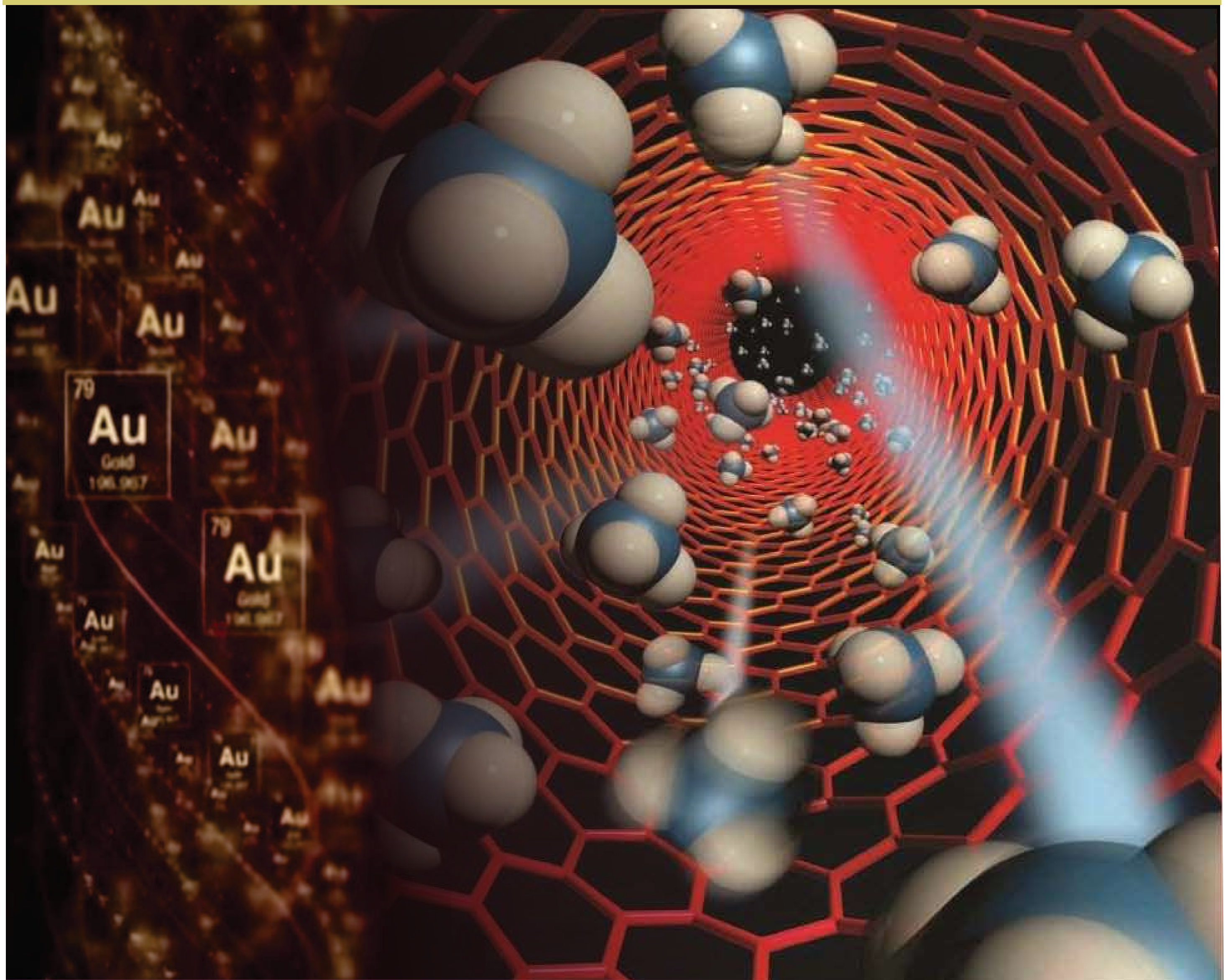
ASSOCIATION OF CHEMISTRY TEACHERS

NEWSLETTER

ISSUE : 18, SEPTEMBER - DECEMBER - 2020



Promoting Excellence in Chemistry Education

Association of Chemistry Teachers
News Letter, September - December 2020

Contents of the News Letter : Issue -18

Disclaimer : The views expressed are that of the authors and ACT is not responsible in any way for them.

From Editorial Desk

Prof. Wasudeo Gurnule
Editor
Kamla Nehru Mahavidyalaya,
Nagpur, Maharashtra.

Wishing you in advance the entire fraternity of ACT, a Merry Christmas, a very happy, healthy and prosperous New Year 2021. The present Editorial Board has put in its bit of efforts, to make the newsletter as attractive and informative as possible. We tried to direct the attention of our readers towards advanced research trends taking place across the globe so as to motivate them to take up initiative in re-orienting themselves towards advanced topics of research and teaching methods. We are bringing the issue of the newsletter with the activities of ACT, articles of current topic, scientific news and reports of international and National webinars. We have also included the report of NCCT-2020 and brief profiles of ACT -2020 award winners. This issue also contains the reports of ACT Research Convention-2020 organized by different zones.

I take this opportunity to say many, many thanks to all my Editorial Board Members for their whole hearted co-operation extended to me.

With warm regards to one and all

Members of Editorial Board

Spectrum of Activities of ACT

1. **Prof Helen Kavitha,** Vice-President ACT, South Zone organized EXPRESSION 2020- Paper Presentation Contest for UG students at SRM Institute of Science and Technology, Ramapuram, Chennai, on Sept. 5 2020.

2. **Prof. P. B. Dwivedi,** ACT Life Member, organized Webinar on Opportunities and Challenges of Virtual Lab and Simulation at Swami Shukdevanand College, Shahjahanpur, UP, on Sept. 30, 2020.

3. **Dr. K. Vijayakumar,** ACT Life Members, organized National Webinar on Recent Advancements in Chemistry for Engineering and Biomedical research at M. Kumarasamy College of Engineering, Karur, TN,on Sept. 29, 30 2020.

4. **Prof. Shraddha Sinha,** Vice-President ACT North Zone, from BBDNITM, Lucknow and Prof. Meet Kamal from Christ Church College, Kanpur organized Poster, Essay and Quiz Competitions on Wild Life Fiesta on Oct. 2-8, 2020.

5. **Dr. Neera Sharma** EC Member ACT, from Hindu College, Delhi. Organized Webinar on National Education Policy in the light of Science Education in India on Oct. 28,2020.

6. **Prof. Shraddha Sinha,** Vice President ACT, North Zone, organized Webinar on Sustainable Methodologies in Polymer Engineering on December 10,2020 at BBDAS NIIT, Lucknow.

7. **Prof. Prem Mohan Mishra,** Vice President East Zone, organized National Chemistry Day and celebrated with great enthusiasm on December 10, 2020 at MLSM College, Darbhanga.

8. **Prof. Shraddha Sinha,** Vice President ACT, North Zone, National Chemistry Day was also celebrated with great enthusiasm on December 10, 2020 at Christ Church College, Kanpur organized by Faculty of the college.

9. **Dr. Hemant Pande,** Vice President West Zone, organized ACT Chemistry Festival CHEMINSIRE 2020 in association with American Chemical Society, International Student Chapter, Association of Chemistry Teacher and Dr. Ambedkar College, Nagpur.

Fly ash - known but forgotten material for water remediation

Sonia Varandani
Smt Chanibai Himathmal Mansukhani College, India
Affilated to Mumbai University, India
sverandani@gmail.com

Theme : Waste Management

"Thousand have lived without love,
not one without water"

- W.H. Auden

The background :

Economic and Social development together with environmental protection guarantees environmental sustainability. The unorganized progress of industrialization and urbanization are responsible for environmental pollution and have harmful and negative effects on a variety of plants, animals and other living beings. In addition to industries, thermal power plants also contribute in deprivation of environment. Both these have exhibited an adverse effect mainly on water, the most basic resource essential for environmental - sustainability. The Millennium Development Goals Report has articulated that 1.2 billion (almost 16% of the worldwide population) have limited wherewithal to clean drinking water.

Water Outlook in our country :

The situation in India is extremely critical as the rural and the urban India mainly depends on ground water, which is under stress. Flood occurrence, drought factors and seasonable variability have made our country one of the highest water stress countries, in the world. India Water Tool (IWT) 2.0, a publicly available online web platform, highlights that approximately 50% of India population are at higher threat of surface-water, 54% of India's groundwater wells are decreasing and more than 100 million people live in areas of poor water quality where at least one to three pollutants exceeds national safety standards.

Coal and Dyes - the Indian Scene :

In our country, coal-based thermal plants consume 90% of the coal mined and generate 65% of the electricity consumed in India. Coal, on combustion produces a fine, glass-like powder called fly ash. A 2016-17 report on fly ash generation stated that 169.25 million tons of fly ash was produced of which 62.15 million tons (36.72%) remained un-utilized. The unspent fly ash when disposed of in ash ponds not only disturbs the ecosystem but also causes water pollution.

The exponential growth of dye manufacturing industry can be gauged from the fact that dye manufacturing increased from a mere 51 dyes and intermediates in 1941 to over 100,000 dyes and intermediates as of the present. The dye industry produces more than 7 x 105 tones of dyestuff annually, of which 56% are textile dyes. About 100 liters of water is consumed for every kilogram of dyestuff being used. Dyes, due to their chemical nature are resistant to fading on exposure to light, water and other normally used chemical or biological remediation techniques. According to literature reports, 28 x 107 kilogram of textile dyes are release in textile industrial effluent per

annum. It is, therefore, no wonder that the textile industry has been criticized as being one of the world's worst offenders in terms of pollution. The control of pollution in industrial effluents has thus become increasingly important to not only safeguard and ecosystem but also maintain human health. Many processes are in place for the treatment of wastewater effluents before discharge into receiving water bodies. Microbial degradation, chemical oxidation, coagulation using alum has been attempted from time to time. Adsorption techniques using carbon, pearl millet husk, neem leaf powder, coconut hust, wheat straw, perlite, maize cobs, wood, natural adsorbent, banana pith, chitin, have been used with mixed success.

Our Plan :

As stated earlier 36.72% of fly ash from thermal plants remains unutilized and the plan of this work is to utilize fly ash in mitigating both dyes and toxic metals in industrial effluents. Natural zeolites have been known for more than 200 years and have found applications as catalysts and adsorbents. Synthetic zeolites have a broader range of applications in comparison to naturally occurring analogues because of the higher purity of the crystalline material and uniform particle size and because they are thermally more stable. It was envisaged that channeling fly-ash management studies for zeolite synthesis would not only aid in minimizing eco-impact but would also provide wider applications. The gist of my research work involves the conversion of fly-ash to diverse types of zeolites and their novel applications for heavy metal and dye removal as a "one pot" operation.

The Start :

Fly-ash was obtained from a thermal power plant from a district in Maharashtra and zeolites were synthesized using an alkali treatment followed by a hydrothermal procedure. In order to ascertain the formation of zeolites, structural characterization of the zeolite was carried out using XRD studies aned SEM profile. The structural units of fly ash zeolite and natural zeolite were composed of double 4 membered rings confirming the conversion of fly ash to zeolites. The synthesized zeolite showed an increase in bulk density; tapped density and surface area, hence increase in crystallinity. The quantitative analysis of XRD and EDXRF spectra revealed the ratio of silicon to aluminum nearly one and chemical composition similar to Zeolite A, reported in literature.

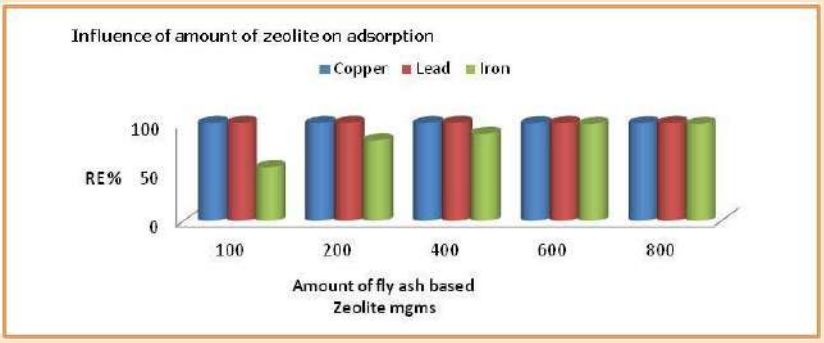
The Steps :

As a first step, the fly ash based zeolite was employed initially to remove reactive dyes from lab prepared industry type effluents. The removal efficiency of reactive dyes was carried out in batch equilibrium wherein the influence of contact time, pH, and initial concentration of the dye and the zeolite dosage on the adsorption process was investigated. Low concentration of dye in industrial effluent could be extracted with the low dose of fly ash based zeolite under acidic conditions.

The adsorption process was studied through adsorption isotherms which depicts graphically the relation between the amounts of adsorbate on adsorbent as the function of amount of adsorbate in bulk material (sample). Different adsorption isotherm models were studied to optimize the adsorption mechanism, explore adsoption capacity of adsorbent and to design effectual adsortpion mechanism, explore adsorption capacity of adsorbent and to design effectual adsorption system. This preliminary investigation showed that the synthesized zeolite was an effective and a low-cost adsorbent for removing dyes from aqueous systems. The adsorption capacity of red, blue and black dyes studied were found to increase with decrease in pH and

increase in amount of adsorbent and time. The optimum conditions for the red dye were pH 2, zeolite concentration 200 mg, reaction time of 90 minutes and 05 ppm initial metal concentration. The dye follows Langmuir isotherm, indicating that adsorption occurs at a fixed site and confined to a small area. Thermodynamic studies indicate that adsorption on fly ash zeolite is spontaneous and endothermmic.

A second step in the investigation was an attempt to remove heavy metals from aqueous systems using the synthesized zeolite. The adsorption abilities of synthesized zeolite were significant in acidic media for the copper, lead and iron with a concentration in the range of 20-40 ppm. The adsorption of iron is more effective at lower concentration and leaching effect is observed at higher concentration of iron and also at lower pH values.



The graph above depicts the influence of amount of Zeolite in milligrams on removal efficiency (RE) of metals (Copper, Lead & Iron). The optimum conditions of adsorbents are : pH3, zeolite concentration 100 mg, reaction time of 60 minutes and 20 ppm initial metal concentration.

Further Steps :

Having achieved positive results for the removal of the dyes and metals from aqueous systems in acidic media, the work has been extrapolated to the removal of both the dyes and metals in a one-pot operation. Conditions are being optimized and removal efficiency and adsorption capacity of the soloist for both the metals and dyes in a one-pot operation is being studied. Preliminary work is also initiated on attempts to regenerate and recycle the zeolites to make the entire process cost efficient and efficient.

Our confidence :

It is our belief that this project will lay the foundations to help develop a low-cost adsorbent for being employed in a bare and efficient method for remediation of industrial effluents. Last but not the least the proposal will also serve to bestow to the Maharashtra Pollution Control Board (MPCB) target of 100% utilization of fly ash.

The end :

As a closure to my story, let me remind my readers that,

"If we pollute the air, water and soil that keep us alive and well, and destroy the biodiversity that allows natural systems to function, no amount of money will save us."

- David Suzuki

BEYOND THE CRISIS : AN ACT WEBINAR SERIES

ACT Research Convention 2020

REPORT

Patron
Prof. Brijesh Pare
President, ACT
Madhav Science
PG College,Ujjian

Patron
Prof. D V Prabhu
General Secretary, ACT
Wilson College,Mumbai

National Convenor
Dr. Raakhi Gupta
Secretary-Central Zone, ACT
IIS(deemed to be University),
Jaipur

CONVENORS

Research Problem Instrumental Methods of Analysis

Prof. M Swaminathan
Member-EC, South Zone, ACT
Kalasalingam Academy of Research and Education, Krishnankoil, Tamil Nadu

Dr. Wasudeo Gurnule
Secretary-EC, West Zone, ACT
Kamala Nehru Mahavidyalaya, Nagpur

Intellectual Property Rights

Dr. Amar Srivastava
Member-EC, North Zone, ACT
DAV(PG) College, Kanpur

Scientometry

Dr. Sanchay Jyoti Bora
Coopted Member-EC, North East Zone, ACT
Pandu College, Guwahati, Assam

Research Problem Instrumental Methods of Analysis

Dr. Pragya Sinha
IIS(deemed to be University), Jaipur)

Dr. Manisha Patni
IIS(deemed to be University), Jaipur

Organic Synthesis

Prof. Helen P. Kavitha
Vice President-EC, South Zone, ACT
SRM Institute of Science and Technology, Ramapuram, Chennai

Dr. Amrit Mitra
Member-EC, East Zone, ACT
Govt.General Degree College, Singur, Hoogly, West Bengal

Analysis of Numerical Data

Prof. Dr. A Sakthivel
Coopted Member-EC, South Zone, ACT
Central University of Kerala, Kasaragod, Kerala

Chemistry Education

Dr. V.P. Singh
Vice President-EC, Central Zone, ACT
NCERT, New Delhi

ADVISORS

Prof. S.D. Samant
Past President, ACT
ICT, Mumbai

Prof. Sudha Jain
Past President, ACT
Principal, GSRMM
PG College, Lucknow

Prof. D.C. Deka
Past President, ACT
Vice Chancellor
Madhabdev University,
Lakhimpur, Assam

Prof. R.K. Bansal
IIS(deemed to be University), Jaipur

Association of Chemistry Teachers (ACT)
C/o Homi Bhabha Centre for Science Education (HBCSE), TIFR, Mumbai

The Association of Chemistry Teachers was launched in 2000 to serve as an apex national body of chemistry educators to promote excellence in chemistry education. In its 20 years of existence and its dedicated service to the academic community, it has not only worked towards capacity-building of Chemistry teachers but has also organized a number of subject related activities to bring together higher secondary school teachers, college and university lecturers, professors, scientists researchers and industry experts on a common platform. In fact over a period of time, it has launched a number of flagship programmes which have become quite popular and are being organized regularly. It is no exaggeration to say that since its inception, ACT has worked tirelessly to strengthen chemistry education in India and to motivate students to pursue chemistry as a career. The research convention is yet another noteworthy feat in its journey of existence of 20 years.

The concept of research convention took seed in its executive council meeting held in February 2020, just before the Corona Pandemic breakdown. It was decided that - in keeping with the New Education Policy and Education 4.0 - the ACT must take initiative in promoting research amongst students and teachers. As a result, the work towards an annual research-related/centric convention was begun and with the support from all EC members, the concept was taken forward in the right earnest. The research convention aimed at providing teachers and young researchers with an insight into the multifaceted dimensions of research.

The diverse topics mandated to cover the step-by-step process of conceptualizing and conducting excellent research, ranging from identifying a research problem, the instrumental methods of analysis, scientometry and organic synthesis to scientific writing, research data-analysis, and IPR were finalized for the ensuing series of events.

Once topics were finalized, it was decided to organize a number of seminars, workshops and conferences, exploring different aspects of research as part of a series. Of course at the time of conceptualizing it was planned to organize these events in offline or physical mode. But the plans had to be changed with the breakdown of Corona and to navigate the unprecedented times of the global pandemic and go beyond the prevailing crisis,online mode was then adopted. Though it came with challenges but it also gave us an opportunity to go global and make these events International in nature. On looking back, one can say with pride that the whole Research Convention – 2020 evolved wonderfully and successfully despite the pandemic. It is heartening to put on record that all zones were active and enthusiastically worked to make this activity successful. It was well organized, the lectures were of good quality, the IT platforms were good, and the attendance was beyond our expectation. Even though it was completely optional, hundreds of students and teachers from not only India but abroad also registered and attended. The comments sent by them are all encouraging. Had these seminars been arranged in physical mode, we would not have received even a fraction of this response

In fact, by way of these webinars, ACT has been successful in accomplishing its mission of promotion of Chemistry education and research in India and capacity-building of Chemistry teachers and students.

ACT supported the organization of these webinars by providing financial assistance wherever required and the registration for all delegates was free.

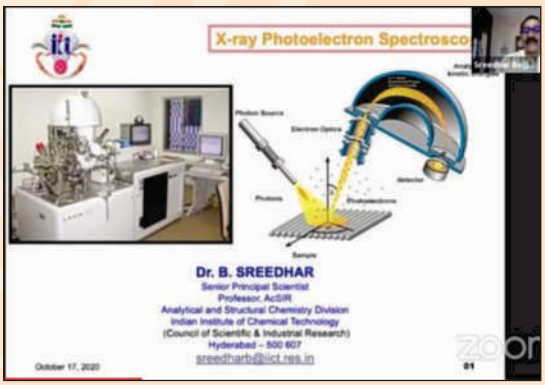
The consolidated report compiled here gives the details of the different webinars conducted as part of this research convention series. The feedback taken in all the webinars is quite encouraging and has motivated the Association to continue organizing the convention every year.

First Webinar

Date	:	5 October 2020
Title of the Event	:	International Webinar on **Research problem (ACTRC-2020)**
Organizing Institution	:	Kalasalingam Academy of Research and Education, Krishnankoil in Association with Kamala Nehru Mahavidyalaya, Nagpur
Convenor	:	Dr. M. Swaminathan
Total No. of registrations in the event	:	**600**
Speakers	:	**Prof. Dr. C. Ramalingan**, Dean SAS, Karpagam Academy of Higher Education
		Prof. Dr. Shriniwas D. Samanth, Professor, Institute of Chemical Technology, Mumbai on "Research Problems in organic chemistry perspective"
		Prof. Dr. Ponnadurai Ramasami, University of Mauritius, Republic of Mauritius on "Graphite, Graphene, Silicene, ….. What is Next?"
		Prof. Dr. M. Swaminathan, Professor of Chemistry, IRC, KARE, Krishnankoilon the topic "Research Problems in Analytical and Environmental Chemistry'

Second Webinar

Date	:	17-18 October 2020
Title of the Event	:	National Webinar on **Instrumental Methods of Analysis**
Organizing Institute(s)	:	Kamla Nehru Mahavidyalaya, Nagpur & Kalasalingam Academy of Research and Education, Krishnakoli, Tamilnadu
Convenor	:	Dr. Wasudeo Gurnule
Total No. of registrations in the event	:	**2858**
Speakers	:	Inaugural Chief Guest - Dr. Smeeta A. Wanjarri, Treasurer of Amar Sewa Mandal, Nagpur
		Dr. Dilip Badwaik, Principal, Kamla Nehru Mahavidyalaya, Nagpur
		Dr. Shreedhar Bojja, IICT Hyderabad 'Surface Characterization by X-Ray Photoelectron Spectroscopy',
		Prof. Uma Sharma, School of Studies in Chemistry & Biochemistry Vikram University, Ujjain, 'Mossbauer Spectroscopy',



Prof. Pundlik R. Bhagat Department of Chemistry, School of Advanced Sciences, Vellore Institute of Technology (VIT), Vellore 'Optimum Use of Instrumentation Resources to Maximize Research Output' and

Dr. N. Selvapalam Centre for Supramolecular Chemistry, Department of Chemistry, Kalasalingam University, Tamil Nadu, 'Application of NMR in Supramolecular Chemistry'




Third Webinar

Date	:	31 October 2020
Title of the Event	:	National convention on **Scientometry**
Organizing Institute(s)	:	Madhavdev University, Assam
Convenor	:	Dr. Sanchay J. Bora
Total No. of registrations in the event	:	**300**
Speakers	:	**Prof. Bhaskar Banerjee,** HOD, Library and Information Science, Banaras Hindu University 'Academic and Scientific Writings: A Scientometric Approach'
		Prof. Deepjyoti Kalita, Cotton University 'Scientometric Indicators and Academic Excellence

Fourth Webinar

Date	:	21 November 2020
Title of the Event	:	National Webinar on **Research Data Analysis**
Organizing Institute(s)	:	**Department of Chemistry**, SPS Central University of Kerala
Convenor	:	**Prof. Sakthivel**, Head, Dept. of Chemistry, Central University of Kerala
Co-Convenor	:	**Dr. M. Bhagiyalakshmi** from Central University of Kerala
Total No. of registrations in the event	:	**200**
Speakers	:	**Prof. R. Nagarajan**, University of Delhi

"Developing critical thinking in scientific research data analysis",

Prof. K. Muralidharan, University of Hyderabad, "Selection on method for chemical analysis"

Dr. M. Bhagiyalakshmi, Central University of Kerala "Data analysis in electrochemical studies" and

Dr. K. Muruga Poopathi Raja, Department of Physical Chemistry, Madurai Kamraj University, Madurai "Spectroscopic analysis: from data to knowledge".

Fifth Webinar

Date	:	27-28 November 2020
Title of the Event	:	International Webinar on **Scientific Writing**
Organizing Institute(s)	:	IIS (Deemed to be University), Jaipur
Convenor	:	**Dr. Pragya Sinha,** Head, Dept. of Chemistry
Organising Secretary	:	**Dr Manisha Patni**
Total No. of registration in the event	:	1145
Speakers	:	**Dr. Ashok Gupta**, Chancellor, IIS (deemed to be) University

Prof. T.N. Mathur, Vice Chancellor, IIS (deemed to be) University

Prof. Gyorgy Keglevich from Budapest University of technology, Development of results during research- Some examples from organophosphorous chemistry

Prof. Martin D Rudd, University of Wisconsin, Getting your research published

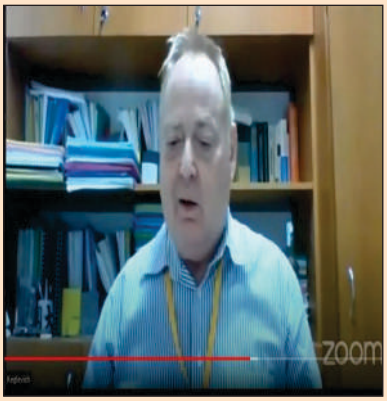
Prof. Sandeep Verma, Secretary Scientific and engineering Research Board, DST Project Writing

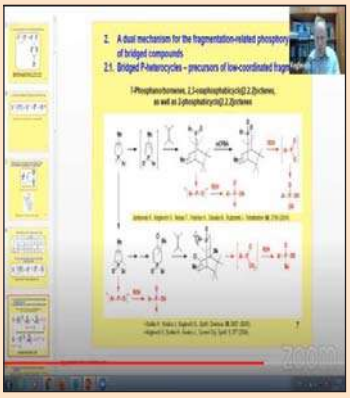
Professor R.K. Bansal from IIS (deemed to be University), Common mistakes in writing a research paper.

Prof. Ayaan Datta, from Indian association for the cultivation of sciences Effective Scientific Manuscript Writing

Prof. Masaki Yoshifuji from Tohuku University Japan Editor's perspective about a research paper

Prof. S D Samant former president, Association of Chemistry Teachers, Mumbai How to write a thesis

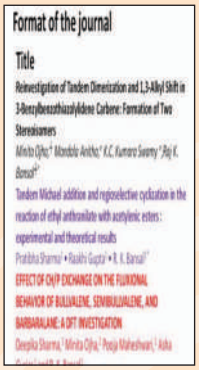




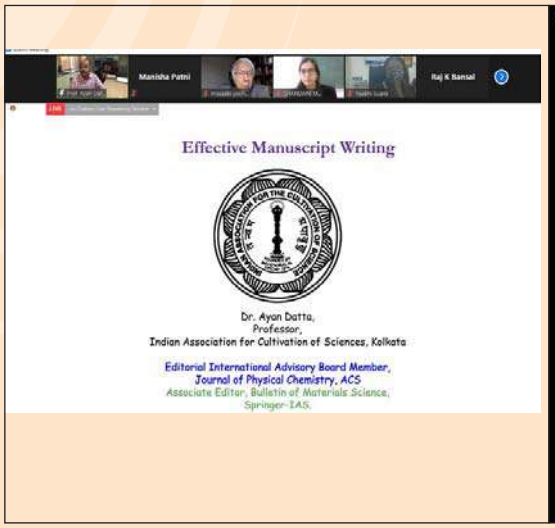
Prof. Gyorgy Keglevich, Department of Organic Chemistry and Technology, Budapest University of Technology and Economics, Hungry

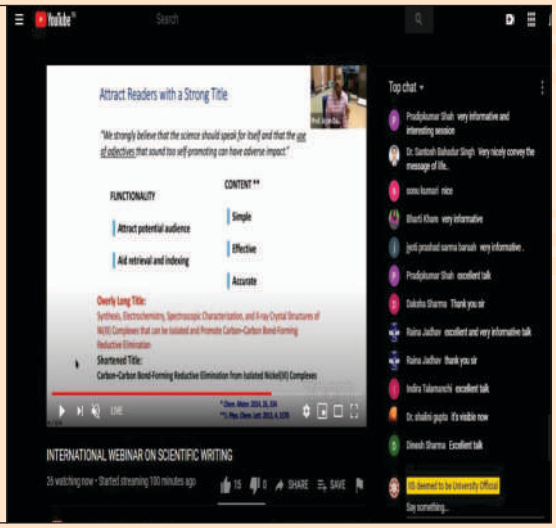
Prof. Martin D Rudd, University of Wisconsin, USA.

Prof. Sandeep Verma, Secretary, Scientific and Engineering Research Board, Department of Science and Technology, New Delhi

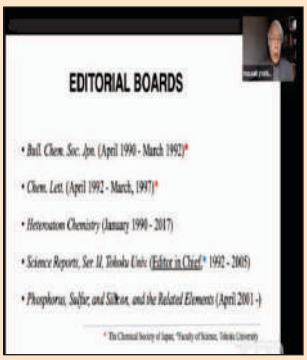


Prof. R.K. Bansal, IIS (deemed to be University), Jaipur

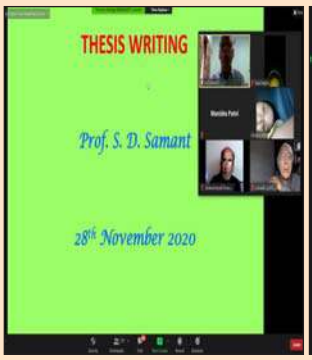




Prof. Ayaan Datta, Indian Association for Cultivation of Sciences, Kolkata



Prof. Masaki Yoshifuji, Tohuku University (Emeritus), Japan



Prof. S D Samant, Former Head, Institute of Chemical Technology and Former President, Association of Chemistry Teachers, Mumbai

Sixth Webinar

Date	:	12-13 December 2020
Title of the Event	:	National Webinar on **Organic Synthesis**
Organizing Institute(s)	:	Department of Chemistry, SRM Institute of Science and Technology-Ramapuram campus and Government General Degree College, Singur, Hooghly, West Bengal
Convenors	:	**Dr. Helen P. Kavitha** and **Dr. Amrit Krishna Mitra**
Total No. of registration in the event	:	**120**
Speakers		**Dr. Subhajit Bandyopadhyay**, Professor, Department of Chemical Sciences and Associate Dean of Academic Affairs, IISER Kolkata "Molecular machines: Who runs them, and how?".
		Dr. Diwan S Rawat, Professor and Dean

Examinations, Department of Chemistry, University of Delhi "Hybrid concept in medicinal chemistry and nano-catalysis: An insightful story".

Dr. Balaram Mukhopadhyay, Professor, Department of Chemical Sciences and Dean of Student Affairs, IISER Kolkata "Synthetic carbohydrate chemistry towards development of synthetic vaccine candidates against bacterial infections".

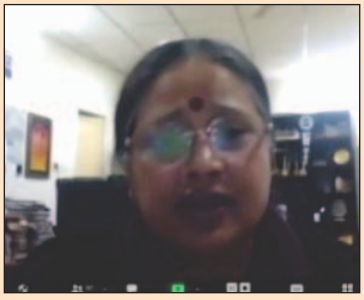
Dr. Biswadip Banerji, Senior Principal Scientist, Organic & Medicinal Chemistry Division, CSIR – Indian Institute of Chemical Biology, Kolkata "Synthetic Journey Towards N-Fused Heterocycles & Their Efficacy Studies".

Prof. Amitava Das, Professor, Department of Chemical Sciences and Dean, Research and Development, IISER Kolkata "Stimuli-responsive Molecules and Molecular Assemblies"

Prof. Helen P. Kavitha
(Welcome Address)

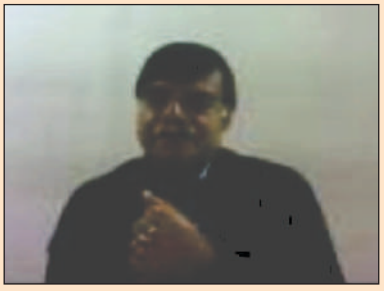
Prof. Brijesh Pare
Presidential Address

Prof. D. V. Prabhu

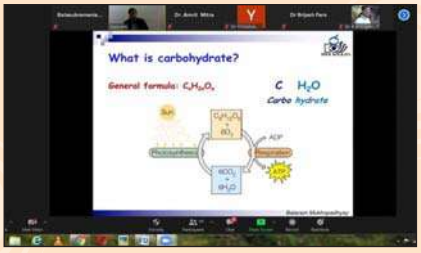


Dr. Raakhi Gupta
Why Research Convention 2020

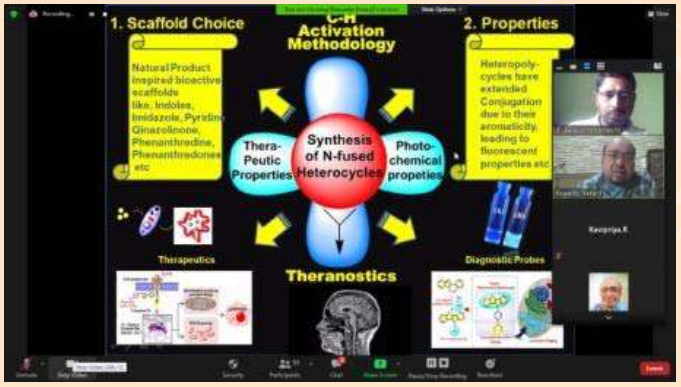
Dr. Amrit Krishna Mitra (WBES)
AddressVote of Thanks



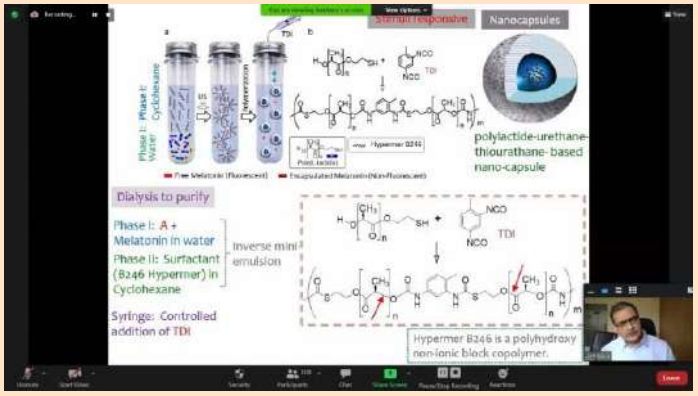
Dr. Balaram Mukhopadhyay's
AddressVote of Thanks



Dr. Biswadip Banerji's Talk



Prof. Amitava Das's Talk



Seventh Webinar

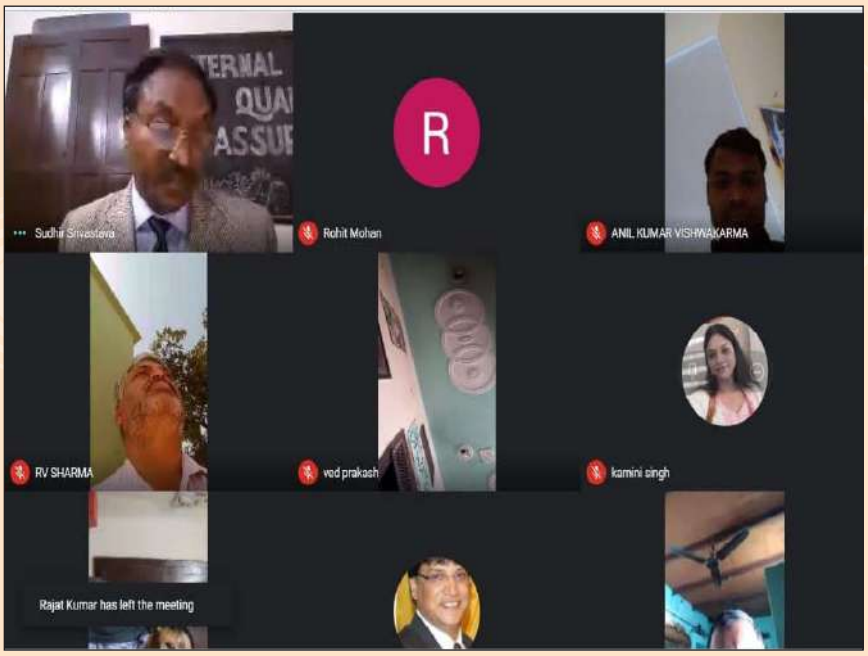
Date	:	19 December 2020
Title of the Event	:	National Webinar on **Intellectual Property Rights (IPRs)**
Organizing Institute(s)	:	D.A.V. (PG) College, Kanpur and CSJM University, Kanpur
Convenor	:	Dr. Amar Srivastava
Total No. of registration in the event	:	**More than 417**

Speakers

Mr. Raghavender GR, Joint Secretary, Department of Justice, Ministry of Law and Justice, Govt. of India, New Delhi. "Copyright laws and academic institutions".

Mr. Vikas Asawat, Registered Patent and Trademark Attorney, Govt. of India, Kota (Rajasthan). "Critical issues in chemistry related inventions in Indian scenario".

Dr. Ramjee Pallela, Chief Operating Officer, Atal Incubation Centre of Center for Cellular and Molecular Biology (CCMB), Hyderabad."IPR and technology transfer avenues in academic sector".



National Convention of Chemistry Teachers (NCCT 2020)

International Webcon on
Recent Advances in Chemistry Education and Chemical Research
In celebration of 20 Years of Association of Chemistry Teachers (2000-2020)
Nov. 29-30 and Dec. 01, 2020

Organised by

Association of Chemistry Teachers,

C/o Homi Bhabha Centre for Science Education (TIFR), Mumbai

Hosted by

Department of Chemistry, MLSM College, Darbhanga, Bihar (India)

Association of Chemistry Teachers, Mumbai and Department of Chemistry, MLSM College, Darbhanga, has organised three days **National Convention of Chemistry Teachers (NCCT 2020)** on Nov. 29-30 and Dec. 01, 2020.

An **International Webcon on Recent Advances in Chemistry Education and Chemical Research (IWRACECR-20)** was also organised as a part of celebration events of 20 years of establishment of Association of Chemistry Teachers (2000-2020)

The main aim of the (NCCT-20) and (IWRACECR) was to provide a platform for scholars of chemistry to share their findings and ideas in various areas of Chemistry Education and Chemical Research as well as to provide a podium for academia and industries to discover the latest innovations in the field of their interest.

This web conference has served as a cradle for the genesis of new ideas pertaining to novel possibilities in the field of chemistry education as well as development and synthesis of new materials having novel properties, development of new methodologies of identification etc. The biggest advantage of this Conference was that it has allowed scientists, scholars, and practitioners to frame a network among the different sects of stake holders.

Our aim was that chemistry educators could learn about effective ways to improve their teaching and evaluation skills and also use the best modern teaching techniques used by their fellow colleagues involved in chemistry education across the globe .

Nearly one thousand participants including school teachers , faculties of universities and colleges, research scholars, scientists, researchers, associations, organizations of chemistry from different parts of India and also from abroad has actively participated in the event.

Day 1 - November 29, 2020

Inaugural Ceremony

Inaugural Cermony started with Kulgeet of L N Mithila University, Darbhanga, Bihar, India. Prof. Vidya Nath Jha, Principal of host college (MLSM College) welcomed the guests. Distinguished guest Prof. S P Singh ,V C, LNMU ,Darbhanga,India elaborated the importance of the event and wished for the success of the event. Prof D V Prabhu , founder general secretary, Association of Chemistry Teachers, Mumbai has produced a brief sketch of 20 years of ACT and its way ahead. The program was formally Inaugurated by Prof Angela Wilson, John A Hannah Distinguished Professor, Department of Chemistry, Michigan State University, Michigan, USA. and President Elect, American Chemical Society, USA. She has also released the souvenir published on the occasion.

Prof Prem Mohan Mishra, Zonal Vice president, ACT, National convenor of NCCT and IWCRACECR-20 has elaborated the objectives of both the event and also the different programs of the three days. Guest of Honour **Prof K Subramaniam**, Director, Homi Bhabha Centre for Science Education (TIFR),Mumbai released the commemorative volume of the activities of 20 Years of ACT. Prof. D V Prabhu, announced the names of recipient of of ACT awards 2020 in various categories.

1. ACT Shri Anupam Sinha Best Chemistry Teacher Award
   Prof. (Dr) B R Venkataraman, Periyar E V R college, Tiruchirappali, Tamil Nadu
2. ACT Best Woman Chemistry Teachers Award for 2020.
   Prof. (Dr) Rita Das, JKBK Government College, Cuttack. Odisha
3. ACT Prof Lallan Singh Award for Best PG Chemistry Teacher (State Universities) for 2020.
   Prof. (Dr) Pramila Kumari Mishra
   of School of Chemistry, Sambalpur University,Jyoti Vihar,Odisha
4. ACT Prof Dr Bhupendra Sahai Saxena Award for Best PG Chemistry Teacher for 2020.
   Prof.(Dr) Murthy SSS Chavali Yadav, Shree Velagapudi Ramakrishna Memorial College, Nagaram, Guntur, AP
5. ACT Prof P R SINGH Award for Outstanding Contribution to Chemistry Education for 2020
   Prof. (Dr) Vimal Rarh, SGTB Khalsa College, University of Delhi, Delhi
6. ACT Prof P B Punjabi Award for Outstanding Contribution to Research in Chemical Sciences for 2020
   Prof. (Dr) Sambandam Anandan, National institute of Technology, Tiruchirappali, Tamil Nadu
7. ACT Life Time Achievement Award for 2020
   i. **Prof (Dr) Ashutosh Ghosh**
      Former Vice Chancellor, University of Calcutta ,and Former Professor, University of Calcutta, Kolkata

ii. Prof (Dr) Amar Nath Mishra

Former Head, Department of Chemistry, T M Bhagalpur University, Bhagalpur, Bihar

This session was presided by Prof. Brijesh Pare, President ACT and it was concluded with vote of thanks by Dr Suresh K Arya , ACT E C member East zone .

Technical Session -1

First technical session was chaired by Prof. S D Samant, Institute of Chemical Technology, Mumbai.Prof Angela Wilson delivered her Keynote Address on the topic Chemical Education, Research, and the Chemical Enterprise: The Key to Our Future. Prof .S Chandrasekaran,SERB Distinguished Fellow, IISc, Bengaluru delivered his lecture on the topic Ethics in Research and Publishing.

Moderator of this session was Dr S. P. Singh, Zonal Secretary, ACT

Prof. Angela Wilson
(Michigan State University, Michigan, USA and President Elect, American Chemical Society, USA)

Prof. S P Singh
Vice-Chancellor, L.N. Mithila University Darbhanga, Bihar, India

Prof. K Subramaniam
Director, Homi Bhabha Centre for Science Education (TIFR), Mumbai, India

Prof. S Chandrasekaran
SERB Distinguished Fellow, IISc, Bengaluru, India

Prof. P Ramasami
University of Mauritius Mauritius

Poster Presentations : Nearly 30 research articles were presented by the teachers and research scholars of different institutions in poster mode. These were evaluated by a panel of three experts consisting of Dr. Amar Srivastava, Dr. Sudesh B Ghoderao and Dr. Umesh Chandra Jain.

ACT EC Meeting

Executive Committee Meeting of ACT was convened in the presidentship of Prof Brijesh Pare conducted by prof DvV Prabhu. Almost all ECmembers of all the six zones of ACT were present and various useful resolutions were passed by the EC

Day - 2 (November 30, 2020)

Technical Session - 2

Prof Peter Mahaffy, The King's University, Edmonton, Canada delivered key note address on the topic Chemistry Education Today for our 2050 World. **Dr Biswajit Saha**, Director CBSE, New Delhi. **Prof P Sivaswaroop**, Regional Director, IGNOU, Nagpur presented his vision on the topic Technology Driven Education in 21st Century. **Prof Javier Garcia Martinez**, University of Alicante, Alicante, Spain, President Elect, IUPAC adreesed the webcon on the topic Chemistry Evolves, So Should Chemistry Education. Prof. Tom Welton, Professor, Imperial college London, President,Royal Society of Chemistry, London. This session was chaired by Prof. Sudha Jain, former Professor Lucknow University, UP and former president, ACT, Mumbai.Master of the Program was Dr. Nayan kamal Bhattacharya, ACT E C member East zone. Vote of thanks was presented by treasure of ACT Dr Hemant Khanolikar.

Prof. Peter Mahaffy
The King's University, Edmonton, Canada

Dr. Biswajit Saha
Director, CBSE, New Delhi, India

Prof. P Sivaswaroop
Regional Director, IGNOU, Nagpur, India

Prof. Javier Martinez
University of Alicante, Alicante, Spain and President Elect, IUPAC

Prof. Tom Welton
Imperial College, London President, Royal Society of Chemistry, London

Presentations by Participants: Nearly 30 research articles were presented by the teachers and research scholars of different institutions in poster mode. These were evaluated by a Panel of judges consisting of Prof. Shraddha Sinha,Dr. Manan K Murthy and Dr. Umesh Chandra Jain.

ACT AGM

Annual General Body Meeting of ACT was convened in the presidentship of Prof Brijesh Pare, President, ACT and conducted by prof D V Prabhu, General Secretay,ACT.A good number of life members of from across all the six zones of ACT participated in the vertual meeting . All the resolutions of ACT EC meeting dated 29/11/20 were ratified and various useful resolutions were passed.

Day 3 - December 1, 2020

Technical Session 3

Dr Venkat Narayan, Principal Polymer Consultant, Anthara Technologies Consulting, Texas, USA delivered his speech on the topic Advances in Polymer Blends. Prof Sourav Pal, Director, IISER-Kolkata presented his lecture on the topic Innovation in Science Research and Education: Inter-disciplinary Approach. Prof S Sivaram, INSA Senior Scientist, IISER-Pune elaborated his vision on the topic future of Chemistry and its impact on Education.

Dr Ankush Gupta of Homi Bhabha Centre for Science Education (TIFR), Mumbai delivered his lecture on the topic "A Quest for Relevance in our Chemistry Curricula"

Prof Andrew Chandler Grevatt, University of Brighton, Brighton, UK. delivered his lecture on the topic "Improving classroom assessment: Developing Chemistry Teachers' Assessment Literacy"

This session was chaired by Prof. D C Deka, Vice chancellor, Madhab deb University, Assam, Ex president ACT, and Prof. Helen Kavitha, HOD Chemistry, SRM University, Surampelam, TN, vice president ACT south zone.

Dr Venkat Narayan
Principal Polymer Consultant
Anthra Technologies
Consulting, Texas, USA

Prof. Sourav Pal
Director,
IISER Kolkata, India

Prof. S. Sivaram
INSA Senior Scientist,
IISER Pune, India

Dr Ankush Gupta
Homi Bhabha Centre for
Science Education (TIFR)
Mumbai, India

Prof. Andrew Chandler Grevati
University of Brighton,
Brighton, UK

Valedictory Function

This Session was addressed by Chief Guest of the session **Prof Nageshwar Rao**, Vice Chancellor, IGNOU, New Delhi and Guest of Honour - **Prof Dolly Sinha**, Pro Vice Chancellor, LNMU, Darbhanga. Prof Sinha has also felicitated Prof D V Prabhu with a certificate in appreciation of his exemplary Services to ACT over the last 20 years since its inception.

Prof Nageshwar Rao
Vice-Chancellor,
IGNOU, New Delhi, India

Prof Dolly Sinha
Pro Vice-Chancellor, LNM
Darbhanga, India

Prof D V Prabhu announced the name of best poster presentation Awardees.

1. K. Santha – St. Joseph College, Kurnool, AP, 2. Amit Kumar - University of Delhi, Delhi, 3. Mridusmita Sarmah - Upper Assam Advance Centre Tea Research Association, Dikam (Assam), 4. Sunita Singh - Navyug Kanya Mahavidyalay, Luknow (UP), 5. V V Durgaveni - Pragati Engineering College, Surampelam (AP)

6. Naveen Kumar - University of Delhi, Delhi. National convenor Prof. Prem Mohan Mishra presented a brief report on all the activities of three days of the mega event and thanked all ACT EC members and the persons directly or indirectly involved in making the event successful specially Prof Brijesh Pare and Prof. D V Prabhu. This session was chaired by Prof. Sudha Jain, Ex President, ACT. Dr. S.P singh, Zonal secretary, ACT delivered vote of thanks to all the guests and participants.Master of the program was Dr Amrit Krishna Mitra, ACT E C member east zone. The program was concluded with national anthem of India.

ACT AWARDS -2020

Association of Chemistry Teachers is proud to honour
Prof Dr B R Venkataraman
of Periyar E V R College,Tiruchirappali,Tamil Nadu
with the ACT Shri Anupam Sinha
Best Chemistry Teacher Award for 2020.

Association of Chemistry Teachers is proud to honour
Prof Dr Rita Das
of JKBK Government College, Cuttack. Odisha
with the ACT Best Woman Chemistry Teachers Award for 2020.

Association of Chemistry Teachers is proud to honour
Prof Dr Pramila Kumari Mishra
of School of Chemistry,Sambalpur University,Jyoti Vihar,Odisha
with the ACT Prof Lallan Singh Award for Best PG Chemistry Teacher
(State Universities) for 2020.

Association of Chemistry Teachers is proud to honour
Prof Dr Murthy SSS Chavali Yadav
of Shree Velagapudi Ramakrishna Memorial College,
Nagaram, Guntur,AP
with the ACT Prof Dr Bhupendra Sahai Saxena Award
for Best PG Chemistry Teacher for 2020.

Association of Chemistry Teachers is proud to honour

Prof Dr Vimal Rarh

of SGTB Khalsa College,University of Delhi, Delhi
with the ACT Prof P R SINGH Award for Outstanding Contribution
to Chemistry Education for 2020

Association of Chemistry Teachers is proud to honour

Prof Dr Sambandam Anandan

of National institute of Technology,Tiruchirappali, Tamil Nadu
with the ACT Prof P B Punjabi Award for Outstanding Contribution
to Research in Chemical Sciences for 2020

Association of Chemistry Teachers is proud to honour

Prof Dr Ashutosh Ghosh

Former Vice Chancellor, University of Calcutta
and Former Professor, University of Calcutta,Kolkata
with the ACT Life Time Achievement Award for 2020.

Association of Chemistry Teachers is proud to honour

Prof Dr Amar Nath Mishra

Former Head, Department of Chemistry,
T M Bhagalpur University, Bhagalpur, Bihar
With the ACT Life Time Achievement Award for 2020.

2020 Distinguished Service to Humanism Award
Dr. Sudesh Ghoderao

Dr. Sudesh Ghoderao received Humanism award for his hard work and dedication as both the National General Secretary of the Federation of Indian Rationalist Associations and the Secretary of the Maharashtra Committee for Eradication of Blind Faith. Last year Dr. Ghoderao helped MANS celebrate its 30 year anniversary by organizing Conference on the theme of "Rationalism for Humanity" with hundreds of National and International delegates. The General Assembly noted that on top of his leadership duties in the Indian humanist movement, Sudesh is also an Associate Professor of Chemistry with an impressive career in teaching and research and has also been a delegate to many Humanists International events in the past.

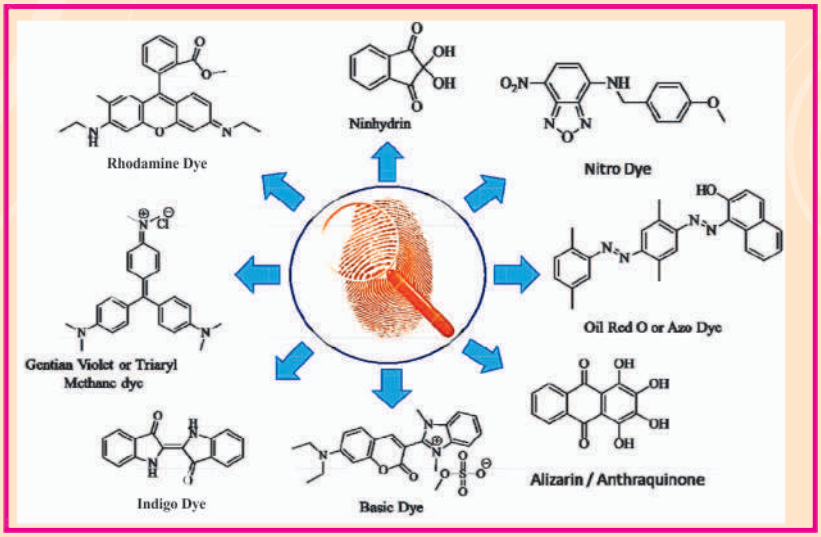
Recent Trends of Dyes in Latent Fingerprint Development

Dr. Devidas S. Bhagat
Assistant Professor, Chemistry
Dept. of Forensic Chemistry and Toxicology,
Govt. Inst. of Forensic Sci. Aurangabad 431 004
Email: devidas.bhagat@gov.in

One of the most common types of physical evidence found at crime scenes is a fingerprint. Latent Fingerprints (LFPs) continue to play a very important role in personal identification in criminal forensics. It is found on various objects at the crime scene side and is used to identify the suspect or criminal and link them to the crime scene, weapon, or object. When the finger touches any surface, the sweat from these pores gets deposited in form of contours, which are the mirror image of the ridge patterns. LFPs have the unique impressions of various loops, whorls, and arches left behind when a finger comes in contact with a surface and it is formed due to the deposition of colorless sweat. LFPs residues consist of secretions of the eccrine (sweat), sebaceous, and apocrine glands present on the palm, head, and nose. Sweat contains 98% water, 0.5% minerals, and 0.5% other organic compounds. Eccrine sweat consists of proteins, urea, amino acids, uric acid, lactic acid, sugars, creatinine, and choline, while sebaceous sweat consists of glycerides, fatty acids, wax esters, squalene, and sterol esters. Fingerprint samples also have unique chemical contents that can be used to extract valuable information about the person or persons of interest. Fingerprints are developed on the hands of individuals in the time of the embryo's development stage from the 9th and 24th week.

The science of developing visible representations of LFPs dates back more than a century, and the number and type of these techniques have steadily increased. From an imaging perspective, the goal of developing latent fingerprints is to maximize sensitivity, contrast, and selectivity. The method of choice is often dictated by the nature of the substrate on which the print is deposited; substrate porosity, reactivity, and other properties must all be taken into consideration when choosing an existing method or developing a new LFPs on the various surface. Apart from imaging, another consideration of increasing importance is that the development technique should not compromise any chemical information that may be contained in the print. An emerging area in fingerprint development is the application of organic dyes for the development of latent fingerprints on porous, non-porous, and wet surfaces by powder dusting methods. Most of these novel methods offer high sensitivity and improved contrast pattern of substrates, and with high resolution.

The scientific community plays a dynamic role in the development of forensics in various dimensions. These topics have always been under constant investigation and development of Latent fingermarks using numerous dyes for the last three to four decades. Every year hundreds of dyes are reported which have excellent applications in the development of latent fingerprints. The most common dye like ninhydrin and azo dye is used for the development of latent prints. Also, The dyes like ninhydrin, Rhodamine, Nitro dye derivatives, ninhydrin, Numerous azo dye derivatives, acidic dye, dye basic dye, alizarin, triaryl methane dye, and indigo dye are used for the development of finger marks. The research community every year develop some novel derivatives having significant application in the visualization of a latent fingerprint.



The field of developed chemical fingerprints has been analyzed by empirical investigations. The chemistry has been investigated out of intellectual curiosity or as an attempt to improve the protocol. The challenge for chemistry instructors, researchers, forensic experts, and students is to develop novel dyes having unique properties.

References:

1. J. Brent Friesen, J. Chem. Educ. 2015, 92, 497-504
2. C. Huynha, J. Halamek, Trends Anal. Chem., 2016, 82, 328-336
3. D.S. Bhagat, et. al, Mater. Today, 2020, 29, 1223-1228

A 3D printed lock and key model to aide teachers to teach Chemistry to visually challenged students

Prof B S Balaji
School of Biotechnology,Jawaharlal Nehru University,
New Delhi 110067
Email ; bsbalaji@mail.jnu.ac.in

According to a report published by the National Programme for Control of Blindness (NPCB), India is home to a third of the world's blind population (about 10 million).The challenges faced by the blind people are numerous. Even teachers of such students face various limitations to teach these children.

In order to alleviate the problems faced by visually challenged people, various support efforts had been carried out by Government of India. Despite these policy measures, when it comes to education, the visually impaired are still not adequately benefited. A survey conducted by the National Council of Educational Research and Training (NCERT) shows, vast majority of the blind children (around 70 %) are not enrolled in any form of education system.

We all know reading and writing are fundamental skills one has to master in order to enjoy intellectual freedom, personal security, independence and have equal opportunities to study and work. Due to lack of getting information through visual clues, the visually challenged children may suffer in perception and concept formation which is one of the fundamental requirements for learning especially subjects like chemistry. To support effective and efficient teaching learning activities for both teachers and students, Braille- a special tactile or touch based system in which raised dots represent the letters of the alphabet is used to teach them how to read.

There are many reasons why blind and partially sighted learners are unable to participate in pure sciences. Some of them include the necessity for the teacher to know Braille to teach blind children, lack of appropriate access technologies, some of the special need teaching materials are too expensive for schools and teachers to acquire, many times they are of short supply, and specifically for science subjects the great challenge is the difficulty of translating equations, graphs, and diagrams into an accessible format. Moreover, many teachers do not have adequate training in teaching blind and partially sighted learners. There are few misconceptions like the visually challenged students are slow learners.

We have developed a simple lock and key model to teach chemistry concepts to visually impaired children. We have included both Braille and alphanumeric letters in our model. The model cards are like a puzzle cards. We have six categories to represent various chemical notations. They include letters (representing elements), numbers, arrows, signs (plus, minus), superscript and subscript. With these 6 categories we can make various representation of chemical concepts. We can create ions both positive and negative, we can create chemical equations. In our models we have included a standard CPK (Corey-Pauling-Kolton colouring) convention that is universally accepted coding for representing chemical elements. Introducing the colour convention at the early stage helps the students learn and understand molecular modelling when they pursue research career. This model can be used not only for visually challenged students, but even normal students can also use it. Using puzzle cards can be like a fun activity for children and it will attract student's interest in learning scientific concepts.

Since we know the current limitations for science education to blind children by the teachers, we have designed our model to address many of these short comings. First, in our model we have included normal letters along with Braille as a means for the sighted students to learn whereas the teacher need not have to be an expert in Braille. Our lock and key models were created using 3D printing technology with biodegradable polymers. These are easy to use, easily dismantlable, light weight. It can be easily integrated into regular curriculum. It is easily affordable and does not require expensive technologies for implementation.

We believe this model can help all the teachers who are teaching low vision and visually challenged students immensely by giving fair access to education which is often neglected due to lack of support. In fact, we have conducted a small survey and found that teaching science, especially chemistry through this model helps in improving blind and low vision student's (BLV) retention of concepts through interactions with tactile models. It is helping them build their own mental model for learning and solving scientific equations, through interactive approaches. We also found that integrating these tactile models with teaching keeps the students involved in their self-paced learning and it engages them for a longer duration.

We have created open-source repository of basic building block design files for writing

chemical formulas, equations. Anyone who is having access to 3D printer can download our design files and print it and start using it to learn or teach chemistry concepts. The lock and key fitting are convenient and easy to adopt by learners including BLV students, because the puzzle pieces can be connected together in the desired manner (any number of times), replacing the need for magnetic letters and board. All the 3D models are embossed with Braille labels and conventional alphanumeric letters to aid both BLV and sighted learners together.

We strongly believe that every piece of material, instrument, or text can be appropriately modified to make science accessible for the blind and visually impaired population through creativity, skill, and tenacity. We have shown one such example and want many more people to create more accessible options for inclusive education. By using these lock and key models, it is possible to write, explain, and present molecules and chemical equations to BLV students by a teacher in an easy and efficient way.

This work has been published in "Creating Atom Representations Using Open-Source, Stackable 3DPrinted Interlocking Pieces with Tactile Features to Support Chemical Equation Writing for Sighted and Visually Impaired Students, Ishu Singhal and B. S. Balaji, J. Chem. Educ. 2020, 97, 118−124".

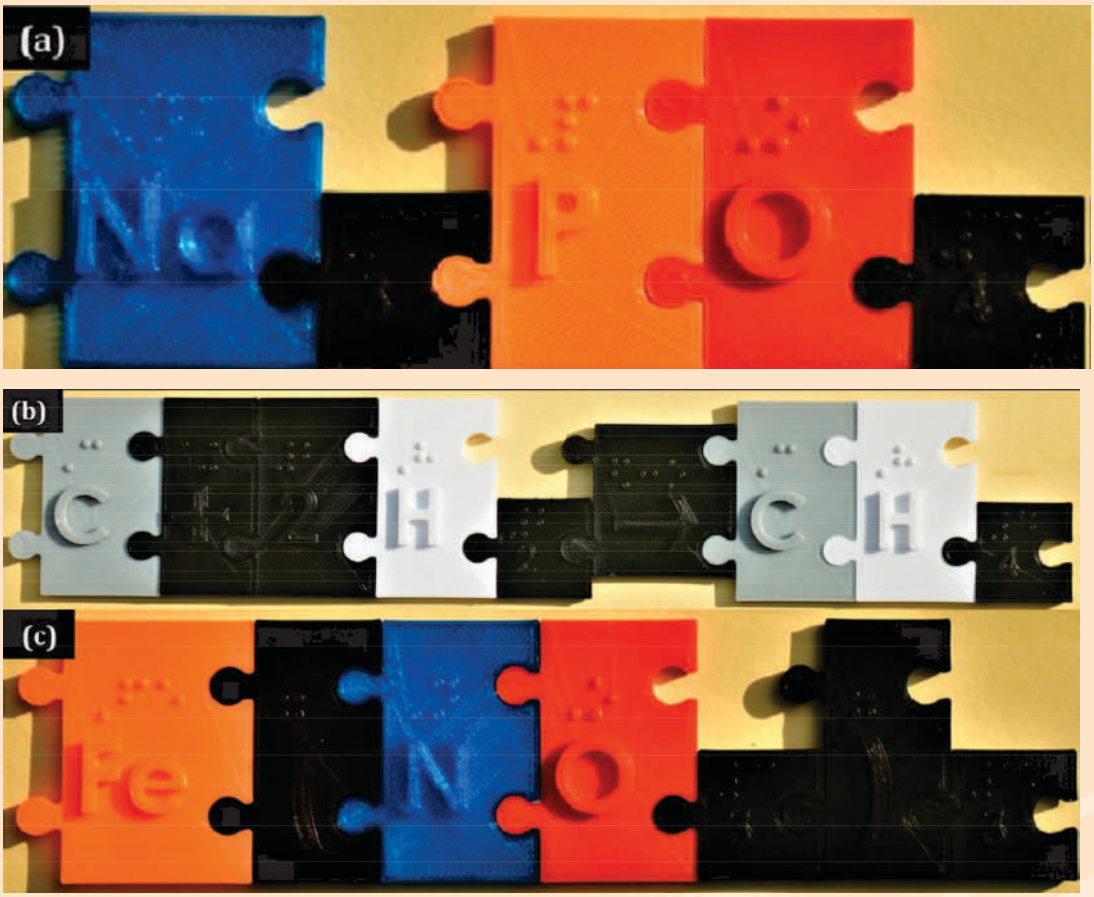


Figure 1. (a) Ionic compounds which can written using ions depicted in Na_3PO_4,
(b) Chemical equations were presented with the formation of some basic organic molecules: $C + 2H_2 \rightarrow CH_4$,
(c) Ionic compounds representation $Fe(NO_3)_3$

Media Coverage about our Braille Work

Rajya Sabha TV had covered our work on 04-Jan-2020 (8.00 pm news)

JNU professor develops Braille model to teach chemistry to visually-challengedstudents (Tweet by Press Trust of India)
https://twitter.com/PTI_News/status/1202523453716193280

1. **JNU professor develops inclusive chemistry teaching model for visually impaired students** (National Federation of the Blind)
http://www.nfbkarnataka.org/event_details?id=2968
2. **JNU Professor Develops Braille Model To Teach Chemistry To Visually-Challenged Students** (NDTV - Education) https://www.ndtv.com/education/jnu-professor-develops-braille-model-to-teach-chemistry-to-visually-challenged-students-2144035
3. Braille model developed by JNU prof to teach chemistry to visually-challenged students(Business Standard) https://www.business-standard.com/article/pti-stories/braille-model-developed-by-jnu-prof-to-teach-chemistry-to-visually-challenged-students-119120500669_1.html
4. **JNU prof develops Braille model for chemistry** (Deccanherald)
https://www.deccanherald.com/national/north-and-central/jnu-prof-develops-braille-model-for-chemistry-782898.html
5. **Braille Model Developed By JNU Prof To Teach Chemistry To Visually-challenged Students** (Republic World) https://www.republicworld.com/india-news/general-news/braille-model-developed-by-jnu-prof-to-teach-chemistry-to-visually-cha.html
6. **Braille model developed by JNU prof to teach chemistry to visually-challenged students** (Outlook) https://www.outlookindia.com/newsscroll/braille-model-developed-by-jnu-prof-to-teach-chemistry-to-visuallychallenged-students/1678266
7. **JNU professor develops inclusive chemistry teaching model for visually impaired students** (Newz Hook) https://newzhook.com/story/jnu-professor-inclusive-chemistry-teaching-model-braille-visually-impaired-audio-books-accessible/
8. **JNU Professor develops Braille model to teach visually-impaired students chemistry** (The Indian Wire) https://www.theindianwire.com/education/jnu-professor-develops-braille-model-to-teach-visually-impaired-students-chemistry-238742/
9. **JNU prof develops Braille model to help teach visually-challenged students chemistry** (dailyhunt) https://m.dailyhunt.in/news/india/urdu/edexlive-epaper-edex/jnu+prof+develops+braille+model+to+help+teach+visually+challenged+students+chemistry-newsid-151505946/amp
10. **Indian Teacher Develops Braille Model to Enable Blind Students to Learn Chemistry** (Sputnik News) https://sputniknews.com/asia/201912051077491858-indian-teacher-develops-braille-model-to-enable-blind-students-to-learn-chemistry/
11. **Professor develops braille model to teach chemistry** https://disabilityinsider.com/2019/12/06/education-and-employment/professor-develops-braille-model-to-teach-chemistry/

Luminescence : A Noble Phenomenon

Dr. Suresh P. Puppalwar
Dept. of Physics
Kamla Nehru Mahavidyalaya, Nagpur
E-mail: suresh.puppalwar@gmail.com

The sun is an example of a luminous object, while the moon is an illuminated object. During the day, the sun generates sufficient light to illuminate objects on Earth. Without the light from the luminous objects, these illuminated objects would not be seen. Light is a form of energy. To create light, another form of energy must be supplied. Lighting technologies are the substitutes for sunlight. The history of lighting can be viewed as the development of increasingly efficient technologies for creating visible light in the desired spectral region. The traditional technologies developed so far include incandescence and fluorescence. Even in this digital era one of the world major problems is the shortage of electricity. This is because of the present lighting system, which includes tungsten filament bulbs which consume more power, fluorescent lamps, which are not eco-friendly as they are excited by mercury, which is harmful, non-disposable, life time is only of the order 1000 h. Around 33% of electricity is utilized due to the present lighting system.

Incandescence is light from heat energy. If you heat something to a high enough temperature, it will begin to glow. For example, when an electric stove's heater or metal in a flame begin to glow “red hot” that is incandescence. When the tungsten filament of an ordinary incandescent light bulb is heated still hotter, it glows brightly “white hot” by the same means. The sun and stars glow by incandescence. In fact, only about 15% of the energy they use comes out as light and the rest is released in the form of heat. Incandescent lamps are the least expensive to buy but the most expensive to operate.

Fluorescent lamps have emerged as a potent alternative of incandescent bulb because of low power consumption and poor life time. The fluorescent tube has a low pressure of mercury vapour and emits a small amount of blue/green radiation. Fluorescent lamps are about 3–5 times as efficient as standard incandescent lamps and can last about 10 to 20 times longer. Compact fluorescent lamps (CFLs) use gases and phosphor inside the lamp to create light, they are available in screw-in or pin-based configurations, in many sizes and shapes with life time around 7–10,000 h of use. They convert 6.6–8.8% of input power to light; consume 2–5 times less power, lasts 8–10 times longer compared to an incandescent bulb. CFL exhibits operation optimum performance at 20 ºC and its efficiency decreases at higher and lower temperatures.

LED lamps emit visible light in a very narrow spectral band; they can also generate white light. This is accomplished with either a red–blue–green array or a phosphor-coated blue LED lamp. LED lamps last from 40,000 to 100,000 h depending on the colour. LED lamps have made their way into numerous lighting applications including traffic signals, exit signs, under-cabinet lights, and various decorative applications.

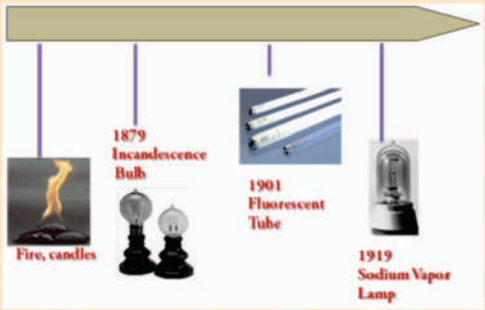


Fig.1. History of Lighting

Luminescence, general term applied to all forms of cool light, i.e. light emitted by sources other than a hot, incandescent body, such as a black body radiator. Luminescence is caused by the movement of electrons within a substance from more energetic states to less energetic states. Luminescence is the generic term for the emission of light which is not an effect of high temperature. So luminescence can be determined as an appearance of cold body radiation. This radiation can either be part of a chemical reaction or a cause of subatomic motions or stress on a crystal. Actually, luminescent materials have the characteristic of emitting light when excited by cathode rays, UV radiation, or visible light. The luminescence is a physical process derived from electronic transitions: only some materials exhibit this phenomenon, called as phosphors. Luminescence has two parts: fluorescence and phosphorescence which are based on the ability of a substance to absorb light and emit light of a longer wavelength and therefore lower energy. The main difference is the time in which it takes to do so. So if it disappears immediately, it's fluorescence. The reason phosphorescence lasts longer than fluorescence is because the excited electrons jump to a higher energy level than for fluorescence.

In fluorescence, the luminescence emission has a lifetime <10−8 s, while in phosphorescence the luminescence emission has a lifetime >10−8 s. The phenomenon known as fluorescence occurs at the subatomic level by a process called electron excitation. When certain atoms are exposed to ultraviolet (UV) light, a photon (particle of light energy) of UV will cause an electron residing in a lower-energy inner electron shell to be temporarily boosted to a higher-energy outer shell. When this occurs the electron is said to be "excited." It will then drop back to its original inner electron shell, releasing its extra energy in the form of a photon of visible light. This visible light is the fluorescent colour that our eyes perceive. The exact colour depends on the wavelength of the visible light emitted, with the wavelength itself being dependent on the type of atom undergoing the electron excitation.

There are varieties of luminescence phenomena observed in the nature or in man-made materials. Chemiluminescence, produced by certain chemical reactions, at low temperatures, electrolumine scence, produced by electric discharges, which may appear when silk or fur is stroked or when adhesive surfaces are separated; triboluminescence, produced by rubbing or

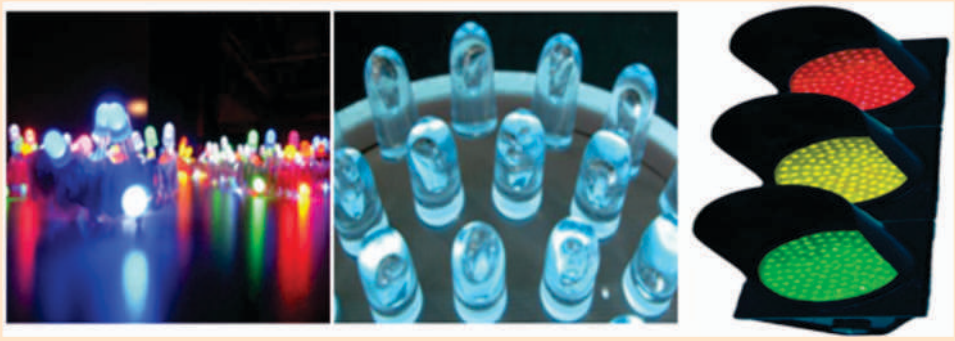


Fig. 2. Solid State Lighting

crushing crystals. Bioluminescence is produced by living microscopic organisms, which collect at the surface of the sea. Luminescence of inorganic and organic substances results from an emission transition of anions, molecules or a crystal from an excited electronic state to a ground state with lesser energy. In photoluminescence, the emission is produced by excitation with the light photons. The fluorescent lamp used in household and general lighting is the principal example of this type of luminescence. 254 nm UV radiations from the mercury vapour discharge are absorbed by one of

activator impurities in the phosphor coated on the inner side of the glass tube. Some of this energy is transferred by resonance to a second impurity. By adjusting the relative concentrations of these activator impurities one can produce desired modification in the colour of the light. There are large varieties of organic and inorganic phosphors, which are used in the consumer items like in road and traffic signals, displays, laundry whiteners etc. in addition to the host of those used in industrial and scientific applications. Phenomena of photoluminescence have found more application than any other luminescence. Review of literature on red, blue, green (RBG) and white light emitting materials arrange of device architectures reveals various measures and handling the degradation issues of the materials for LEDs. With these measures if we succeed in improving the efficiency, performance and lifetime, the present lighting system can be replaced by eco-friendly, energy efficient green technology called solid state lighting, which would play a significant role in reducing global energy consumption. Researchers should now concentrate on the challenges to improve various factors such as electricity to light conversion efficiency, device stability and lifetime, novel fabrication technologies, manufacture cost in order to advance this technology and overcome the technical barriers to compete with the present lighting system with the eco-friendly LEDs.

The host substance is usually a dielectric or semiconductor material with sufficiently large band gap. There are many types of hosts, such as alkali-earth sulphides, alkali-earth aluminates, rare-earth oxides, lanthanides, halides, silicates etc which are solid inorganic compounds. Phosphor contains mainly a passive (not light-emitting) medium to which some activator substance is added with some concentration. Considerable improvement in the field of luminescent materials has been made by the introduction of rare earth ions as luminescent species. An important breakthrough was the use of Eu3+ activated materials as the red component for colour-television screens. Trivalent rare earth (RE) complexes, which featured line-like emissions, high luminescent efficiency, high quantum efficiency and easy synthesis, have been introduced as the emission material into the field of light-emitting diodes (LEDs).

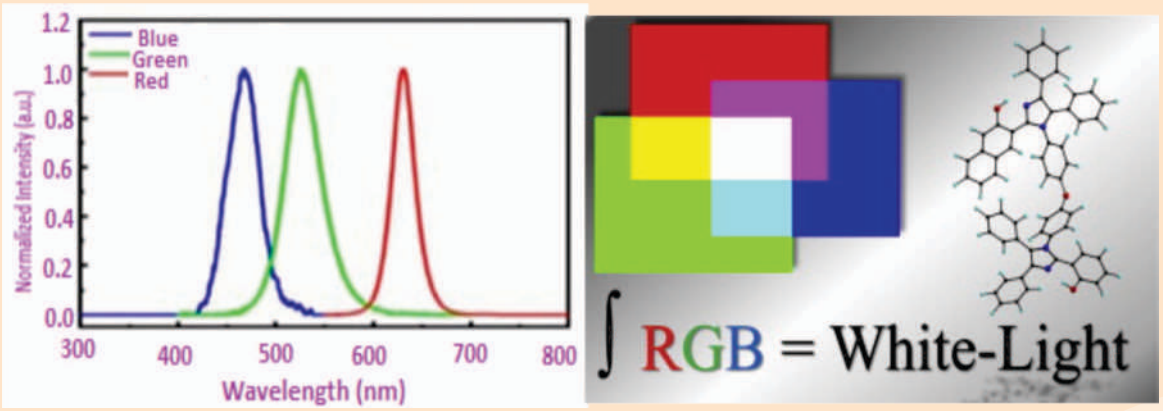


Fig.3. A wide range of colours by mixing the three looks almost white with full brightness.

There are various methods for the synthesis of luminescent materials, for example, chemical reaction, co-precipitation, sol gel, combustion, solid state diffusion etc. Formation of the compound is confirmed by taking the XRD pattern. XRD pattern shows well defined peaks, which define the crystallinity and phase formation of the synthesized material. A number of different properties can be relevant for the use of phosphors. The shape of the luminescence spectrum determines the colour appearance. The luminous efficacy determines how bright the appearance

can be with a given excitation level. It can be degraded by various quenching mechanisms, which involve crystal defects, surface effects or impurities. Even for the same type of phosphor, it can vary substantially, depending on the fabrication details. Phosphors can be optimized for different excitation mechanisms. The limited lifetime can also vary substantially depend on the type of phosphor and the operation conditions.

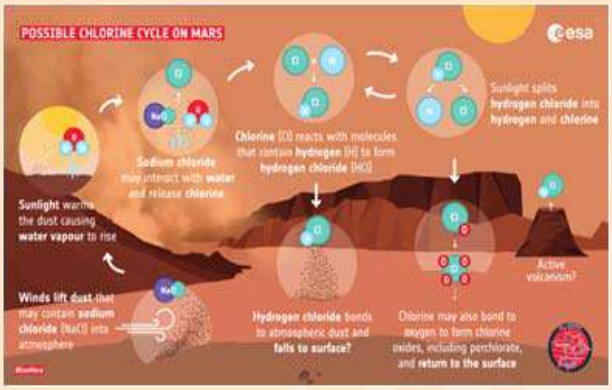
The most important fact of the phosphor is its applications in different fields. One of the applications of the phosphor is in a fluorescent lamp. The actual LED (based on InGaN) produces blue light, some of which is directly used for illumination, while another part of it is absorbed by some phosphor which produces light at longer wavelengths often in the green to orange region (mostly yellow), so that overall one obtains a white colour impression. Colour screens typically contain three different kinds of phosphors, e.g. with red, green and blue emission, which are arranged in a regular pattern, which have been used in most television devices, computer displays and digital oscilloscopes. The phosphor layer is often deposited on a fibre-optic plate or fibre, transferring and possibly transforming the image, either for direct viewing or for recording with an image sensor. There are phosphors mostly based on zinc sulphide to which a radioactive material such as radium is added, are used in wristwatches or displays which emit a little light without requiring illumination or electric power. Phosphors generally exhibit a limited lifetime due to degradation processes which mainly occurred during operation. The resulting lifetimes differ very much in different phosphors. The Nobel Prize in Physics 2014 was awarded jointly to Isamu Akasaki, Hiroshi Amano and Shuji Nakamura, "for the invention of efficient blue light-emitting diodes which has enabled bright and energy-saving white light sources".

Views, News and more....

First Detection of Hydrogen Chloride Gas on Mars

Hydrogen chloride gas has been detected in Mars atmosphere at the first time by the ExoMars Trace Gas Orbiter of the European Space Agency and Russian Space Corporation Roscosmos. These is the first detection of hydrogen gas in the atmosphere of Mars and represent a new chemical cycle to understand, said Kelvin Olsen from the University of Oxford, one of the lead scientists on the project.

The discovery of HCl on Mars was the result of a dust storm that hit the planet back in 2018. Chlorine-based gases sometimes indicate volcanic activity, but the HCl was found in the northern and southern hemispheres of Mars at the same time, and no other volcanic gases were detected. Therefore, the gas appears to be linked to an entirely new surface– atmosphere interaction driven by dust seasons on Mars.



You need water vapour to free chlorine and you need the by-products of water – hydrogen – to form hydrogen chloride. Water is critical in this chemistry,' Olsen explained. 'We also observe a correlation to dust: we see more hydrogen chloride when dust activity ramps up, a process linked to the seasonal heating of the southern hemisphere.' Further reactions could see the chlorine or hydrochloric acid-rich dust return to the surface, perhaps as perchlorates, the agency suggested.

The Space Rock that Doomed the Dinosaurs was Shrapnel from a Comet

A space rock crashed into present-day Mexico 66 million years ago, dooming the dinosaurs.

The object's origin has remained a mystery, but Harvard astrophysicists have a new theory.

They suggest the dinosaur-killer wasn't an asteroid, but shrapnel from a comet that had flown too close to the sun. About 66 million years ago, a space rock more than 6 miles wide collided with Earth, striking land that is now part of Mexico.

The impact sparked wildfires that stretched for hundreds of miles, triggered a mile-high tsunami, and released billions of tons of sulfur into the atmosphere. That gaseous haze blocked the sun, cooling the Earth and dooming the dinosaurs, along with 75% of all life on the planet.

But the origins of that dinosaur-killing rock, named Chicxulub, have remained a mystery.

Most theories suggest Chicxulub was a massive asteroid; hundreds of thousands of these rocks sit in a donut-shaped ring between Mars and Jupiter. But in a study published, two Harvard astrophysicists suggested an alternate idea: that Chicxulub wasn't an asteroid at all, but a piece of shrapnel from an icy comet that had been pushed too close to the sun by Jupiter's gravity.

Comets form from ice and dust outside our solar system and are generally small and fast-moving, whereas rocky asteroids are larger, slower, and form closer to the sun.

We are suggesting that, in fact, if you break up an object as it comes close to the sun, it could give rise to the appropriate event rate and also the kind of impact that killed the dinosaurs, Avi Loeb, an astrophysicist and cosmologist at Harvard University said.

List of ACT Life Members During September to December 2020

L.M. No.	Name	Institutions
2309	Dr. Dimple Kumari	College of Commerce, Arts & Science, Patna, Bihar
2310	Dr. Rambabu Dandela	Institute of Chemical Technology (ICT), IOC, Odisha
2311	Ms. Avisa Indira	A.G & S.G Siddharth Degree College, Vuyyuru, Andhra Pradesh
2312	Dr. Sreenivasulu Reddymasu	Jawaharlal Nehru Technological University, Kakinada, Andhra Pradesh
2313	Dr. Vinod Kumar Tiwari	Institute of Science, Banaras, Varanasi
2314	Mr. Ayon Chakraborty	
2315	Dr. Arun Sharma	Ch. Kaliram Degree College, Nangal, Sahranpur, Uttar Pradesh
2316	Dr. Alka Harit	
2317	Prof. (Dr.) Kishan Shankarrao Lohar	Shri Krishna Mahavidyalaya Gunjoti, Omerga, Osmanabad, Maharashtra
2318	Dr. A. Geetha	Kongu Engineering College, Perundurai, Tamil Nadu

ASSOCIATION OF CHEMISTRY TEACHERS

(Promoting Excellence in Chemistry Education)

C/o. Homi Bhabha Centre for Science Education (HBCSE, TIFR)
V.N. Purav Marg, Mankhurd, Mumbai - 400 088

www.associationofchemistryteachers.org

ACT NEWS LETTER

ISSUE - 18, SEPT - DEC 2020