

**REPORT ON THE INDIAN ANALYTICAL SCIENCE CONGRESS 2019 ORGANIZED BY INDIAN
SOCIETY OF ANALYTICAL SCIENTISTS AT , HOTEL APOLLO DIMORA, THIRUVANANTHAPURAM ,
KERALA STATE DURING SEPTEMBER 19-21, 2019**

The Indian Analytical Science Congress 2019 (IASC-2018) was organized by the Indian Society of Analytical Scientists (ISAS) at Hotel Apollo Dimora, Thiruvananthapuram , Kerala , India during September 19-21, 2019. The theme of the congress was ,” Recent Advances in Analytical, Bioanalytical and Separation Techniques”. The Main goals of organizing the conference were to evaluate the recent advances and developments modern analytical science and Technology in India. The conference provided an excellent venue to the participants for gaining information and develop knowledge on key analytical ,bioanalytical and separation tools. IASC 2019 conference focused on all aspects concerned with analytical science and technology and helped scientists to connect the dots that matter to them. Conference sessions brought out the latest strategies, research, and best practices to improve outcomes through quality, safety and staffing and provided opportunity to learn from evidence-based research and discover innovations they can start using immediately.

IASC 2019 was attended by about 200 scientists from all over the country. The scientific program consisted of 10 sessions. Around 100 research papers have been presented in the conference. IASC 2019 provided an excellent scientific and social environment to participating scientists for discussing innovating and emerging advances in the area of analytical, bioanalytical and separation techniques . The present conference held at Thiruvananthapuram was the latest in the series of IASC series of conferences started by ISAS in 2007 to promote analytical science and technology in our country. This conference also provided an excellent opportunity for young researchers, teachers and students, and scientists from all over the country, a forum to meet the experts and representatives of national scientific community and enabled them to re-establish links with their peers and colleagues.

Dr Dinesh Srivastava, Chief Executive, Nuclear Fuel Complex, Department of Atomic Energy, Hyderabad inaugurated the Conference on September 19,2019 at Hotel Apollo Dimora , Thiruvananthapuram. In his inaugural speech Dr Srivastava talked about the importance of analytical science in the production of nuclear materials particularly nuclear fuels and other nuclear materials. Analytical sciences play an important role in providing safe environment controlling pollution, etc. Quality assurance and control of nuclear materials depends on analytical sciences to a great extent. Realizing its importance nuclear fuel complex ,Hyderabad has established an excellent quality control laboratory with all modern facilities and equipment.

He hoped that the three day conference will give a boost to the progress of analytical science in the country and identify new opportunities for R&D in this area.

A souvenir brought out in commemoration of the conference was released by Dr Dinesh Srivastava. In the inaugural session ISAS Life time achievement Award 2018 was presented to Dr K N Ninan, Former Deputy Director, Vikram Sarabhai Space Centre, Thiruvananthapuram in recognition of a lifetime of distinguished achievements and outstanding contributions made by him in the field of Space Science and Technology and also analytical sciences. The award was presented to Dr Ninan by Prof CGR Nair, Former Chairman, Kerala state Council for Science and Technology .

Dr P P Chandrachoodan, President-ISAS presided over the function. In his presidential address Dr Chandrachoodan spoke about the importance of R&D in the field of analytical science which can serve as the driver of future solutions that make our country better, safer and eco-friendly. He said the focal theme of Indian Analytical Science Congress 2019 i.e. "Recent Advances in Analytical, Bio-analytical and Separation Techniques" reveals the vastness of applications of analytical techniques related to the sprawling development sectors that are closely connected with these important areas of applied science and technology. Various key leaders of our national development activities such as heads of government department, heads of university departments, scientists, technologists, professors, R&D management experts, instrument manufacturers, suppliers, laboratories, users, etc. have gathered under this one umbrella of IASC 2019. The three day conference, he said, will go a long way in promoting the progress of analytical science and technology in our country. Dr S.C.Sharma, Deputy Director, VSSC and Prof CGR Nair offered felicitations. Dr KKA Rashid ,Chairman of the national organizing committee welcomed the participants. Dr R.Rajeev, Chairman- local organizing committee proposed the vote of thanks. Dr KN Ninan, the ISAS life time achievement award winner also spoke on the occasion.

The inaugural session was followed by technical session I. The technical session I was chaired by Dr P P Chandrachoodan, President-ISAS. Dr K N.Ninan the ISAS 2018 Life Time Achievement award winner delivered the first talk. The title of his talk was , "Analytical Science in the evolution of chemical systems for India's satellite launch vehicles and spacecrafts". In his talk he reiterated the importance of analytical science in space science and technology . Analytical science has helped in meeting the demands of the future and enabled Indian scientists to make Indian space programs contemporary and competitive, and enabled them to face enormous challenges. In the success of various space missions analytical scientists have played an important role particularly in the ambitious programmes of India's future space endeavors including Chandrayan, Mangalyan, etc. The first plenary address of the conference was presented by Prof (Dr) S.K.Satheesh Centre for Atmospheric & Oceanic Sciences & Divecha Centre for Climate Change Indian Institute of Science ,Bangalore, India. The title of his talk was, " Microscopic light absorbing particles in the atmosphere as short lived climate forcers. His talk

was centered around climate impact of light absorbing particles in the atmosphere (known as aerosols) due to their high atmospheric warming potential.

In the afternoon session (Technical session II) One plenary talk and two invited talks were presented. This session was chaired by Prof Dr K K Mohammed Yusuf, Former dean faculty of science, Cochin University of Science and Technology. The second plenary talk of the conference was delivered by Dr V.P. Venugopalan, Associate Director, Bio Sciences, BARC, Mumbai. Dr Venugopalan and his group have developed technologies that provide solutions to prevent post-harvest spoilage of agricultural produce. Combination of radiation and chemical based techniques has been developed for extending the shelf life of agricultural produce such as vegetables, fruits, pulses and cereals. A number of ready-to-eat food items have also been developed by his group which not only have extended shelf life, but also meet the nutritional requirement of consumers. In the talk Dr Venugopalan gave an excellent overview of the application of nuclear and isotopic techniques that will go a long way in ensuring food security for the country.

The first invited talk of the conference was delivered by Dr Kuruvilla Joseph, Dean, IIST, Thiruvananthapuram. The title of his talk was, "Fluorescent nano-materials for bio-sensing applications. Fluorescent noble metal quantum clusters (NMQCs) with interesting functional properties have received great attention in the present scenario due to their fascinating photophysical and optical properties such as well-defined molecular structure, discrete electronic transitions and strong luminescence. In his presentation he highlighted the application of these clusters for biosensing with detection of creatinine as an example. The second invited talk in this session was delivered by Dr A.K. Basu, Ex. Dy Director cum Coordinator, Central Forensic Science Laboratory, Ministry of Home Affairs, Govt. of India, Pune. The title of his talk was, "Recent advances in the application of analytical techniques in forensic science". In his talk he presented an overview of recent advances in forensic science. Forensics and forensic investigations are fast changing their face as every other day new types of crime are being committed. Now DNA profiling, audio video tape forensics, brain finger printing, computer forensic, etc are some of the newer forensic technologies which have given entirely new dimensions to the whole system of scientific investigations. A synergic combination of sensitive methods like AAS, ICPAES, ICPMS, Glow discharge MS, GCMS, LCMS, NAA, electroanalytical methods and other sophisticated analytical techniques along with separation methods like ion exchange, solvent extraction and chromatographic techniques lead to specific and sensitive procedures for establishing the truth in criminal justice system.

Technical Session III was chaired by Prof S. Sugunan, Former Professor of Chemistry, Cochin University of Science and Technology. Dr Sahana Moodakare from ARCI, Chennai delivered the first talk in this session. The title of her talk was, "Multi analytical techniques in lithium ion battery technology". The various electrochemical characteristics of the lithium ion cell depends

on the structural properties of the electrode material, electrode coating and the interface between various components. The material properties such as defects, impurities, morphology, chemical composition and distribution across the material influence the practical achievable energy and power density, cyclic stability of the cell. The structural properties of the material, electrode and the interface can be investigated using various analytical techniques such as X-ray diffraction, Scanning Electron Microscopy, Transmission Electron Microscopy, Thermo Gravimetric-Differential Thermal Analysis, ion chromatography, Inductively Coupled Plasma Atomic Emission Spectroscopy, Mass spectroscopy, Fourier Transmittance Infra Red and Raman spectroscopy. The electrochemical performance of the cell is investigated using electro analytical methods such as potentiostatic and galvanostatic impedance spectroscopy, cyclic voltammetry, constant current and constant voltage charging/discharging. In her talk she gave an overview of these techniques. The second talk in the session was delivered by Dr Y Balaji Rao, Nuclear Fuel Complex, Hyderabad. In his talk he covered various analytical methods employed at Nuclear Fuel Complex , Hyderabad for the chemical characterization of nuclear fuel and related materials. This was followed by a cultural program and dinner.

The program of second day started with a plenary talk by Prof (Dr) VM Murukshan, Director, Center For Optical and Laser Engineering, Deputy Director, The Photonics Institute, Nanayang Technological University, Singapore. Dr P P Chandrachoodan, President-ISAS chaired the Session IV. The title of Dr Murukeshan's talk was , "Impact of optics and analytical science in industry 4.0". His lecture focused on importance of optics and analytical science in fighting fraud, food quality monitoring, face recognition and counterfeit currency detection, etc. While we are slowly entering into 4th industrial revolution, the recent developments in this area was reviewed by him. This talk in this context, will be covering all the above mentioned aspects and the recent study using grapheme plasmonics for diagnostic sensing applications, with a special emphasize on lasers and optics underpinning their impact in I 4.0. He said lasers and photonics will be pivotal to delivering Industry 4.0 on multiple fronts. The convergence of light assisted processing and communications under pinning Industry 4.0 is stimulating the ever increasing demand for more integration and novel approaches in individualized manufacturing, precision healthcare and autonomous vehicles. According to him, Industry 4.0 would be nowhere without optics and photonics. The next invited talk was presented by Dr G. Ramakrishnan, President-Chromatographic Society of India, Mumbai. The title of his talk was , " Importance of Chemical Ionization in mass spectrometry". His presentation detailed general introduction to Electron Ionization and details of Positive Chemical Ionization (PCI) and Negative Chemical Ionization(NCI), theory, instrumentation and applications. Dr G.Rami Reddy, Senior Professor, Homi Bhabha National Institute & Outstanding Scientist, (Retd), Bhabha Atomic Research Centre, Mumbai delivered the next invited talk entitled , "Analysis of Structures considering service and accidental loads to ensure safety". His presentation described the methods of generating design

basis loads, detailed analysis and design of structures with proper safety and design classifications. The procedure of health evaluation of existing structures, such as bridges, structures of nuclear facilities will be described. Also details will be discussed on the methods of retrofitting of structures if the demand of the accidental loads is exceeding the capacity to ensure the safety. The last talk in this session was a contributed presentation by Dr Beena Sunil Kumar from AMD, Hyderabad.

Technical Session V was chaired by Dr Benny K George, Director, VSSC, Thiruvananthapuram. Dr SVS Narayana Murty presented the next invited talk entitled, "Multi-material solutions for critical aerospace applications. In this presentation Dr Murty talked on the importance of multi material solutions in the success of Indian space program. Author's experience in providing solutions to some of the problems encountered were shared. The next invited talk was presented by Prof(Dr) N.Rajesh from BITS- Pilani, Hyderabad Campus, Hyderabad. He talked on efficacy of customized biopolymers, synthetic resins and grapheme oxide for defluoridation of water. "Recent advances in the application of analytical techniques in catalyst manufacturing and applications", was the title of the next invited talk presented by Dr Sunit Kumar Yadav, SÜD-Chemie India Pvt Ltd, A-1/2, Nandesari Industrial Area, Dist .Vadodara- 391 340, Gujarat. In this technical presentation, he focused on the challenges faced for elemental estimations during analytical method developments for heterogeneous catalysts, zeolite based catalyst and catalytic converters using ICP-OES and X-ray Fluorescence spectrometer (XRF). The elemental interferences during estimations in both the techniques were also discussed.

Technical Session VI in the afternoon was chaired by Dr Raghaw Saran, Former Director, Atomic Minerals directorate. Dr Benny K George from VSSC presented the first talk in this session. The title of his talk was Mas Spectrometric Techniques for characterization of space materials. Dr Benny's talk focused on applications of mass spectrometry and hyphenated techniques for the characterization of space materials. "Rheology and mechanical characterization of solid propellants", was the title of the next invited talk presented by Dr R.Sivaramakrishnan, GM,RPP, VSSC, Thiruvananthapuram. Solid propellants consist of a polymeric binder, oxidizer, metallic fuel and other additives. To start with it is a thick paste and on curing/cross linking it forms a solid. The flowing ability of the paste in its uncured condition dictates the type of casting process, casting devices and casting condition. The relationship between the shear rate and shear stress provided by the rheological behavior law allows the prediction of the flow rate of the slurry in the casting facilities and the calculation of the time and temperature of casting or the number of grains that can be cast with in a period of time compatible with the pot life of the propellant. Their rheological and mechanical characterization techniques are very important. This was followed by an industrial talk and one contributed talk by Dr V K Praveen, CSIR-NIIST, Thiruvananthapuram.

Immediately after Session VI Poster Session was started. 70 posters were presented in this session. Posters were evaluated by an expert team consisting of Prof (Dr) Mohammed Yusuf, Prof (Dr) S. Sugunan, Br Benny K. George and Dr K. G Nair. Out of the 70 posters 4 were selected for best poster awards.

List of award winning posters is given below:

1. Aparna S, KSM DB College Kollam for the poster entitled, "Characterization of grapheme synthesized from banana stem".
2. Rekha Krishnan G, VSSC/IIST, Thiruvananthapuram for the poster entitled, "Nano Hydroxy Apatite: A Potential adsorbent for perchlorate from water.
3. Veena Vijayan, School of Environmental Studies, CUSAT, Kochi for the poster entitled," Sonolysis as a potential advanced oxidation process for the removal of traces of toxic indigo carmine dye pollutant from water.
4. Soumyamol P.B, VSSC, Thiruvananthapuram for the poster entitled," Preparation and characterization of epoxy – organo clay nanocomposites.

Technical Session VII ,commenced at 09.30 hours on 21st September 2019. This session was chaired by Dr N.K.Pillai, CEO, Kerala Enviro Infra Structure Limited, Kochi. The first paper in this session was a plenary talk entitled,"Radioanalytical Techniques of Medical Interest: In Vitro to in vivo assays", presented by Dr MRA Pillai, Director, Molecular Cyclotrons, Kochi. Most of the analytical techniques used in conventional analytical chemistry viz. LC-MS, GC-MS, CE-MS, HPLC, GC, UPLC, MS and NMR are adapted and used for the measurement of biological materials. Mapping the biological reactions taking place inside the body by non-invasive techniques is another important aspect of disease management. Though the concentration of the biological materials present is not measured in absolute numbers, their relative concentration measured is useful to detect disease. Molecular imaging using radiopharmaceuticals is one such technique. For e.g. positron emission tomography in fusion with computed tomography (PET-CT) is used to find glucose metabolism in vivo. Cancer cells proliferate fast and hence need higher levels of glucose. Higher uptake of a radioactive glucose (FDG) is seen in PET-CT imaging of patients suffering from cancer. Similarly, the in vivo measurement of prostate specific membrane antigen (PSMA), an enzyme over expressed during prostate cancer, is used for the identification and staging of prostate cancer. A PET-CT imaging for this purpose is developed by using a radiolabelled enzyme inhibitor as reagent. The relative amount of PSMA present in different organs and tissues of the body is used for detection and staging of prostate cancer .He discussed in detail various aspects and applications of radioimmunoassay, PET-CT, Radiotracers, etc. used for in vitro and in vivo analysis.

"Bio - sensing and Bio-imaging: A Quantum Dot Approach", was the title of the next invited talk delivered by Dr R.S.Jayasree, Sri Chitra Tirunal Institute for Medical Sciences and Technology, Thiruvananthapuram . This presentation included the synthesis of cysteine functionalized cadmium selenium quantum dots and their use as multi analyte sensors for copper and creatinine. A hybrid system of carbon nanotube and quantum dots facilitated a multifunctional

system for photothermal therapy and imaging. Yet another study by her provided femto molar level detection of endosulfan using citrate capped quantum dots. Their studies in working with QD has paved the way for novel biological applications of the technique in cell imaging, targeted therapy, and bio - sensing leading to molecular diagnostics. The third talk in this session was delivered by Dr T R G Kutty, Former Senior Scientist, Radiometallurgy Division, BARC, Mumbai. The title of his talk was , "Microstructure, Material Properties and Analytical Methods". The microstructure of materials is an essential feature for the design of engineering structures with improved performances. Scientists can tailor the microstructure of a material to give it specific properties. With clear interpretation and sound understanding, microstructure can be exploited to provide information on mechanical, chemical and other properties. Diagnostic techniques such as microscopic texture investigations, microscopic roughness profile determination and in situ tension and compression tests are carried out to extract detailed information about microstructure and properties of engineering materials. A variety of optical microscopic techniques are also used along with scanning electron microscope and transmission electron microscope to yield variety of information on microstructures. Dr TRG Kutty covered the above aspects in his excellent talk.

Technical Session VIII was chaired by Dr SB Singh, Former Head of Chemistry Group, Atomic Minerals Directorate, Hyderabad. Dr K K A Rashid, Advisor(R&D), Active Char. Pvt. Limited, Cochin presented the first invited talk in this session. " Activated carbon for air purification" was the title of his presentation. Dr Rashid presented application of activated carbon or its doped versions in trapping impurities like H₂S, mercaptans , CO, CO₂, SO₂, NH₃, HCN and several volatile organic compounds. Regenerable type of activated carbon based adsorbents for repeated cyclic operations with scope for favorable adsorption, desorption and further utilization at moderate conditions of temperature and pressure has received wide attention over the recent years. Modification of pore structure and basicity of activated carbon through chemical and thermal treatments yield products having improved adsorption capacities with favorable desorption at mild conditions over repeated cycles of adsorption / regeneration. The second invited talk in this session was presented by Dr Daisy Joseph from Nuclear Physics Division, BARC, Mumbai. She spoke on the Application of X-ray Emission Techniques (XRF, PIXE, XANES, EXAFS) in Bioanalytical Sciences. Her talk highlighted experimental methods, results and conclusion in bio analytical applications such as soil, blood, ayurvedic drugs, sorghum plants, Indian spices, curcumin, uranium uptake in bioremediation studies, fertilizer use, etc. This was followed by a business talk by Shri D K Sharma, Kunash Instruments, Thane and two industrial talks by representatives of M I S Anabond Limited, Chennai and Spectralab, Mumbai.

Technical Session IX Started after lunch. This session was chaired by Dr P N Mohandas, Former Deputy Director, NIIST, Thiruvananthapuram. In this session eight contributed papers selected for oral presentations were presented. Details of the papers are given below:

1. Quantitative estimation of silanol content in silica aerogels by FTIR spectroscopy, Deepthi Thomas, Nisha balachandran, Supriya N, Sadhana R, Rajeev R Analytical and Spectroscopy Division, Analytical, Spectroscopy and Ceramics group. Vikram Sarabhai Space Centre, Thiruvananthapuram-695022

2 Acidified molybdenum disulphide nanohybrid material as chemical sensor for quantification of glucose in blood samples, Neema P M and Jobin Cyriac* Department of Chemistry, Indian Institute of Space Science & Technology Thiruvananthapuram, Kerala– 695 547, INDIA

3. Analysis of volatile anthropogenic trace compounds (ATCS) in natural waters using LC-MS/MS: A case of acephate and fenvalerate , B Upendra*, V Vinu Dev, V Arun and K Anoop Krishnan Hydrological Processes group, National Centre for Earth Science Studies (NCESS), Akkulam, Thiruvananthapuram

4. An Efficient Theoretical and Experimental Approach for Thermal Analysis of 100 Ah Lithium-ion Cell, Shivam Kumar*, Abhishek Kumar, Thermal Design Division, Propulsion Research Group, Solid Propulsion and Research Entity, Vikram Sarabhai Space Centre, Indian Space Research Organization, Thiruvananthapuram-695022, Kerala

5. Determination of Zn (II) ions using bismarck brown Y film modified electrode by square wave anodic stripping voltammetry, S Vasanthi , S Sriman Narayanan*, Department of Analytical Chemistry, University of Madras, Guindy Campus, Chennai – 600 041

6. Study of influence of synthesis routes on catalytic activity of carbon nitride-nickel oxide composite as burn rate catalyst for composite solid propellants Gladiya Mani*¹, P Radhakrishnan Nair², Suresh Mathew¹, ¹School of Chemical Sciences, Mahatma Gandhi University, Kottayam, ²Advanced Molecular Materials Research Centre, Mahatma Gandhi University, Kottayam

7. Evaluation of shape memory properties of organic - inorganic hybrid polytriazoles, Ragini Ramdas M¹* , Santhosh Kumar K.S.², ¹Rajagiri School of Engineering and Technology, Rajagiri Valley, Kakkanad, 682039 ²Polymers and Special Chemicals Group, Vikram Sarabhai Space Centre, Thiruvananthapuram, 695022

8. Isocyanate terminated poly (ether ether ketone) - epoxy copolymers: synthesis, characterization and evaluation of adhesive, rheological and fracture morphological properties, Leena Karthikeyan¹, Temina Mary Robert¹, Drisya D S¹, Nisha balachandran² , Deepthi Thomas², and Dona Mathew¹, ¹Polymers and Special Chemicals Division, ²Analytical and Spectroscopy Division, Vikram Sarabhai Space Centre, Thiruvananthapuram-, Kerala, India

Among the above, Presentation No 2 was adjudged to be the best oral presentation and presentation 6 was awarded consolation prize.

The concluding session started at 16.00 hours and was chaired by Dr P.P. Chandrachoodan, President-Indian Society of Analytical Scientists. He said, "as in previous years, it has been amazing to me how quickly three days filled with exciting lectures, short oral communications, poster presentations, and many personal discussions passed by. An entire year of careful

planning and organization by ISAS , supported by outstanding advisory and organizing committees have again culminated in a very stimulating, and energizing scientific event. He spoke on the importance of scientific conferences such as IASC 2018 in creating awareness among scientists, technologists and particularly students about the innovations and emerging advances in analytical science and technology. Over the years, IASC series of conferences has established itself as the premier Indian conference for discussion and presentation of analytical chemistry in a global sense covering a broad spectrum of advancements in analytical technologies as well as their applications in various and challenging fields. Dr Chandrachoodan opined that IASC 2019 was a great event where he got the opportunity to meet professionals from all over the country and sharing of ideas with them. Conference sessions were well précised and venue was great. Dr KKA Rashid, Dr VR Nair , Shri Rakesh Ranjan also spoke on the occasion. There was a feed back session in which the participants voiced their opinions and comments. "Participants opined that IASC 2019 was a very well-organized and coordinated event and provided an excellent platform for all the participants representing various segments of the Analytical science and technology to brainstorm and discuss on the pertinent issues and the critical challenges in the field. The congregation initiated new partnerships and valuable discussions. The event got fabulous feedback from the attendees for quality of sessions, networking opportunities and eminence of delegates. The conference was finally concluded with Dr R.Rajeev thanking all those who made the event a grand success. He expressed his delightfulness and gratitude to see the hall full of audience at the time of his closing address. He proposed a formal vote of thanks and closed the event.

In conclusion, IASC 2019 was another successful and enjoyable conference bringing together experts in instrumental methods of analysis, researchers, instrument companies, and young postgraduates to present their work, to discuss possible scientific collaborations, and to explore networking opportunities. It was a highly interdisciplinary conference where innovations and emerging advances in the area of analytical science and technology were discussed in a congenial atmosphere. The conference was organized in such a way to enable optimum interaction between the delegates and experts to provide lots of networking opportunities. The general character of the program provided participants with a unique chance of an overlook of contemporary analytical chemistry.

We look forward to welcoming all for the Indian Analytical Science Congress 2020 which will be held at Vadodara, Gujarat State. The exact dates will be announced soon.