	**Oral Presentations 1 to 10**
5:00-5:30 PM	**STE Annual Awards Ceremony- Part II. STE International Achiever Award; STE Meritorious Award for Excellence in Academics & Research; STE Water Award; STE Women Excellence Award; STE Innovation Award.**

ONLINE INTERNATIONAL CONFERENCE ON

ENVIRONMENT, WATER, AGRICULTURE, SUSTAINABILITY AND HEALTH (EWASH-2022): STRATEGIZING A GREENER FUTURE

&

4th Annual Meet of STE

12th - 13th January, 2023

Day 2: 13th January, 2023	
Chairpersons: **Prof. Shachi Shah**, Director, SOITS & Professor in Environmental Studies, IGNOU, New Delhi. **Dr. Sushil K. Singh**, Additional Director & Scientist 'F' SSPL, DRDO, Delhi *Co-ordinators: Dr. Neha Kapoor, Dr. Hemant Verma & Ms. Manisha Chawla*	
	KEYNOTE ADDRESS
10:30-10:50	**Dr. Neeraj Tandon,** Former Scientist-G and Head, Medicinal Plants Division, Indian Council of Medical Research, New Delhi 110029 – ***Title: Phytopharmaceuticals: A New Drug Class Regulated in India***
10:50-11:10	**Prof. Nupur Bose,** University Prof.& Head, P.G.Department of Geography, & Prof-in-Charge, Dept. of Environment and Water Management (Retd.) A.N.College, Patliputra University**,** Patna, India - ***Title: Innovation, Science & Technology to align with National Missions: Case study of the development of TERI's TADOX® Technology***
11:10-11:30	**STE Annual Awards Ceremony, Part III. STE Best Principal Award; STE Best Teacher Award; STE Young Researcher Award; STE Humanitarian Award for NGO.**
	INVITED TALKS
Chairpersons *Co-ordinators:*	**Dr. Suraj K Tripathy,** Associate Professor and Associate Dean, KIIT School of Chemical Technology, Bhubaneswar; **Dr. Maulin P Shah,** Chief Scientist & Head at Enviro Technology Ltd., Ankleshwar, Gujarat, India *Dr. Richa Tyagi, Dr. Raghvi Khattar and Dr. Neha Chaudhary*
11:30-11:45	**Dr. Imteyaz Qamar**, Assistant Professor, School of Biotechnology | Gautam Buddha University, Gautam Budh Nagar | Uttar Pradesh (INDIA) -
11:45-12:00	**Dr. Pinaki De,** Senior Scientist, CSIR - National Institute For Interdisciplinary Science and Technology (NIIST), Thiruvananthapuram, Kerala - ***Title : Recovery, Recycle And Reuse-Based Green Biorefinery Strategies For A Sustainable And Secure Future***
12:00-12:15	**Dr. Jayato Nayak,** Assistant Professor, Centre for Life Science, Mahindra University, Hyderabad - ***Title : Graphene integrated photocatalyst development for transformation of anthropogenic CO_2 to Bio-methanol***
12:15-12:30	**Dr. Arti Bhatt,** Scientist F, Centre for Fire Explosives and Environment Safety, DRDO, India -
12:30-1:15	**Oral Presentations – 11 to 20**
1:15-1:30	Remarks by Chairpersons Vote of Thanks by Coordinator

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SAVE THE ENVIRONMENT
A Society for Research Awareness and Social Development

Co-organized by

CSIR-National Environmental Engineering Research Institute
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ONLINE INTERNATIONAL CONFERENCE ON

ENVIRONMENT, WATER, AGRICULTURE, SUSTAINABILITY AND HEALTH (EWASH-2022): STRATEGIZING A GREENER FUTURE

&

4th Annual Meet of STE

12th - 13th January, 2023

1:30-2:45	**Lunch Break & Student Activities** • **Quizzmania** • **Pictionary**
TECHNICAL SESSION	
Chairpersons: **Dr. Rajinder Singh Chauhan**, Dean, Centre for Life Sciences, Mahindra University, Hyderabad, Telengana, **Dr. Usha Panjwani**, Scientist G, DIPAS. DRDO *Co-ordinators: Dr. Meenu Shrivastav and Ms. Manisha Chawla and Dr. Priyanka*	
INVITED TALKS	
2:45-3:00	**Dr. Girija Bharat,** Director, Mu Gamma Consultants Pvt Ltd. Unit 29, 18th Floor, One Horizon Center, Golf Course Road, DLF Phase V, Gurugram - ***Title: National Framework on Safe Reuse of Treated Water for India***
3:00-3:15	**Prof. Shubhankar Suman,** Associate Professor, SOM - Oncology Academic Department, Georgetown University - ***Title: Space radiation-induced accelerated aging, associated cancer risk, and potential mitigation strategies***
3:15-3:45	**Poster Presentations**
3:45-4:00	Remarks by Chairpersons Vote of Thanks by Coordinator
VALEDICTORY SESSION	
Chairperson: **Dr. Kalpana Bhargava**, Additional Director/Scientist "F" GPS Division, High Energy Material Research Lab (HEMRL), Defence Research and Development Organization (DRDO), Ministry of Defence, Government of India, Sutarwadi, Pashan, Pune, Maharashtra *Co-ordinator:* Dr. Devanshi Magoo and Dr. Pragya Naulakha	
4:00-4:10 PM	Welcome of Chief Guest,
4:10-4:30 PM	Address by Hon'ble Chief Guest,
4:30-4:40 PM	Address by Teacher in Charge, Chemistry Department, Hindu College, University of Delhi, Delhi
4:40-4:55 PM	**ANNOUNCEMENT OF RESULTS**
4:55-5:15 PM	Concluding Remarks & Vote of Thanks ***National Anthem***

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ONLINE INTERNATIONAL CONFERENCE ON

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&

4th Annual Meet of STE

12th - 13th January, 2023

Contents

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Keynote Talks

Sustainable water resources development and management in rural and urban areas: an introduction

Pankaj Kumar Roy

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Jadavpur University, Kolkata, India
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ABSTRACT

Increasing human activities have modified the global cycle of heavy metals, non-metals and metalloids. Both arsenic and fluoride are ubiquitous in the environment. Thousands of people are suffering from the toxic effects of arsenicals and fluorides in many countries all over the world. These two elements are recognized worldwide as the most serious inorganic contaminants in drinking water. Many studies have reported as regards to simple fluorosis and arsenicosis, but the knowledge of the joint action of these two elements is lacking and the results derived from previous studies were inconclusive. Contradictory results were reported in experimental studies in which different joint actions such as independent, synergistic and antagonistic effects were observed. This indicates that interaction mechanism of these two elements is considerable complicated and requires extensive studies. When two different types of toxicants are simultaneously going inside a human body they may function independently or can act as synergistic or antagonistic to one another. Thus there is an urge to resolve the question that how arsenic and fluoride act in condition of concomitant exposure. The selective removal of fluoride and arsenic has been evaluated by several methods (coagulation/chemical precipitation, electrocoagulation, adsorption, ion exchange, membrane technologies), which are efficient. The current problem of contamination by fluoride and arsenic, as well as the lack of efficient and economically viable technologies for vulnerable populations, makes it necessary to generate proposals to solve this problem through the evaluation of conventional technologies. The present study will discuss on the detailed scenario of water quality monitoring and remediation of the two most important pollutants at laboratory and field scale.

Innovation, Science & Technology to align with National Missions: Case study of the development of TERI's TADOX® Technology

Nupur Bahadur

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Area Convenor, TADOX® Technology Center for Water Reuse, TERI
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ABSTRACT

We as scientists, academicians, researchers, teachers and students have a great collective role to play in realizing the dream of a 'New India'! With new Education Policy in place and knowing the importance of Innovation and STEM, it's 'The Time' when we should not sell, as an idea, 'what we want to', rather we need to sell 'what is the requirement'! Which means, we need to sense the mood and need of the Nation and the World around. We have to align our Innovation, S&T efforts, thoughts, training, funding and resources with the ongoing National Missions. It is in this pursuit, The Energy and Resources Institute (TERI), New Delhi has developed a novel technology called TERI Advanced Oxidation Technology (TADOX®), which provides treatment of wastewater streams containing high color, high COD, BOD, TOC, dissolved organics, micropollutants, non-biodegradable and persistent organic pollutants (POPs) in effluents from grossly polluting industries and municipal wastewater. TADOX® involves UV-Photocatalysis as an Advanced Oxidation Nanotechnology (AON), leading to oxidative degradation and mineralization of targeted pollutants. It ultimately leads to adequate treatment of wastewater, higher water reuse efficiency, reduction in use of chemicals hence addressing sludge and associated secondary pollution issues. It also provides a retrofittable solution in existing STPs and ETPs and treatment within few hours means high resource and energy efficiency, economical and sustainable solution for addressing the current issues of point source pollution and thereby safeguarding drains and natural riverine ecosystem. Thus this technology development is an example, when a simple scientific idea, conceptualized with the inspiration of Namami Gange Program in 2014, developed with DST-WTI Water Mission Program during 2017-2020; being implemented at pilots since 2021 aiming for 'Swatch Bharat Mission', 'Jal Jeevan Mission' and now all set to be commercialized to realize the goals of 'Make in India', 'Self Reliant India', the Water Vision@2047 and ultimately serving the UN SDGs, in particular the SDG 6.

Phytopharmaceuticals: A New Drug Class Regulated in India

Neeraj Tandon

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Indian Council of Medical Research, New Delhi 110029

ABSTRACT

India has strong traditional systems of medicine for health care and has been a front runner in use of medicinal plants for centuries. However, the quality of commercially available formulations based on traditional texts has many a times raised questions on the standard of preparation and validation. The Gazette of India notification of guidelines for phytopharmaceutical drug development offers opportunity to leverage traditional knowledge for drug development based on modern science and modern medicine principles. There is an immediate need to undertake research and evaluation of the traditional plant based drugs using modern scientific tools ensuring quality, safety and efficacy for their wider acceptance and recognition by international regulatory agencies. “Phytopharmaceutical drug” includes purified and standardized fraction with defined minimum four bio-active or phyto-chemical compounds (qualitatively and quantitatively assessed) of an extract of a medicinal plant or its part, for internal or external use of human beings or animals for diagnosis, treatment, mitigation or prevention of any disease or disorder but does not include administration by parenteral route.The phytopharmaceuticals would promote innovations and development of new drugs from botanicals in a scientific way and would give boost to research in drug development for innovators, industry, national laboratories and pharmaceuticals labs in India. The R&D cost of developing new drugs can be drastically lowered by following the phytopharmaceuticals approach and compared to synthetic drugs these may exhibit lesser adverse effects. The Council of Scientific & Industrial Research (CSIR), Department of Biotechnology (DBT) and Indian Council of Medical Research (ICMR) have entered into Memorandum of Understanding (MoU) for inter-ministerial cooperation for the promotion and facilitation of innovative research on Phytopharmaceuticals.

Invited Talks

Sustainable Separation and Recovery of Lithium from Leach liquor of Spent LiBs using Membrane-based Hybrid Technology

Ramesh Kumar* and Byong-Hun Jeon

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Hanyang University, 222-Wangsimni-ro, Seongdong-gu, Seoul 04763, Republic of Korea

ABSTRACT

The lithium-ion batteries (LiBs) were first introduced in the market in 1991 and gained popularity in wireless communication devices, portable instruments, consumer electronics, medical equipment, and recently electric and hybrid vehicles. It constitutes 37% of the world market for rechargeable batteries and plays a crucial for the stable transition towards low carbon society and a fossil fuel-free economy. The future is predicted with the rapid growth of electric vehicles (EVs), which results in massive demand for LiBs, accumulation of waste batteries, and strained supply chains of critical metal ions (Li, Co, and Ni). According to the International Energy Agency (US DOE) report, ~140 million EVs are expected to be on the transportation worldwide by 2030, which would result in an accumulation of ~11 million metric tons of end-of-life LiBs. At present, <5%of spent LiBs are being recycled. Hence, waste LiBs management is a critical global issue. It can be done by developing eco-friendly and efficient technology for valuable resource recovery from spent LiBs for a sustainable supply of essential elements for the battery industry. A novel membrane-integrated hybrid system has been developed to separate and recover valuable metal ions (Li, Ni, Co, and Mn) from leach liquor of cathode materials of waste LiBs. Initial alkaline pretreatment effectively removes contaminants (Fe and Al) from the leach liquor. The nanofiltration membrane (VNF2) was successfully applied to separate monovalent ions (Li^{+}) from bivalent ions (Ni^{2+}, Co^{2+}, Mn^{2+}). The Li-enriched solution after nanofiltration was crystallized to Li_2CO_3 of high purity of 99.5 wt.% using 4 M K_2CO_3 for application in the battery industry. The membrane-based system can help to develop a clean and sustainable technology for recycling valuable metal ions from waste LiBs.

Keywords: E-Waste management, Spent lithium-ion battery, Membrane-based system, Recycling, Lithium carbonate.

Water Contaminants: Fate and existence during treatment process

Noor Afshan Khan

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ABSTRACT

Water pollution is one of the biggest challenges that humans face in recent years. Water pollution is mainly attributed and distributed by human activities. The pollution is mainly because of undesirable chemicals that are added in the water during course of different human activities. Such chemicals are named as CONTAMINANTS, due to their harmful effect on biotic environment on continuous exposure. These toxic chemicals found its way in water through point sources or non-point/ diffuse sources. The point sources are the drainage of wastewater from cropped farms, factories, and municipalities. The amount of this type of water pollution decreases as the distance from the point source is increased and it can easily be monitored and controlled. However, in diffuse source or non-point source, toxins get in water from diversified sources such as atmosphere, agricultural chemicals, i.e., fertilizers and pesticides, drainage, sewage industrial wastewater, infiltration of ground water. The impacts of pollution from diffuse source could be troublesome. *What is the fate of these contaminants*…?

Although many study has been conducted worldwide to tackle this problem but the situation is getting worsen day-by-day. During the treatment of both water and waste water only the conventional contaminants are removed because of the conventional method of treatment / design of treatment plants. However, the scenario is now completely changed, we not only have the conventional pollutants but trace level contaminants are intensely added in the water, for removal of which our conventional system is not so much effective. Since water circulate within our environment system (Fig.), it become extremely necessary to look for a treatment process which take care for the removal of these trace level contaminants as well, which is the need of the hour.

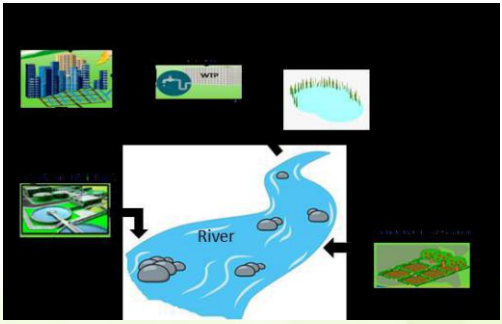

Fig. Circulation of contaminants in water environment

Photocatalytic Systems for Advanced Environmental Remediation Applications

Raju Kumar Gupta[1,2,3,4]*

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ABSTRACT

Water pollution is an emerging problem across the world due to rapid population growth and modern industrialization. Wastewater contains organic (such as phenolic derivatives, polycyclic aromatic hydrocarbons etc.) and inorganic compounds (e.g. heavy metals) which can cause serious disorder. Photocatalysis is an advanced oxidation process, considered an effective technique for treating wastewater laden with organic contaminants. The method successfully harnesses abundant and sustainable solar energy for water purification. ZnO and TiO_2 are well known photocatalysts to degrade organic and inorganic pollutants. However, these materials still require modifications with other nanomaterials because these materials absorb only ultraviolet part of sun light due to wide bandgap and the excitons created under the UV light recombine rapidly. In this talk, I will present our group's recent work about visible light activated nanostructured photocatalysts for removal of dyes and toxic heavy metals. Photocatalytic activity was enhanced through sensitization with carbon/quantum dots, doping with transition metals and functionalization with metal nanoparticles. Developed materials are reusable, and their nanostructures do not change after repetitive usage. Finally, development of inexpensive prototype photochemical reactor will be discussed towards continuous flow operation. Our current research focus is to develop visible light activated low-cost and scalable photocatalysts to treat effluent water from industries in particular, pharmaceutical, textile and tannery and to convert CO_2 to fuels.

Although many study has been conducted worldwide to tackle this problem but the situation is getting worsen day-by-day. During the treatment of both water and waste water only the conventional contaminants are removed because of the conventional method of treatment / design of treatment plants. However, the scenario is now completely changed, we not only have the conventional pollutants but trace level contaminants are intensely added in the water, for removal of which our conventional system is not so much effective. Since water circulate within our environment system (Fig.), it become extremely necessary to look for a treatment process which take care for the removal of these trace level contaminants as well, which is the need of the hour.

Ecotoxicology and its Role in Understanding Eco-Health

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ABSTRACT

Our ability to predict and assess ecological changes such as pollution and climate change is of principal importance in the fields of toxicology at the centre of environmental monitoring efforts. Ecotoxicology focuses on predicting the impact of potential toxic anthropogenic chemicals at various levels of bio-strata. At present, several studies are done to gain deeper understanding of molecular and cellular aspects of ecotoxicity. Fish model has been established as the most relevant, time- and cost-effective *in vivo* testing in ecotoxicology, since fishes can be utilized in field studies as well as can be cultured in laboratory simulated conditions. Fish-specific organs such as the gills and their metabolic action make fishes highly susceptible to the toxicity of anthropogenic chemicals like endocrine disrupting chemicals, pesticides and heavy metals. Notably, cellular response networks, physicochemical biomarkers, cell-based testing are reliable molecular tools to understand the prospects of ecotoxicology in terms of ecological and human health. However, monitoring of toxicity in environment by biochemical analysis is not completely reliable to predict the toxic effects on ecosystem. This is due to the fact that increasing number of unknown chemicals and pollutant mixtures are present in the environment. Hence, novel methods are the necessity to provide a rigor link between chemical exposure and its biological effect. The combination of ecotoxicological experiments and models is key for a more comprehensive assessment of toxicological paradigms for better understanding of eco-health.

Recovery, Recycle and Reuse-Based Green Biorefinery Strategies for a Sustainable and Secure Future

Pinaki Dey

Sr. Scientist MPTD division CSIR-NIIST Trivandarum-695019

ABSTRACT

CO2 is the primary greenhouse gas responsible for global warming. Anthropogenic carbon dioxide (CO2) emissions from fossil fuels and industries have increased considerably since 2000 and in 2019, they reached a record level of 36.7 billion metric tons. Consequently, in 2021 overall temperature reached 1.1o C above the pre-industrial set level, and extreme heat-related human deaths increased to 68% during 2017-21. Human-induced climate change primarily affected wildlife populations, water resources, agriculture, natural ecosystems, health, and the food chain. To protect the earth from unexpected climate change and environmental pollution while keeping the 1.5-degree Celsius Paris Agreement in mind, “transition to sustainable lifestyles and sustainable patterns of consumption and production approaches” are presently encouraged worldwide. Manufacturing sectors are mandated to enforce sustainable approaches toward achieving carbon neutrality. Chemical industries must adopt inclusive approaches for the sustainable production of chemicals, emphasizing the mantra of Recovery, Recycle and Reuse (RRR)-based green biorefinery strategies to secure a sustainable environment for tomorrow. Under biochemical-based production routes for value-added products, the use of biocatalysts like microorganisms and enzymes is mainly encouraged. Under the main segments of biochemical processes, i.e., upstream processing and downstream processing, recovery, recycle and reuse of feedstock, biocatalysts and chemicals pave the way for developing the economic viability of the processes. More specifically, with cutting-edge and efficient technologies like membrane technology, recovery and utilization of biocatalysts and substrates have been made possible to improve the overall efficiency of the processes ensuring waste minimization and complete resource management.

Graphene integrated photocatalyst development for transformation of anthropogenic CO_2 to Bio-methanol

Jayato Nayak

Center for life sciences, Mahindra University

ABSTRACT

The exponential escalation of anthropogenic CO_2 concentration in the global atmosphere is reckoned to be the greatest threat confronting the biotic societies from the last few decades. This issue is going to be more crucial due to human population explosion, the modern luxurious lifestyle and extensive industrial development where the overexploitation of carbon based fossil fuels are resulting a continuous increase in CO_2. In this regard, the cutting-edge technology of photocatalytic transformation of atmospheric CO_2 into valuable fuel hydrocarbons (like methanol or ethanol) under solar excitation appears to a brighter approach in solving the crisis related to energy and environment. Utilizing atmospheric CO_2 as raw material, such next-gen biomimetic processes exploiting solar energy appears to be a bright option due to simultaneous mitigation of a potential pollutant and transformation to low-cost of hydrocarbon-based fuel (methanol).

A heterogeneous photocatalyst has been developed using sono-chemical assisted sol-gel method by maintaining a weight ratio of 1:2:3 for hydrogen exfoliation graphene, titanium oxide and copper sulphate and exhaustively characterized. Rigorous experimentations have been done using newly developed heterogeneous photocatalyst for efficient capturing and maximum conversion of carbon di oxide to methanol by mutual effects of governing conditions, like as catalyst dose, pH, CO_2 flow rate and temperature. Optimization study has been carried out employing a statistical approach of response surface methodology which reveals the maximum methanol productivity and yield. Approximately, 134 g/Lh of productivity and 40 mg/gcat of yield were found after 3 h of illumination under UV in an annular type Pyrex reactor at an optimum catalyst dosage of 10 g/L, CO_2 flow rate of 3 L/m, pH of 3, and process temperature of 50 ^{0}C.

The developed novel membrane integrated scheme for the synthesis of methanol from CO_2 using a new generation graphene (hydrogen exfoliation graphene) based nanocomposite materials simultaneous catalyst recycling using the flat-sheet cross flow membrane integrated system is

first of its kind offering high yield methanol production with a maximum productivity. Hydrogen exfoliation graphene (HEG) not only enhanced the photo catalytic activity as well as increased the ability of adsorption of feed substrate through its high surface area. Employing response surface methodology, reasonably high yield (40 mg per g of catalyst) of methanol from CO_2 was confirmed using the developed graphene loaded photocatalyst under a set of optimum conditions consisting of a catalyst dose of 10 g/L, process temperature of 50^0C, pH of 3 and CO_2 cross flow rate of 3 L/m.

Keywords: Carbon-di-oxide, Methanol, Graphene, Photocatalyst, titanium di oxide, Response surface methodology

National Framework on Safe Reuse of Treated Water for India

Girija K Bharat and Krishna C Rao

Mu Gamma Consultants Pvt. Ltd., Gurugram

ABSTRACT

In 2021, urban Indian households generated 72, 368 MLD of sewage, amounting to an annual volume of 26,414 million cubic meters. Of this amount, 63% of sewage is not collected (as per the CPCB) and untreated water is released into water bodies leading to contamination and health concerns, particularly where dilution levels of the receiving water body are low. The launch of Swachh Bharat Mission 2.0 and AMRUT 2.0 on 1 October 2021 seeks to improve the collection and treatment infrastructure.

At present, only a small proportion of treated sewage is reused and potential for improvement is significant. In our rapidly populating and urbanising country, demand for water is increasing with associated challenges for water security. With waste considered as a resource and able to generate revenues, a shift in approach from a linear to circular can facilitate cost-effective and fit-for-purpose solutions. In the past few years, several pioneer Urban Local Bodies (ULBs) have initiated safe reuse and several States have drafted the SRTW policies. Under the support provided by the India-EU Partnership and the GIZ support to Ganga Rejuvenation, national framework on Safe Reuse of Treated Water (SRTW) has been developed.

The SRTW framework is aimed to facilitate the uptake of water reuse by serving as a reference on existing water reuse practices. It sets out a guidance within which water quality standards will be reviewed and established for industrial use, agricultural and aquaculture use, non-potable domestic and municipal use, the release to surface water bodies and for groundwater recharge, where considered safe. It highlights a wide range of potential non-potable end users for SRTW in urban, rural and peri-urban settings, including industry, agriculture, municipal uses, environment, maintenance of wetlands and environmental flows, construction, landscaping and on-site uses within Sewage Treatment Plants (STPs). Each district is different and the Policy anticipates this diversity through a needs-based response suited to the local socio-economic development context and local priorities.

The framework fulfils three functions for SRTW from the national to the community level by: a) providing the directive for the reuse of treated used water for various non-potable end-uses; b) setting up a mechanism to support SRTW through provision of incentives; and c) providing the model policy framework for States to consider and adapt in the development and enhancement of their own policy, regulations and implementation tools. A set of business models for reuse in agriculture, industry and urban use has also been proposed in the SRTW Framework.

Space radiation-induced accelerated aging, associated cancer risk, and potential mitigation strategies

Shubhankar Suman

Department of Oncology, Lombardi Comprehensive Cancer Center,
Georgetown University Medical Center, Washington DC
*Email: ss2286@georgetown.edu

ABSTRACT

One of the major obstacles to keeping astronauts active and healthy during and after an interplanetary mission is minimizing the health hazards brought on by exposure to space radiation. However, by putting countermeasures in place that are intended to lessen radiation exposure and its effects, biological harm caused by radiation can be minimized.

Chronic exposure to galactic cosmic radiation (GCR) above accepted permissible limits is projected to enhance cancer risk among deep-space astronauts. Particularly, heavy ions present in GCR have been estimated to pose a greater but undetermined carcinogenic risk due to its densely ionizing characteristics. The overarching goal of our research is to understand the risk of cancer development after space radiation exposure by providing biological insight on radiation quality effects, deciphering carcinogenic signaling events, and identifying plausible targets for chemoprevention. To bridge prevailing knowledge gaps, we irradiated wild-type and cancer surrogate mouse models to space radiation and analyzed molecular, cellular, and histological alterations in relation to -rays. Heavy-ion induced higher levels of persistent oxidative stress marked by increased accumulation of intracellular reactive oxygen species. The oxidative DNA damage was also higher, while cell death was unchanged, and mitotic activity was increased. Space radiation exposure also triggered a time-dependent progressive increase in DNA double-strand breaks marked by γH2AX and 53BP1 foci accumulation along with alterations in DNA damage and repair signaling. Further, when we knocked out Wip1 phosphatase, a negative regulator of the DNA damage signaling, we found that heavy ion-induced tumorigenesis was completely abrogated, which further affirms the role of DNA damage response in space radiation-induced tumorigenesis. A subset of proliferative cells showed permanent exit from the cell cycle and become senescent. Also, a sub-population of the senescent cells acquired the senescence-associated secretory phenotype, and this was accompanied by the release of pro-growth inflammatory factors. We also found a plausible correlation between persistent DNA damage, alterations in DNA repair response, and cellular senescence with carcinogenesis. Overall, this study is important in understanding space radiation-induced DNA damage response and cancer risk and has implications for developing preventive strategies against the tumorigenic potential of space radiation.

Participants Abstracts

Oral Presentation-1

CO_2 emission, industry, energy research and development in India – ARDL and innovation accounting approach

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ABSTRACT

The article examines relation among Industrial sector GDP, total final energy consumption and technology and CO_2 emission empirically in India during 1990-2020.

Design/methodology/approach – Industrial sector GDP, total final energy consumption and research and development (R&D) expenditure as proxy for technology have been used. Long run cointegration relationship among the study variables was tested by Auto Regressive Distributed Lag (ARDL) Model and innovation accounting approach (variance decomposition and impulse response functions) is used for judging the direction of causality among the variables.

Findings – The primary findings found that the variables are all stationary after first difference and there is existence of long run cointegration relationship among the variables.

Keywords: CO_2 emissions, total final energy consumption, Auto Regressive Distributed Lag Model, variance decomposition, impulse response function

Oral Presentation-2
Immunotherapy: A Therapeutic Arsenal in the Treatment of Bladder Carcinoma

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ABSTRACT

Bladder Carcinoma is one of the leading cause of compromised quality of life and mortality. Environmental risk factors of bladder carcinoma include exposure to cigarette and tobacco smoke, arsenic in drinking water, fungicides, chemical dyes and vehicle exhaust. Immunotherapy has been recognized for being more selective, individualized and effective than conventional cancer therapy.

In this single-centered, retrospective-observational study conducted for 4 months patients over 18 years of either gender, with a confirmed diagnosis of bladder carcinoma and who have received at least six cycles of immunotherapy were included. The study site was ACTREC, Tata Memorial Centre, Mumbai. Efficacy outcome measures (primary) were as per RECIST 1.1 criteria. Performance scores were evaluated using the "Eastern Cooperative Oncology Group (ECOG) Scale." Adverse outcome measures (secondary) were documented and graded using CTCAE version 5.0.

A total of 30 patients were included in the assessment. The performance score was score-1 for 17(56.7%) and score-2 for 14 (43.3%) patients. In bladder carcinoma patients, Complete Response, Partial Response, Stable Disease and Progressive Disease were in 12(40%), 8(26.7%), 7(23.3%) and 3(10%) respectively. There were no Grade 4 or 5 adverse events observed. Grade 3 adverse events were observed in only 8 patients out of 30 (26.7%) patients.

Immunotherapy is safe and effective in treating bladder carcinoma with increased overall survival and quality of life as compared to other conventional cancer therapies.

Oral Presentation-3

Versatile and recyclable Magnetic Metal Organic Framework Composites as catalysts for various organic transformations

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ABSTRACT

In today's scenario, the grand challenge facing the academic as well as industrial researchers is the development of greener and engineered materials that can meet the sustainability criteria while preserving the essence of green chemistry. Recently, use of MOFs as heterogeneous liquid phase catalysts has gained conspicuous prominence. Impressed by the fascinating features of such materials, we have successfully fabricated and characterized magnetic MOF composites and further explored their catalytic efficacy in mediating a broad array of industrially and pharmaceutically substantial organic transformations which include synthesis of 2-substituted benzimidazoles *via* C-H activation, one-pot three component click coupling reaction to yield 1,4-disubstituted 1,2,3-triazoles, one-pot multicomponent condensation reaction to form 2,4,5-trisubstituted and 1,2,4,5-tetrasubstituted imidazoles and one-pot three component condensation reaction to form 2*H*-indazoles. In addition, the developed materials exhibited numerous benefits like excellent durability, good recyclability, high catalytic turnover number, excellent yield and ease of recoverability. The design of these versatile and hybrid materials with multiple components and well-controlled interactions play a key role in addressing environmental and economic issues as they lead to efficient and benign synthetic protocols.

Keywords: Greener and engineered materials, Hybrid composites, Magnetic retrievability, Multiple component reactions, High yield.

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Oral Presentation-4
Evaluation of the water quality of River Alaknanda, a tributary of River Ganga using Water Quality Index

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ABSTRACT

The quality of glacier-fed Himalayan rivers is susceptible to global climate change and anthropogenic activities. Chemical weathering of rocks occurring in glacial environment is responsible for increased solute fluxes in the proglacial zone. Further, the ongoing multipurpose projects in the high-altitude glacier rivers such as the Alaknanda River have given rise to an unsettling increase in river contamination. Therefore, assessing river water quality is essential for both domestic and agricultural use as it affects environmental and public health. In the present paper, spatial and temporal variations in the water chemistry of the River Alaknanda have been extensively studied using the Water Quality Index (WQI). The study was carried out at six sampling sites, selected along the course of the river during three seasons i.e., pre-monsoon (May 2021), post-monsoon (October 2021) and winter season (January 2022). The WQI was computed using eight important physicochemical parameters viz., pH, EC, TDS, hardness, alkalinity, DO, Ca^{2+} and Mg^{2+} using the Central Public Health Environmental Engineering Organisation (CPHEEO), 1991 and Indian Council of Medical Research (ICMR), 1975 standards. The "excellent" status of river water quality for drinking purposes was observed in the pre-monsoon and winter seasons and the "medium" status in the post-monsoon season which may attributed to the different anthropogenic activities in the surrounding area of the river. The suitability of river water for irrigation purposes has been evaluated based on salinity, Sodium Adsorption Ratio (SAR) and Residual Sodium Carbonate (RSC) and found to be fit for irrigation purposes.

Keywords: Water quality index, Hydrochemistry, SAR, RSC, Salinity, River Alaknanda.

Oral Presentation-5

GC-MS metabolomics and network pharmacology-based investigation of molecular mechanism of identified metabolites from *Tinospora cordifolia* (Willd.) Miers for the treatment of kidney disease

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ABSTRACT

Tinospora cordifolia (Willd.) Miers (T. cordifolia) is a well-known Indian medicinal plant containing several non-polar and polar constituents that play an important role to mitigate various ailments such as diabetes, urinary disorders, hepatoprotective etc. Due to the lack of evidence on phytopharmacological relevance to the unpredicted non-polar matrix of T. cordifolia, the present study aimed to evaluate the metabolomic pattern of different fractions obtained from aqueous extract of T. cordifolia, which have been recommended in AYUSH for various ailments including kidney disorders. HPTLC and GC-MS analysis was performed on aqueous extracts and hexane, DCM, and the methanolic fraction of T. cordifolia aqueous extract to evaluate fingerprinting and metabolomic profile, respectively. Principle components and pharmacokinetic analysis were performed using XLSTAT and in-silico SwissADME tool to determine metabolite variability and pharmacokinetic relationship based on lipophilicity and drug-likeness. Further, network pharmacology analysis was performed to determine the exact biomolecular relationship in alleviating kidney disease. The GC-MS metabolomics results showed several metabolites in different fractions with high variability of phytoconstituents in the methanolic fraction. In pharmacokinetics, each metabolite exhibited a direct correlation between drug lipophilicity and permeability. Network pharmacological suggested five fatty acids which significantly interacted with the genes such as AGTR1 ATG, RELA, NOS3, NOS2, REN, INS, IL6, TNF, MAPK1, CASP3, etc. which could potentially regulate various pathophysiological conditions such as hypertension, insulin resistance, oxidative and inflammatory stress and electrolytes homeostasis, thus strengthening the normal function of the kidney. The study showed that six metabolites of T. cordifolia play a multi-mechanistic role in alleviating kidney disease.

Keywords: Tinospora cordifolia (Willd.) Miers, GC-MS, Metabolomics, Fatty Acids, Network Pharmacology

Oral Presentation-6
Magnetically Responsive Nanomaterials for Water Pollution Remediation

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ABSTRACT

Water and water resource management are crucial for the sustainable development of our modern society. Deterioration of surface and ground water quality as a result of massive growth of population, industrialization and other anthropogenic activities has become an issue of serious concern across the globe, threatening the entire biosphere. Recently, water treatment technologies utilizing nano-engineered architectures have garnered the attention of the scientific community as a promising treatment methodology as they provide leapfrogging opportunities to develop next-generation nanomaterials with lower energy consumption and facile operation conditions. Within this context, magnetic nanoscavengers have shown exuberant potential to remove noxious pollutants from hydrological systems due to their high removal efficiency, faster kinetics, low cost, easy accessibility, design flexibility and ability to regenerate the material. The present study describes design, synthesis, characterization and applications of magnetically retrievable nanomaterials for water pollution remediation.

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Oral Presentation-7

KNN/PVDF composite films-based flexible piezoelectric generator: KNN concentration's impact on a generator's piezoelectric performance

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ABSTRACT

In the current study, a high output piezoelectric generator (PEG) based on flexible composite films of potassium sodium niobate and poly (vinylidene fluoride) (KNN/PVDF) with varying KNN ceramic particle concentrations (0%, 5%, 10%, 15%, and 20% on the weight of the polymer) was built. By using X-ray diffraction and Fourier Transform Infrared spectroscopy, the prepared pure PVDF and composite films were phase analysed. The generated composite films' microstructure was examined using a scanning electron microscope (SEM). The concentration of KNN ceramic particles in the PVDF matrix significantly influenced on several parameters. The maximum open-circuit voltage of 11.2 V and short-circuit current of 0.3 µA were obtained for the device created with 15 wt.% KNN in the PVDF when force was applied to the surface of the constructed PEG device. Overall, the flexible PEG development result obtained points to their significant potential for usage in wearable and self-powered technology.

Keywords: Lead-Free, solid state, Composite Film, Piezoelectric Generator

Oral Presentation-8

Design and fabrication of metal organic framework derived copper oxide nanoparticles as catalyst for the synthesis of 2,3-dihydroquinazolinones

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ABSTRACT

The designing of MOFs and their derived materials have witnessed significant advancements in the recent years. In an attempt of developing a sustainable heterogeneous nanocatalyst for the multicomponent reaction which can exhibit impressive catalytic efficacy for the pharmacologically active 2,3-dihydroquinazolin-4(1*H*)-one moieties, we have successfully synthesised a series of CuO nanoparticles (NPs) by the controlled pyrolysis of Cu-5-nitroisophthalate (Cu-5-NIPA) metal organic framework (MOF). The systematically designed CuO nanoarchitectures were synthesized *via* single step pyrolysis of Cu-5-NIPA in air atmosphere and analytically approved using a multitude of advanced physico-chemical characterization techniques. The synthesized nanomaterial owing to its enhanced chemical and thermal stability, great porosity, high surface area and abundant dispersion of active sites shows impressive catalytic potential in the concerned reaction. The catalytic potential of the developed CuO nanoarchitectures was subsequently evaluated in the one-pot multicomponent coupling of aromatic aldehyde, isatoic anhydride, alkyl/aryl amine to produce 2,3-dihydroquinazolinone moieties. Additionally, the developed protocol includes startling attributes such as excellent product yield in short duration, easy work-up procedure, green reaction solvent, ambient reaction parameters, wide substrate scope, high turnover number and good recyclability for multiple runs.

Keywords: MOF derived CuO NPs; One-step pyrolysis; 2,3-dihydroquinazolinones; High yield; Good recyclability

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Oral Presentation-9

Numerical groundwater flow and sulphate transport modelling in gypsum enriched aquifer of Bemetara district, Chhattisgarh state, India

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ABSTRACT

Groundwater is a dynamic system and its flow measurements are very important for tracking the solute transport. Therefore, groundwater flow simulation and contaminant transport modeling of SO4 was investigated in gypsum enriched aquifer of Bemetara district in Chhattisgarh state, India. The aim of the present study was to predict the response of aquifer and the migration of contaminant (SO4) over a period of time using MODFLOW and MT3D software and restoring the concentration under the BIS limit (400 mg/L). A grid system of 445 m×470 m was designed and the various input parameters such as hydraulic head, layer thickness, recharge, groundwater withdrawal etc. were applied under various packages available in the software. The model was calibrated for three years data (2014 to 2016) and validated on the basis of available two years data (2017 to 2018). For performance evaluation of the simulated profiles corresponding to the calibrated model's parameters, few statistical measures viz. residual mean (RM), absolute residual mean (ARM), standard error of the estimate, root mean squared error (RMSE), normalized root mean squared error (NRMSE), correlation coefficient, were used. It is seen that in the north-western part and eastern portion, sulphate concentration is low and within permissible limits. Concentration increases on moving away from south to north side. South central portion has the highest sulphate concentration up to 1900 mg/L. Based on the contour map of SO4 (%) dilution, three sites were selected having dilution greater than 60% for implementing the artificial recharge with different rates. The sulphate concentration at Murra (highly contaminated site) was around 1042 mg/L and the ground water table was around 252 m above mean sea level. A scenario was considered by application of one injection well with constant recharge rate of 100 m3/d. The results of model run indicated that the sulphate concentration in groundwater declined from 1042 mg/L to 414 mg/L that is close to 400 ppm by running the model for two years period. Further, it was also observed that the concentration decreases with increase in the rate of ground water recharge through injection well. Simulation results could be integrated in the future groundwater management plan of the study area.

Keywords: Groundwater Quality, Contaminant transport, MODFLOW, MT3D, Groundwater recharge

Oral Presentation-10

Exploring anti-inflammatory and antioxidant activity of Moringa oleifera Lam. in Chicken Splenocytes culture system

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ABSTRACT

Ethnomedicinal practices exhibited a colossal impact on human and animal health as these exploits efficacious, safe and natural preventative and therapeutic preparations since time immemorial. *Moringa oleifera* Lam., popularly known as a miracle tree or tree of life, has been extensively used as a functional food and nutritional asset worldwide. It is reported to have several pharmacological activities, *viz*., antibacterial, antitumor, hepatoprotective, and cardiac stimulant properties. The aqueous extract of *Moringa oleifera* (MOE) leaves was prepared and explored for its antioxidant and anti-inflammatory potential through various *in vitro* assays. The maximum non-cytotoxic dose (MNCD) of the MOE was determined through MTT assay and this dose was used to evaluate anti-inflammatory effect through differential gene expression at mRNA level in chicken splenocytes via quantitative real time PCR (qRT-PCR). The results showed promising antioxidant and anti-inflammatory potential in MOE through different *in vitro* assays conducted. There was up-regulation of anti-inflammatory mediators, while pro-inflammatory cytokines were down regulated in chicken lymphocytes exposed to MOE as compared to untreated control cells. Over all the study showed significant antioxidative and anti-inflammatory potential of *Moringa oleifera* leaves in chicken lymphocytes culture system. However, this plant bioresource be further explored through suitable *in vitro* and *in vivo* analyses for development of plant-based preparation.

Keywords: *Moringa oleifera*; anti-inflammatory; antioxidant; chicken lymphocyte; differential expression analysis; cytokines.

Oral Presentation-11
Monitoring of Pesticide Pollution- what have we achieved and what lies ahead !

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ABSTRACT

Injudicious and Indiscriminate use of pesticides has raised serious concerns over environmental and food contamination ever since they have been in use. The levels at which these toxic chemicals accumulate in human body via environment and food are dangerous for human beings and livestock alike, beside degrading the soil quality and surrounding environment, leading to heavy chemical pollution. This makes continuous monitoring of pesticide pollution imperative to preclude their entry into biological samples and human bodies.

Analytical methods have come a long way from conventional time-consuming, laboratory methods of 'chromatography' to rapid enzyme assays such as ELISA that rely upon the antibody-analyte interaction. 'Dipstick immunoassay' format allows simple to use, cost-effective and sensitive on-site monitoring of pesticides. Significant progress has been made in the field of 'Microspot detection systems' that employ a 'developing' antibody against a 'sensor' antibody. This is based on ratiometric analysis i.e. measurement of analyte concentration from the ratio of signals emitted. Further, an array of sensor antibodies of different selectivity employed in the form of a chip emiting discrete fluorescent signals, helped in multianalyte determination. Gold- or Selenium-nanoparticle based aggregation immunoassay technique has also been recently undertaken for multianalyte sampling of pesticides. In order to increase their specificity and sensitivity, immunoassay techniques have been combined with biosensors, to form 'immunosensors' based on optical, piezoelectric, electrochemical and micromechanical designs. So far, these immunosensors have emerged as the most sophisticated immunoassay format for field-monitoring of trace amounts of pesticides. Opto-electronic based biosensors such as Surface Plasmon Resonance (SPR) sensors, interferometer devices or grating couplers offer the benefits of real-time measurement of biomolecular interactions, portability, versatility and regenerability in multi-analyte detection. However, main challenges in biosensor technology remain- the efficient capturing of biorecognition signals and their transduction into visible results.

Future prospects: Miniaturization of the biosensing devices using micro-and nano- fabricated structures and microelectronic circuits (lab-on-a-chip devices), microfluidic elements such as Microfluidic Paper-Based Analytical Devices (μPADs) and Micro Total Analysis Systems (μTAS) can be worked out for development and implementation of rapid, on-site pesticide detection systems. Improvement in transduction mechanism viz. automation, multi-analyte sensitivity, speed, shorter response time, and reproducibility can be attempted using different nanomaterials (such as NPs, NRs, NWs, CNTs, QDs, and dendrimers). The promising field of molecular modelling systems based on theoretical and computational methodologies can be used in setting up a virtual library of functional monomers with potential residues able to interact with the template, minimizing the need of templates and creating more accuracy. However, developing these new group of analytical tools also face primary hurdles viz. lack of widespread technical knowledge of latest technological trends and limited availability of resources and/or reproducibility.

Conclusively, despite making advances in the field of sensitive diagnostic tools for detection of pesticides, the quest for Next Generation devices, which perform 'intelligently' in real samples still persists; the need for better on-site, robust and more sophisticated versions of equipments to monitor pesticide pollution for environmental and food analysis is still need of the hour.

Keywords : pesticide ; pollution ; monitoring, immunoassay; biosensors ; nanobiosensing.

Oral Presentation-12

Design and synthesis of two-dimensional boron nitride nanosheets based nancomposites for diverse organic transformations

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ABSTRACT

In recent years, astonishing advancements have been witnessed in the rational design and fabrication of well-defined, highly active and selective structured materials for diverse catalytic applications. The prospects of tuning the catalytic properties of nanomaterials by controlling the structural aspects of nanoparticles and manipulation of interaction between the catalytically active species and its support matrix has aided in the engineering of new type of hybrid multifunctional materials that can be deployed for diverse industrially significant organic transformations. Amongst a wide variety of solid-supported catalytic systems, two-dimensional nanomaterials analogous to graphene like nanostructures especially, ultrathin hexagonal boron nitride nanosheets has captivated enormous interestowing to their exceptional structural and morphological features such as large surface area to volume ratio, high oxidative resistance, excellent thermal, chemical and mechanical strength, nanometer size, capability of dissipating heat in exothermic reactions and coordinatively unsaturated active sites.In addition, anchoring of magnetic nanoparticles onto the boron nitride support endows facile recovery and reusability of the catalyst. Such two-dimensional boron nitride nanostructured based catalysts do not possess only stupendous potential to expedite substantial manufacturing of industrially demanding motifs such as 5-substituted 1*H*-tetrazoles, 3,4-dihydropyrimidin-2(1*H*)-ones/thiones, 2-amino-4*H*-benzopyrans, 1,4-dihydropyridines etc., but also unlock insights for designing next generation 2D catalytic systems which would pave the way towards sustainable chemistry.

Keywords: Two-dimensional nanomaterials, facile recovery and reusability, significant organic transformations.

Oral Presentation-13

Novel functionalized magnetic biochar for selective adsorption of heavy metals from aqueous solutions

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ABSTRACT

Unquestionably, the current era of the industrial revolution has led to striking scientific developments, but it has also given rise to serious water contamination challenges, endangering the existence of all species worldwide. Therefore, one of the largest worldwide issues of the twenty-first century is ensuring that everyone has reliable access to drinkable and safe drinking water. In fact, the sixth Sustainable Development Goal (SDG), which places a focus on guaranteeing access to clean water and sanitation, has acquired even more prominence. Literature reports have shown that a variety of contaminants, such as heavy metals (Cr, Pb, Cd, As, etc.), organic pollutants (polyaromatic hydrocarbons), and dyes, have invaded different water channels (methylene blue, orange-G etc.). Heavy metals have been labelled as "indestructible poisons" among other contaminants since they seriously impair the body's normal metabolic processes, endangering the existence of all species. In order to combat problems associated with the heavy metals, several techniques such as precipitation, flocculation, membrane separation, adsorption and ion exchange have been exploited so far for the removal of heavy metals, but unfortunately, they are either not economical or eco-friendly and also suffer from serious drawbacks like lack of sensitivity and selectivity, use of large amount of toxic organic solvents which have deleterious effect on human health and environment. Adsorption has become the preferred methodology because it offers an affordable, convincing, environmentally friendly, and long-lasting alternative to other conventional methodologies.

Amongst a wide variety of adsorbents, biochar which is a carbon-rich, porous solid produced from waste materials (agrowastes such as rice husks, wheat straws etc.) has gained utmost prominence. Being blessed with abundant surface functional groups (C−O, C=O, COOH, and OH, etc.), that can be engineered further, it offers great prospects in the field of adsorption. Recently, magnetic biochar has shown immense potential in removal of wastewater pollutants

from diverse wastewater streams owing to their high adsorption capacity, rapid kinetics, remarkable reusability and most importantly ease of separation via the use of magnetic field, which is greener, energy, time, and cost efficient. Considering the significance of the magnetically retrievable biochar-based adsorbents, researchers are working continuously in the effort of increasing the capabilities of such type of adsorbents by surface modifications for eliminating toxic heavy metals from water. Our research group has been actively involved in the designing and further engineering of the magnetic biochar based materials that have proven more beneficial for selective removal of heavy metals from wastewater. In this presentation, we would be emphasizing on the various surface engineering approaches adopted so for the design of competent magnetic biochar based adsorbents that have resulted in greater removal efficiency and higher selectivity.

Keywords: Magnetic biochar, Engineered magnetic biochar, Adsorption, Heavy metals, Wastewater.

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Oral Presentation-14

The role of plant growth promoting bacteria in alleviating the adverse effect of salinity on physiological traits of black cumin (*Nigella sativa* L.)

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ABSTRACT

Salinity reduces the yield of various plants because salt inhibits plant physiological and biochemical properties. Plant growth promoting bacteria promote plant growth, physiological traits and yield under salt stress. In this study, the effect of plant growth promoting bacteria on physiological properties of black cumin under salt stress at Institute of Genetics and Plant Experimental Biology, Uzbekistan Academy of Sciences was investigated. The pot experiment was a completely randomized block design with three replications. Treatments included: control (soil without inoculation), *Bacillus subtilis* IGPEB 1, *Bacillus altitudinis* IGPEB 8, *Bacillus endophyticus* IGPEB 33, *Pseudomanas koreensis* IGPEB 17. After forty days, photosynthetic pigments (total chlorophyll, chlorophyll a, chlorophyll b, carotenoid contents) of leaves in black cumin were measured. Fresh leaves were collected in the morning. Fifty mg of fine pieces of fresh leaf sample 2 to 3 mm in size were cut and added to test tubes containing 5 mL of DMSO. Then the test tubes were incubated at 37 °C for 4 h in the dark. The incubation was continued until completely colorless tissue was obtained. The absorbance of the extract was taken at 470 nm, 645 nm, and 663 nm using a spectrophotometer against a DMSO blank. Relative water content of leaves in black cumin was measured. One hundred mg of fully expanded fresh leaf sample were placed immediately after sampling in petri plates filled with double distilled water for 4 h at room temperature. The samples were then taken out and blotted dry, and the turgid weight was recorded. The samples were kept in an oven at 70 ◦C overnight, and the dry weight (DW) was recorded. Relative water content was calculated as: RWC (%) = [(FW − DW)/(TW − DW)] × 100. The results revealed that salt stress decreased physiological traits of black cumin. *B. altitudinis* IGPEB 8 and *B. endophyticus* IGPEB 33 increase significantly the total chlorophyll, chlorophyll a, chlorophyll b and carotenoid contents of leaves in black cumin. Moreover, *B. altitudinis* IGPEB 8 and *B. endophyticus* IGPEB 33 treatments significantly enhanced the

relative water of leaves in black cumin under salt stress. As conclusion, *B. altitudinis* IGPEB 8 and *B. endophyticus* IGPEB 33 positively influence physiological properties in black cumin under salt stress.

Keywords: Black cumin, saline soil, plant growth promoting bacteria, plant growth, total chlorophyll content.

ONLINE INTERNATIONAL CONFERENCE ON
ENVIRONMENT, WATER, AGRICULTURE, SUSTAINABILITY AND HEALTH (EWASH-2022): STRATEGIZING A GREENER FUTURE
&
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Oral Presentation-15

Impact of different iron levels on physiological traits of basil (*Ocimum basilicum* L.) under hydroponic condition

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ABSTRACT

Iron (Fe) is most important micronutrient for plant growth and photosynthesis. It plays a major role in physiological and biochemical pathways in plants. Iron deficiency negatively affects plant growth, physiological and biochemical properties in various plants. The effects of different iron concentrations on physiological traits of basil under hydroponic condition at Institute of Genetics and Plant Experimental Biology, Uzbekistan Academy of Sciences were investigated. The pot experiment was a completely randomized block design with three replications. Four treatments (0, 10.0, 20.0 and 40.0 mg L^{-1} Fe.) were carried out based on the Hoagland nutrient solution in the experiment. After sixty days, physiological traits were measured. Photosynthetic pigments such as total chlorophyll, chlorophyll a, chlorophyll b and carotenoid contents of leaves in basil were measured. Fresh leaf (50 mg) of basil sample was cut and added dimethylsulfoxide (5 mL) to test tubes. The test tubes were incubated at 37 °C for 4 h. Then absorbance of extract was determined using a spectrophotometer. Relative water content was measured. One hundred mg of fully expanded fresh leaf sample of basil were placed immediately after sampling in petri plates filled with double distilled water for 4 h at room temperature. The samples were then taken out and blotted dry, and the turgid weight was recorded. The samples were kept in an oven at 70 °C overnight, and the dry weight was recorded. The results revealed that Fe deficiency stress inhibited physiological traits of basil. The results showed that compared to the control total chlorophyll, chlorophyll a, chlorophyll b and carotenoid contents of leaves in basil were significantly increased by 20.0 mg L^{-1} Fe treatment. However, 40.0 mg L^{-1} Fe treatment significantly enhanced the total chlorophyll, chlorophyll a, chlorophyll b and carotenoid contents of leaves in basil compared to the control. The relative water content significantly affected by Fe solution concentration (20.0 and 40.0 mg L^{-1} Fe) as compared to the control, respectively. The results concluded that 20.0 and 40.0 mg L^{-1} Fe treatments positively affect physiological characteristics in basil.

Keywords: Basil (*Ocimum basilicum* L.), iron uptake, total chlorophyll, chlorophyll a, chlorophyll b, carotenoid contents.

Oral Presentation-16
Bonkanali village (West Bengal) gets water and sanitation access: No one is left behind

Mary Abraham

Mu Gamma Consultants, Gurugram

ABSTRACT

In India, there has been significant progress in the last decade toward ending open defecation throughout the country, resulting in significant improvements in access to water, sanitation, and hygiene. The Swachh Bharat Mission (2014, 2019) and the Jal Jeevan Mission (2019) have made tremendous progress in improving the sanitation and water supply access in rural and urban India. Yet, several geographically difficult regions such as the Bonkanali in Purulia District of West Bengal, located in the forests of mountainous range, are lagging far behind.

The Bonkanali village, also known as Sabar Tola (named after the Sabar community) are an impoverished community, which makes up seven percent of the total population of Purulia District. A shortage of annual rainfall in Purulia has resulted in very low agricultural production, making this tribe unable to resort to agriculture. Forests are therefore the primary source of livelihood and these people hunt, fish, and collect wood from the forest.

People in Purulia lack basic amenities like electricity, water access, and sanitary facilities. Electricity shortages have restricted the provision of basic facilities in the region, including water supply. The lack of adequate sanitation contributes to the rapid spread of diseases, resulting in a substantial economic and personal burden further spiralling the vicious circle of poverty and underdevelopment.

Save The Environment (STE) has been working towards enhancing development and improving environment in the most backward areas. The water and sanitation interventions in Bonkanali village is one such example that we have recently undertaken.

Reaching out to the most vulnerable and untouched

Sabar Tola, where about 10 families belonging to the Sabar community live near the Swapnaloke school. We interacted with the community and understood their challenges of safe drinking water, sanitation facilities, which was compounded due to lack of electricity in the area. The STE founders and members raised crowd funding of Rupees 5,16,000/-, planned and installed toilets, drinking water-cum-WASH facilities. In the absence of electricity in the area, the drinking water system-cum-WASH unit is powered by solar energy. Our interventions include the installation of three toilets, two for households in the region and one specifically for students at the school. There have been intense community engagements, behaviour change campaigns, inter-personal communication, education and generation of ownership at the community level. About twenty students at the school and approximately forty people living in the vicinity in Bonkanali village have greatly benefited from this project.

These WASH interventions in this remote and geographically challenged region is expected to




contribute to the control of infectious diseases, improved child and adult health, reduction in morbidity, mortality and contribute towards the Sustainable Development Goal (SDG) 6. The interventions have not only contributed to water and sanitation in the region but has also stimulated the uptake of clean energy technologies for water supply in difficult areas with limited access to electricity.

This is a replicable, scalable, sustainable model of WASH access with clean energy in remote rural areas.

Oral Presentation-17

Environmentally benign synthesis of xanthene derivatives and their application in the detection of heavy metal ions using fluorescence enhancement strategy

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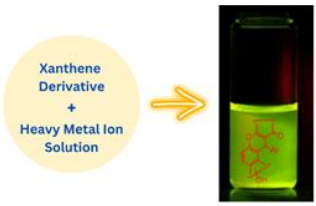
ABSTRACT

Heavy metals are posing a serious threat to human health and ecological environment and becoming a concern. The currently used techniques for detecting them are atomic emission spectrometry, atomic absorption spectrometry and laser induced breakdown spectrometry. These techniques are not ideal as they failed to identify multiple elements at a time, unstable spectrum, insufficient precision and not cost effective. Thus, there is a need for alternative. It is found that xanthene derivatives produce unconventional fluorescence as it has high quantum yield and greater photo-stability thus providing an excellent method to detect the heavy metal ions. This research is involved around the environment benign synthesis of xanthene derivatives, thereby modifying them as sensors for heavy metal ion detection.



Keywords: Fluorescence, Xanthene, Sensor, Heavy metal.

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Oral Presentation-18

In silico targeting of Gamma-aminobutyric acid (GABA) receptors by the Green synthesised Spiro barbiturates as potential drugs for behavioural disorders

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ABSTRACT

Barbituric drugs that cause anaesthetic affect positively modulate allosterically GABA A receptors; but their usage has been discontinued due to their heavy abuse. Hence, there is growing interest to develop analogues of barbiturates that have both therapeutic benefits and less undesirable side effects. One such class of barbiturates that is synthetically formed by a closed ring at the 5 th carbon position is called spiro barbiturates (SB), and have been shown to possess various biological functions as anti-convulsant, hypnotics, anaesthetics, and anti- cancer activities. Spiro barbiturates and spiro thiobarbiturates cause the same level of CNS depression as that is observed with barbiturates. In this study, we used SB synthesised via green approach to study their drugability quotient. The synthesized compounds were subjected to in silico methods through molecular docking tools and Molecular dynamic simulations. Docking is now a crucial component of computer-aided drug discovery and design (CADDD) where small ligands with computer-generated 3D structures were positioned into receptor structures to understand the molecular recognition and probable drugs in medicinal chemistry. Barbiturates were known to act via GABA receptors to modulate postsynaptic glutamate receptors and affect their signaling, activity and expression. Conversely, NMDA receptor activity differentially regulates GABA B receptor subunit expression, signaling and function. Thus, in this study N-methyl-D-aspartate receptors (NMDARs), GABA receptors and glutamate receptors are considered as the primary proteins (ligands) and docking and MD simulation studies of our newly green synthesised spiro barbiturates were carried out. Our synthesized SB showed interactions with all these neurotransmitter receptors, namely GABAA/B receptors, N-methyl-D-aspartate receptors (NMDARs), and Glutamate receptors and all the four synthesized substituted SBs showed good binding affinity. The molecular dynamics simulation of SBs with GABA(A)R were run to find their mode of action and probable binding sites on GABA(A)R. Our results also showed that our designed SBs bind to the α1β3 (Ortho-chloro-SB, Meta-chloro-SB and P- fluoro-SB) and β3γ2 (Methoxy-SB) subunits. As observed from the RMSD plots, GABA(A)R maintained stable structure in complex with

SBs wit RMSD less than 2.5 Å in each case while the SBs showed RMSD ranging from 3-7 Å to achieve the stable conformation by the end of the simulation with P-fluoro-SB and Meta-chloro-SB showed less fluctuations as compared to Ortho-chloro-SB and Methoxy-SB. Thus, the synthesized SBs have tremendous potential as neuronal drugs for Alzheimer's, depression and other diseases and can replace the harmful barbiturates still prevalent as drugs of abuse.

Keywords: In silico study, Gamma-aminobutyric acid (GABA) receptors, Spiro barbiturates, MD simulation, molecular docking.

Oral Presentation-19
Nanoparticles synthesis from leaf litter extract for dye degradation

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ABSTRACT

Delhi has a semi-arid climate with high variation in its weather conditions, ranging from extremely hot to extremely cold. The arid and semi-arid zones have a “thorny scrub” vegetation. The primary forest, known as Ridge Forest, is classified by Champion and Seth (1968) as a "Tropical Thorn Forest," and more specifically as a "Semi-Arid Open Scrub” [1]. The North Campus of Delhi, having different colleges, is blessed with this rich vegetation and many departments possess a compulsory green belt. Most abundant trees are *Saraca asoca* (Ashok), *Plumeria obtuse* (Champa), *Eucalyptus tereticornis* (Eucalyptus), *Azadirachta indica* (Neem), *Ficus religious* (Pipal) and *Syzygium cumini* (Jamun). Due to a rich vegetation, high litter fall is observed and typically, the north ridge which has more than 100 plant species experiences a lot of litter fall.

Dry tree leaves generate a considerable amount of solid waste every day. Organic materials continue to be the largest component of Municipal Solid Waste (MSW). As per records, 15% waste of MSW is garden waste [2]. The traditional methods for disposing off leaf litter include burning and landfilling, however burning releases a number of dangerous compounds into the atmosphere including PM10, PM2.5, carbon monoxide, nitrogen oxide, and hydrocarbons. Moreover, burning leaves may also release dioxins into the atmosphere which are known to cause cancer, and PM10 and PM2.5 is particularly known to induce respiratory dysfunction, among other major health issues. It has been observed that large amounts of leaf litter waste are produced during landfill treatment, raising transportation costs and necessitating more landfill space. Additionally, Green House Gas is released into the atmosphere during composting. As a result, we are rapidly degrading our air quality.

Instead of adopting the conventional burning methodologies, leaf litter can be used to create nanoparticles using the concept and principles of green chemistry and nanotechnology . Green chemistry is a branch of chemistry that aims at the development of chemical products or processes that reduce or eliminate the use and generation of hazardous substances. It usually operates in accordance with 12 principles meant to encourage sustainable growth. One sustainable step that is widely acknowledged is the synthesis of metal nanoparticles (NPs) using a greener method. Plants have been demonstrated to provide some of the best capping and stabilizing properties for the synthesis of NPs which have showed great efficacy in waste treatment process because of their exceptional antioxidant activities and high phytochemical content.

Green synthesized NPs follow Fenton's mechanism for dye treatment with more than 90% efficiency. It is novel to employ dry leaf litter as a substrate for the synthesis of NPs because phytochemicals can also act as stabilizing and capping agents. In general, plant leaf litter is more useful since it may be utilized as a fuel wood substrate, while still being environmentally acceptable. In the current study, we focused on Delhi's north ridge as the site for the leaf samples. The most abundant leaf litter were collected, separated, weighed, washed thoroughly and dried in an oven to remove all moisture. The dried leaves were then crushed and powdered to make the extract. The aqueous leaf extract was added in to ferrous chloride solution and after a while, the colour of the solution changed from pale yellow to intense black colour and which indicated the formation of iron nanoparticles. Iron nanoparticles were characterized by SEM, XRD, EDX, and FTIR spectroscopic and microscopic techniques and were examined to identify the effective functional molecules responsible for the reduction and stabilization of iron nanoparticles synthesized by leaf litter extract.

The efficiency of these iron NPs were investigated in the degradation of dyes. EBT (Eriochrome Black T) was selected because EBT is an organic dye that is anionic and water-soluble. The extensive usage of EBT as an indicator in complexometric titration is found in number of institutional laboratories. Out of all the primary pollutants, environment has been severely affected due to the increased influx of dyes, (like EBT, Methyl blue, and Methyl orange) from many industries, including textile, plastic and leather, medical, automotive, and paper printing [3]. The study revealed the formation of nanosized particles, suitable for the removal of EBT (Eriochrome Black T). The effect of adsorption dosage, contact time, pH, and temperature on EBT removal has been studied. Overall, employing leaf litter in this green synthesis can be a wise financial decision for green waste management techniques.

Keywords: Nanoparticle; Dye; Phytochemical; leaf litter; EBT

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Oral Presentation-20
Nurturing Ideating Entrepreneurs for Creating a Better Tomorrow

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ABSTRACT

Modern times are marked with the unbridled use of chemicals which we hardly take cognizance of! Oblivious of its obvious & subtle presence in our lives, we tend to ignore the devastating impact of the chemicals on the environment. As we cannot afford to turn away from this fact, it's time to bring this realization to our students that they have ownership towards the well-being of our environment which would invariably bring wellbeing to mankind.

ITL Public School aims to create a cohesive entrepreneurial culture and hub under the brand name **Anthelia** The idea is to **Ideate, Impact, and Change.** The students took up the onus of contributing their bit as sensitive and responsible 21st century Global citizens The vision is to develop an organic and herbal brand **Anthelia** thus contributing positively to environmental issues, to presenting eco-friendly products thus providing solutions for side ef fects of harmful toxic substances. The project also aims to enhance scientific temperament among students and thus making the students future-ready **Anthelia experiential learning trending on the path of Prosperity of "People" & the "Planet".**

Anthelia - a start-up initiative by ITLeens was launched to provide the students with hands-on experiential learning in product development apart from developing marketing strategies and entrepreneurship skills. This initiative assumed an interdisciplinary approach by involving students of all domains of Science, Commerce, and Humanities in the production network. This extraordinary feat with a comprehensive approach was attained by involving a maximum number of students as prospective input providers, irrespective of their age.

Keywords: Entrepreneurship skills, Natural products, experiential learning, interdisciplinary approach.

Poster Presentation-1

Environmental economics to maintain a balance between economic development and environmental quality

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ABSTRACT

There are costs associated with environmental protection, including the costs of complying with regulations, implementing pollution control measures, and cleaning up contaminated sites. However, there are also many benefits to protecting the environment, such as improved public health, increased property values, and the preservation of natural resources for future generations. In some cases, the costs of not protecting the environment can be much greater than the costs of taking action to protect it. For example, the costs of responding to and cleaning up an oil spill can be significant, but the costs of not addressing the spill – in terms of damage to the environment and human health – can be even greater.

Poster Presentation-2

Green Perspectives on Waste/Spent Lithium Ion Batteries

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ABSTRACT

"Waste" which has often been touted as "undesirable"/"unwanted" as it leads to uneconomical use of resources and capital is now being considered as a "precious resource". Green Chemistry has shown the phenomenal capability of solving the twin problems of resource and waste by making the latter a solution to the former. Henceforth, the linear economic model is slowly being replaced by the circular economic model wherein increasing emphasis is placed on converting different types of waste materials into value added resources. With the booming of consumer electronics (CE) and electric vehicle (EV), a large number of spent lithium-ion battery (LIBs) have been generated worldwide. More than 50 million metric tons of e-waste is generated globally every year, averaging some seven kilograms of e-waste per capita. Resource depletion and environmental concern driven from the sustainable industry of CE and EV have motivated the scientific community towards focusing on the recovery of the spent LIBs urgently.

For the purpose of imparting experiential skills on conversion of e-waste to wealth through Green Chemistry, Hindu College has initiated a capsule course on "Green Perspectives on Waste/Spent Lithium Ion Batteries" for the students pursuing B.Sc (Hons) Chemistry and B.Sc Physical Sciences with Chemistry which includes a strong research component. Under this course, specific emphasis has been directed towards recovery of lithium cobalt oxide from the spent batteries of mobile phones which have been chemically converted into cobalt oxide nanoparticles using a greener pathway since the conventional process combined with leaching, precipitating, and filtering was found to involve the use of toxic precursors and quite energy intensive. Typically through this project, we have developed a novel alternative sustainable recovery process, using non-toxic greener reagents. When the optimal parameters for leaching process was controlled at 150 min retention time, 95 °C heating temperature, 15 g L −1 solid-liquid ratio, and 400 rpm rotation rate, the recovery rate of Lithium and cobalt from spent LIBs could reach to 98% and 97%, respectively. The obtained oxide nanoparticles displayed promising efficacy in the

photocatalytic degradation of methylene blue dye. Additionally, the work also tentatively discovered the leaching mechanism of lithium cobalt oxide (LiCoO2) using oxalic acid, and the leaching order of the sampling LiCoO2 of spent LIBs. All the obtained results have contributed to a short-cut and high-efficiency process of spent LIBs recycling toward a sound closed-loop cycle.

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Poster Presentation-3

Insights on Hydrogels through Molecular Spectroscopy

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ABSTRACT

Pioneered by Wichterle and Lím way back in 1960 and having existed for more than half a century, "Hydrogels"-a three-dimensional (3D) network of natural or synthetic polymers chains have left a deep impact in a myriad of applications right from showing great capability in delivering drugs or cells to regenerating hard and soft tissues to their applicability as adsorbents in removal of organic as well as inorganic contaminants and marvellous efficacy in enhancing crop productivity. Fascinatingly, their inherent ability to swell and hold large amounts of water, while maintaining the structure due to chemical or physical cross-linking of individual polymer chains has been one of the prime reasons behind their expansive use in diverse fields. Furthermore, in order to make best use of the hydrogels, acquiring deep insights into their structures is imperative and thus researchers have resorted to molecular spectroscopic tools that primarily rely on the interaction of the electromagnetic waves with the substances and divulge the necessary structural characteristics.

Impressed by these smart polymeric materials and the role they can play in water remediation coupled with the intension to impart experiential learning, Hindu College initiated a Value Added Course on "Insights on Hydrogels through Molecular Spectroscopy" under which the students from B.Sc Chemistry (Hons), B.Sc Zoology (Hons), B.Sc Botany (Hons) and B.Sc Physical Sciences with Chemistry are working on a project based on "Hydrogels and their application in Water Treatment." The purpose of this study has been to analyze the spectroscopic behaviour of Standard Biomolecular Absorbance probes in Hydrogel based Aqueous solutions at varying pH conditions, where UV-Vis spectroscopy and Time fluorescence spectroscopic tools have been utilized. Under this project, hydrogels of 5, 10, 15, 20% monomer concentration have been synthesized and their impacts with variable temperature and pH have been studied which are being explored as adsorbents for the removal of toxic dyes. Effect of various parameters such as adsorbent concentration, pH and kinetics are also being investigated. The project holds

significance in view of the current mandates of National Educational Policy (NEP 2020) which has given due emphasis to research and this has been a great opportunity for the undergraduates to expand their thinking beyond the curriculum.

Keywords: Hydrogels, Molecular Spectroscopy, Water Remediation

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SAVE THE ENVIRONMENT (STE) was founded and registered on 19th November 1990. In 1992 with the collaboration of WWF (India), the organization started working to combat arsenic poisoning problem of water in the arsenic prone areas of West Bengal. Since then STE has been involved in various projects related to combat arsenic problem in India.

Our Vision

To protect present and future generations from various environmental hazards.

Our Mission

To create awareness and motivation among rural communities & provide cost effective, energy efficient & environment friendly technologies.

Our Activities

Conducting interactive sessions, workshops/ seminars, awareness programs, field operations through projects, science fairs, posters & quiz competitions.

Please join us and become part of our family
by enrolling yourself as Life Member of STE Family

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