

August 2022

Volume 3 Issue 8



CECRI NEWS

A monthly newsletter of CSIR-CECRI

compilation of significant happenings

Dr. N. Kalaiselvi elevated as DG-CSIR and Secretary, DSIR

Dr. N. Kalaiselvi, Director, CSIR-CECRI has been elevated to the coveted post of Director General of the Council of Scientific and Industrial Research (CSIR), India and the Secretary to the Department of Scientific and Industrial Research (DSIR), Govt. of India. She is the 1st Woman Director General of CSIR in its 80-year-old history and only the 4th Woman to occupy the position of a Secretary of a Scientific Department under the Central Government. Her research work spans over 25 years on electrochemical power systems – developing electrode materials, custom-design synthesis methods, optimising reaction parameters and in-house prepared electrode materials for making energy storage devices. Her research interests include lithium-ion and beyond lithium-ion batteries, supercapacitors and waste-to-wealth driven electrodes and electrolytes for energy storage and electro-catalytic applications.



EDITORIAL BOARD

Dr. S. Sathiyarayanan
Chairman

MEMBERS:

Mr. KR. Karupiah
Mr. S. Gunasekaran
Mr. M. Jayakkannan
Mr. T. Ashok Balamurugan

“

*Dr. Kalaiselvi
will now lead the
Network of 37 CSIR
Laboratories with nearly
4,500 Scientists, and has
been appointed for a term of
two years*

”

INSIDE THIS ISSUE

- Dr. N. Kalaiselvi elevated as DG-CSIR and Secretary, DSIR
- 22nd National Convention of Electrochemists
- Azadi Ka Amrit Mahotsav and CSIR-CECRI@75
- Honours & Awards



Dr. Kalaiselvi has been involved in projects to increase electric mobility in India and her expertise in these sectors will likely help with India's push towards increasing the number of electric vehicles. The Centre announced the second phase of a programme, **FAME** [Faster Adoption and Manufacturing of (Hybrid &) Electric Vehicles in India], that will invest ₹10,000 crore in developing electric vehicle infrastructure.

From a village near Ambasamudram in Tirunelveli District of Tamil Nadu to heading the CSIR, it has been a long, strenuous journey for Dr. Kalaiselvi. Having studied in her native district in a Tamil medium school, she had gone on to pursue her PhD degree from Annamalai University in Chidambaram.

In February 2019, Dr. Kalaiselvi was appointed as Director of CSIR-CECRI, the 1st Woman Director in its 75-year-old history. Better known as “*lithium battery expert*” among the academicians, she has been involved in multiple research projects. She has also served as the Nodal Scientist for Multifunctional Electrodes and Electrolytes for Futuristic Technologies (**MULTIFUN**), the 12th Five-Year Plan Project sponsored by CSIR with CSIR-CECRI as the Nodal Lab. A 68.54 crore project, MULTIFUN lasted from 2012 to 2017 and six other CSIR institutes also collaborated on the same. The project was graded

‘Excellent’ by the sectoral monitoring committee.

Dr. Kalaiselvi has published over 125 research papers and holds six patents to her credit. Eight research scholars have earned their PhD under her guidance and six more are now enrolled in doctoral programmes. Between 1999 and 2019, she has received multiple merits, fellowships and awards, including winning the ‘Materials Research Society of India Medal’ (MRSI, Bangalore), Raman Research Fellowship, the **Most Inspiring Women Scientist** award and C.V. Raman Mahila Vijnana Puraskara.

She was also awarded an **Indian National Science Academy (INSA)** Visiting fellowship in 1999. In 2003, she received the Brain Pool Fellowship of Korea and, in 2011, was selected for the INSA-NRF Exchange Program of Scientists and visited the Korea Electrotechnology Research Institute (KERI). Since 2011, she is serving as the Editor of “**Ariga Ariviyal**” - a monthly science magazine (Tamil) published by Ariga Ariviyal, Kundrakudi.

CSIR-CECRI, Karaikudi will be celebrating its Platinum Jubilee in 2022 and this is the first time a Scientist from the CSIR-CECRI has been appointed Director-General of the CSIR which is not only another feather in her cap, but also a major win for women in science.



22nd National Convention of Electrochemists (NCE-22)

The Society for Advancement of Electrochemical Science and Technology (SAEST), established in 1964 at Karaikudi, has been organizing National Conventions and International Conferences to disseminate the knowledge on Electrochemical Science and Technology. In this series, SAEST, in association with CSIR-CECRI & PSG College of Technology, Coimbatore, organized its 22nd National Convention of Electrochemists (NCE-22) during August 26-27, 2022 at PSG Tech Coimbatore.

More than 500 delegates from academia and industries including research scholars, faculty members, and scientists across the country actively participated in NCE-22. The convention included three memorial award lectures, invited lectures by experts, 50 oral and 221 poster presentations by research scholars and faculty members from various academic and R&D institutes. An exhibition of more than 20 stalls exhibiting products of various manufacturers of scientific instruments used in R&D of electrochemical science and technology was also arranged.

Dr. K.J. Sreeram, Director, CSIR-CECRI presided over the inaugural function. Dr. G.A. Pathanjali, Managing Director, High Energy Batteries, Mathur and Chairman of the Organizing Committee of NCE-22 mentioned that the event is a boon for participants especially after the pandemic slowdown. Dr. N. Kalaiselvi, Director General, CSIR and Secretary, DSIR was the Chief Guest and in her presidential address, she highlighted the role of electrochemistry in Water, Food, Health, Energy, and Strategic Securities. She also stressed the importance of electrochemistry for cleaner and greener energy technologies.

Dr. Ajayaghosh, Former Director, CSIR-NIIST, Trivandrum, Dr. Nagahanumaiah, Director, CMTI, Bengaluru, and Dr. Tata Narasinga Rao, Director (In-Charge), ARCI, Hyderabad were the Guests of

Honour during the Inauguration and they offered felicitations. Prof. R. Ramaraj, Emeritus Professor & Raja Ramanna Fellow, Madurai Kamaraj University delivered Prof. K.S.G. Doss Memorial Award Lecture on '*Electron Transfer Reactions at Membranes: Molecules to Nanomaterials*'. Prof. S. K. Rangarajan Memorial Award lecture was delivered by Prof. Rama Kant, University of Delhi on '*Complexities in Modeling of Electrochemical Processes and Systems*'. Prof. Sathyanarayana Memorial Award Lecture was delivered by Prof. Vijayamohan K Pillai, Chairman & Dean (R&D), IISER, Tirupati and his lecture was on '*Cyclic Voltammetry: Uses and Misuses*'.

During the valedictory function on August 27, 2022, Dr. J. Mathiyarasu, Secretary, SAEST provided the summary of NCE-22. Prof. M. Krishnan, Hon'ble Vice-Chancellor, Central University of Tamil Nadu, Thiruvavur, graced the occasion as the Chief Guest and in his valedictory address, he highlighted the contributions of CSIR to the society and stressed the importance of education system and the role of SAEST, particularly NCE-22, in popularizing the electrochemical science and technologies among student community in association with CSIR-CECRI and PSG College of Technology.

Dr. G. A. Pathanjali, Managing Director, High Energy Batteries, Mathur, Dr. C. Kannan, Executive Director - Chemical Technology & Tech. Promotion & Forecasting, Indian Oil Corporation Ltd., R&D Centre, Faridabad, and Dr. K. Prakasan, Principal, PSG College of Technology were the Guests of Honour. The best oral and poster presentations were awarded with a cash prize and certificate. The sponsors of the event were also acknowledged with the certificates of appreciation. NCE-22 also had a cultural programme of '*Tech Music*' by students of PSG Tech. The event concluded with vote of thanks by Prof. C. Theivarasu, Co-Convenor of NCE-22, PSG College of Technology.



Business Development Leads

- ❖ Discussion with **Synorganic Pvt. Ltd.** on R&D collaboration [Aug 5]
- ❖ Project Discussion with **M/s. Consultech and L&T officials** (CNP 1/22) [Aug 10]
- ❖ Review Meeting on **Electrolyser Technology** of CSIR-CECRI [Aug 11]
- ❖ Online Project Discussion with **M/s. Cochin Shipyard Ltd.** [Aug 11]
- ❖ Project Meeting with **Consultech, L&T, CSL and RH DHV** [Aug 12]
- ❖ Discussion with **Isha Yoga Centre**, Coimbatore on scientific interventions required [Aug 16]
- ❖ Discussion on R&D collaboration with **M/s. BHEL** [Aug 16]
- ❖ Discussion between **CSIR-CECRI and SUMMITs** on R&D collaboration [Aug 18]
- ❖ Meeting with **Avaada Energy** on PEM technology [Aug 18]
- ❖ Discussion on **Magnesium Technology** with Mr. R. Saravanabhavan, Deputy Adviser, Minerals Division, NITI Aayog [Aug 22]
- ❖ Meeting with various industry representatives on scientific interventions required [Aug 22]

Updates on CSIR-ICeNGESS, Mission, Theme and Major Projects

- ❖ Review Meeting on CSIR Mission Project - Innovation Centre for Next Generation Energy Storage Solutions (**ICeNGESS**) [Aug 24]
- ❖ Review Meeting on CSIR's Hydrogen Technology Mission (**H2T**) Projects [Aug 12]
- ❖ Review Meeting on CSIR's **Aerospace Theme** Projects [Aug 12]

Centre for Education and AcSIR Highlights

AcSIR:

- ❖ DAC-III Presentation by Mr. R. Vinoth (Guide: Dr. Vinu Mohan) [Aug 2]
- ❖ Synopsis submission of Mr. C. Murugan (Guide: Dr. A. Pandikumar) [Aug 3]
- ❖ Synopsis submission of Mr. S. Venkateshwaran (Guide: Dr. S.M. Senthil Kumar) [Aug 10]
- ❖ PhD Viva voce Examination for Ms. K. Sangeetha (Guide: Dr. Subrata Kundu) [Aug 16]

Centre for Education:

- ❖ Meeting of the Faculty Members of CFE [Aug 3]
- ❖ CFE Management Affairs Committee Meeting for admission of students under lateral entry [Aug 8]
- ❖ Admission to B.Tech. of CFE under Other State [Aug 8]

Skill Development Activities

- ❖ A one-week **Skill Development Training Programme** was organized by CSIR-CECRI on **Surface Analytical Techniques** during 1-8 August, 2022. A total of 37 registered candidates were trained.
- ❖ A two-week **International Special Refresher Training Programme** for The Projects Development Institute (PRODA), Nigeria on "**International Special Practical Hands-on Training on Lithium Ion Battery Manufacturing: The R&D Perspective**" was organized during July 25 - August 3, 2022 at CSIR-CECRI, Karaikudi. In addition, demo experimentation and hands-on-training was provided to the participants at CSIR-CECRI, Chennai Unit, Taramani, Chennai during Aug 4-5,

2022 and Lab visits to CSIR-SERC and CSIR-CLRI, Chennai on Aug 6 & 8, 2022, respectively. This special programme was coordinated by Dr. A. Sivashanmugam, Dr. K. Ramesha and Dr. S.M. Rajendran. A total of 9 participants from PRODA, Enugu, Nigeria enthusiastically took part in this programme and gained valuable insights.

CSIR-JIGYASA:

- ❖ Meeting on the upcoming activities [Aug 3]
- ❖ **Orientation Programme** for Principals / Headmaster(s) of 75 schools adopted under CECRI@75 [Aug 18]
- ❖ Meeting with M/s. iCreate Officials [Aug 18]
- ❖ JIGYASA - AcSIR - Societal Projects [Aug 24]

Azadi Ka Amrit Mahotsav and CSIR-CECRI@75

Under the ongoing monthly Lecture Series on *'Electrochemical Science and Technologies: A Path Forward to Sustainable Society'* organized in collaboration with the SAEST, Dr. Debashish Bhattacharjee, Vice President, Technology & New Materials Business, Tata Steel delivered a lecture on the topic *"A Steel Company Building Future Sustainability"*. He started with how to sustain in the changing world of awareness, particularly sustainability in steel, and covered the history of steel and its manufacturing, the challenges. The lecture also highlighted decarbonization, changing technology-market landscape and circular economy. The issues with the CO₂ emission in steel manufacturing dealt with apt solutions by Tata Steel were also presented. Their activities in the area of new materials such as composite structures, graphene & advanced ceramics were also projected.



On August 05, 2022, Dr. S. A. Ilangovan, Vikram Sarabhai Space Centre, Thiruvananthapuram delivered his lecture titled *"From Particles to Plug-in Vehicles"*. He highlighted the importance of renewable energy, energy storage and in particular the e-mobility. He shared his research experience on batteries and supercapacitors used in space applications. He also compared the combination of supercapacitor and battery-type electrode material, supercapattery, and showed the advantage of attaining optimum energy and power densities.



Shri. R. Saravanabhavan, Deputy Adviser, Minerals Division, NITI Aayog, New Delhi delivered a lecture on *"Challenges in achieving self-sufficiency in non-ferrous metals and the role of CSIR Institutes in making India Atmanirbhar (a special focus on Magnesium demand supply in India)"* on August 22, 2022. In his talk, he enlightened the various past and near future policies of NITI Aayog and how CSIR can take a lead role in making India 'Atmanirbhar' by transforming the available technologies to various products. He also explained NITI Aayog's role in bridging the research organizations and the industrial partners. He emphasized on the demand and supply chain of magnesium in India and the urgent need for the alternative technology towards import substitution.



On August 23, 2022, Prof. S. Sampath, a renowned electrochemist from Indian Institute of Science, Bengaluru delivered a lecture on *"Interfaces in Electrochemistry"*. He highlighted the seminal contributions of Indian Electrochemists and brought out the importance of the interfaces in various electrochemical processes. He also discussed the on-going research activities on Mg-ion batteries and organic electrode materials for battery applications. He highlighted the fundamental mechanistic aspects of the processes understood through spectroelectrochemical tools such as in situ Raman studies. A long interactive session with the audience ensued.

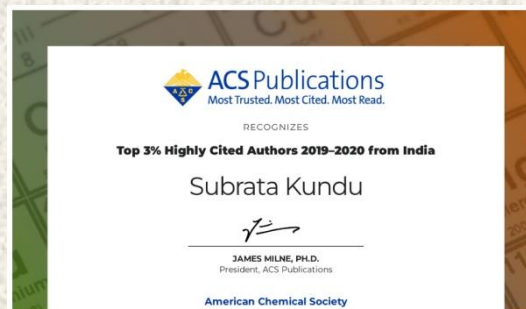


Honours and Awards



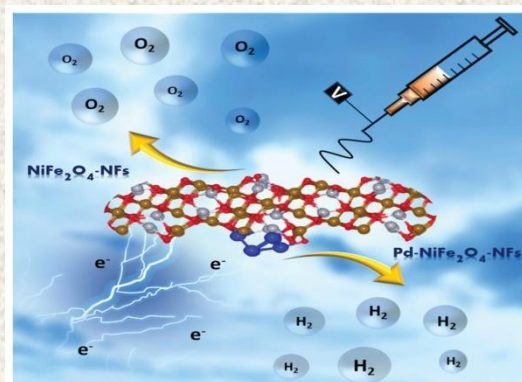
Dr. Subrata Kundu, Principal Scientist, Electrochemical Process Engineering Division, CSIR-CECRI has been recognized by the American Chemical Society (ACS) among the **Highly Cited ACS Authors from India**.

(Top 3% cited works in 2021 for all publications from India between 01/01/2019 to 31/12/2020).



Recent Research Publications

- ❖ Constructing electrospun spinel NiFe_2O_4 nanofibers decorated with palladium ions as nanosheets heterostructure: boosting electrocatalytic activity of HER in alkaline water electrolysis
S. Sam Sankar, T.K. Bijoy, K. Sangeetha, Arun Karmakar, M. Ragunath Madhu, Krishnendu Bera, N. Sreenivasan, D.N. Hariharan, S.C. Lee and Subrata Kundu
Nanoscale 14 (2022) 10360 {**Cover Page**}
<https://doi.org/10.1039/D2NR02203F>
- ❖ Artificial Intelligence (AI) and Internet of Medical Things (IoMT) Assisted Biomedical Systems for Intelligent Healthcare
M. Pandiaraj, M. Siva Ananth, M. Sindhu Monica, Shekhar Hansda, Ajeet Kaushik, Ravikumar Shinde and S.P. Thipperudraswamy
Biosensors 12 (2022) 562
<https://doi.org/10.3390/bios12080562>
- ❖ Rationally Constructing Chalcogenide-Hydroxide Heterostructures with Amendment of Electronic Structure for Overall Water-Splitting Reaction
M. Ragunath, J. Rahul, Arun Karmakar, S. Sam Sankar, K. Sangeetha, Krishnendu Bera, N. Sreenivasan, N.D. Hariharan, Md Mahbubul Islam and Subrata Kundu
ACS Sustainable Chemistry & Engineering 10 (2022) 11299
<https://doi.org/10.1021/acssuschemeng.2c03292>
- ❖ Exploring the Defect Sites in UiO-66 by Decorating Platinum Nanoparticles for an Efficient Hydrogen Evolution Reaction
Shamna Muhamed, R.K. Aparna, Arun Karmakar, Subrata Kundu and Sukhendu Mandal
Inorganic Chemistry 61 (2022) 13271
<https://doi.org/10.1021/acs.inorgchem.2c02023>



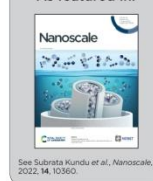
Showing research from Dr Subrata Kundu's group at CSIR-Central Electrochemical Research Institute (CECRI), Karaikudi, Tamil Nadu, India.

Constructing electrospun spinel NiFe_2O_4 nanofibers decorated with palladium ions as nanosheets heterostructure: boosting electrocatalytic activity of HER in alkaline water electrolysis

Nickel ferrite nanofibers (NiFe_2O_4 -NFs) were synthesised via electrospinning (ES) method followed by the carbonization process. The resultant fiber was subjected to electrocatalytic water splitting reactions in alkaline medium. The catalytic efficiency of the NiFe_2O_4 -NFs in OER was highly satisfactory, but it is not high enough to catalyze HER process. Hence, palladium ions were decorated as nanosheets over NiFe_2O_4 -NFs as a heterostructure to improve the catalytic efficiency of HER in the overall water splitting reaction.



As featured in:



See Subrata Kundu et al., *Nanoscale*, 2022, 14, 10360.

rsc.li/nanoscale
Registered charity number: 207890

This cover page showcased constructing electrospun spinel NiFe_2O_4 nanofibers decorated with palladium ions as nanosheets heterostructure: boosting electrocatalytic activity of HER in alkaline water electrolysis. Nickel ferrite nanofibers (NiFe_2O_4 -NFs) were synthesised via electrospinning method followed by carbonization process. The resultant fiber was subjected to electrocatalytic water splitting reactions in alkaline medium. The catalytic efficiency of the NiFe_2O_4 -NFs in OER was highly satisfactory, but it is not high enough to catalyze HER process. Hence, palladium ions were decorated as nanosheets over NiFe_2O_4 -NFs as a heterostructure to improve the catalytic efficiency of HER in the overall water splitting reaction.

Official Events

- ❖ Walk-in-interview for engagement of Project Personnel [Aug 2]
- ❖ Meeting on Health Insurance Policy for all staff members [Aug 3]
- ❖ **DST Webinar** on the role of Sub Agencies regarding the Revised Procedure of Flow of Funds under Central Sector Schemes [Aug 3]
- ❖ Felicitation to Dr. N. Kalaiselvi, Director General, CSIR and Secretary, DSIR, New Delhi [Aug 10]
- ❖ Meeting of The Chemical Research Society of India (CRSI) [Aug 10]
- ❖ JRF to SRF Upgradation meeting [Aug 12, 19]
- ❖ Meeting of the Technology Evaluation Committee [Aug 19]
- ❖ Meeting of the Organising Committee of National Convention of Electrochemists (NCE-22) organized by The Society for Advancement of Electrochemical Science and Technology (SAEST), Karaikudi [Aug 5, 8, 23]
- ❖ **CSIR Foundation Day Celebration** - Preliminary Meeting [Aug 23]

Snapshots



Hoisting of National Flag on 76th Independence Day



Know-how Transfer to M/s. Synorganic Paints, Chhattisgarh



Project Discussion with M/s. Consultech, L&T, CSL and RH DHV



Project Discussion with M/s. Cochin Shipyard Ltd.



Inauguration of Metal Finishing Laboratory



Participants of Special Refresher Course for PRODA, Nigeria



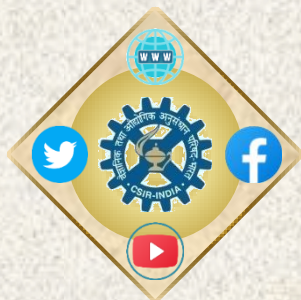
Group Photo of Organizers of National Convention of Electrochemists (NCE-22)

TECHNOLOGY COMPENDIUM OF CSIR-CECRI

- ❖ Indigenous Li-ion battery
- ❖ Indigenous Sodium Ion Battery
- ❖ Performance Improved Lead Acid Battery
- ❖ CO₂ capture under flue gas conditions
- ❖ Integrated Corrosion Monitoring Sensor Gadget accessible through a Mobile App
- ❖ Thermal Barrier Coatings for Strategic Applications
- ❖ Electrochemical Production of Sodium Hypochlorite as a Disinfectant (against COVID-19)
- ❖ Tri-layered reusable face mask with antibacterial coating
- ❖ Polymer Electrolyte Membrane (PEM) fuel cell
- ❖ Triboluminescent Coating and Smart Camera for Crack Detection in Structural Components
- ❖ Electrochemical Defluoridation of Drinking Water
- ❖ Solar Powered Proton Exchange Membrane (PEM) Based Water Electrolyser for Hydrogen Generation
- ❖ Cement-Polymer Composite Coating System for Corrosion Protection of Reinforcing and Prestressing Steels
- ❖ Solid Lubricant Coatings for Brahmos Missile Application
- ❖ Li Spheres for Torpedo Applications
- ❖ Electrowinning and Recovery of Tin from Primary Ore and Secondary Sources
- ❖ Electroplating of Gold, Copper and Nickel, Chromium, Zinc-Nickel Alloy; Anodizing of Aluminium; Electropolishing of Stainless Steel
- ❖ Electro-catalytic Conversion of CO₂ and butadiene to Adipic Acid; CO₂ to Formic Acid; CO₂ to Oxalic Acid.
- ❖ Farmer Friendly Soil Health (predictive) Analyzer
- ❖ Three Coat System for Steel Structures
- ❖ Inhibitor Cement Slurry Coating for Rebars
- ❖ Electrochemical Preparation of DL-Homocysteine Thiolactone Hydrochloride from DL-Homocysteine
- ❖ Electrochemical Perfluorination of Sulfolane to Perfluoro Butane Sulfonyl Fluoride
- ❖ Electrochemical Preparation of Calcium Lactobionate and Calcium Gluconate
- ❖ Electrochemical Production of KIO₃
- ❖ Degradable Amorphous Alloy Coatings by Sputtering for Bioimplants
- ❖ Multicoat Protective Schemes for Concrete Structures and Bridges
- ❖ Moisture Compatible Coating for Cooling Towers
- ❖ Temporary Protective Coating for Maraging Steel & 15CDV6
- ❖ Corrosion Resistant Thermal Coating for Hydroclaves
- ❖ Al-Zn-In Galvanic Alloy Anode for Cathodic Protection
- ❖ Formulation of Neutral Paint Removing Jelly
- ❖ Corrosion Resistant Inhibitive Admixtures for Portland Pozzolana Cement
- ❖ Inhibitor Admixture for Concrete
- ❖ Cost Effective Metallic Coatings to Rebars Embedded in Concrete Structures
- ❖ Redox Active Polymer Encapsulated Lamellar (REL) Compound based Anticorrosive Coating for Reinforcement Bars
- ❖ Extraction of Calcium, Magnesium by Molten Salt Electrolysis
- ❖ Extraction of Zinc oxide and Metallic Zinc from Galvanizer Ash
- ❖ Extraction of Rare Earths and Alloys by Molten Salt Electrolysis

www.cecni.res.in

https://www.twitter.com/CSIR_CECRI



<https://www.facebook.com/1CSIR.CECRI>

<https://www.youtube.com/CSIR-CECRI-KKDI>