CECRI NEWS

(A monthly newsletter of CSIR-CECRI)

August 2024 Vol. 5 Iss. 8

Award for Excellence in R&D in Heavy Mineral of the Year to CSIR-CECRI

CSIR-Central Electrochemical Research Institute (CSIR-CECRI) has been bestowed upon the **Award for Excellence in R&D in Heavy Mineral of the Year** at the **International Conference on *Heavy Metals & Lithium for Energy Security* (REES Series-2024)** held at Kochi during 29-30 Aug 2024. **Dr. D. Singh**, Chairman and Managing Director, Indian Rare Earths Limited (IREL) presented this Award and a team of Scientists from CSIR-CECRI led by Dr. C. Naveen Kumar, Principal Scientist and Head, Electroplating and Electrometallurgy Division received the Award. **REES Series-2024**, jointly organized by the **Rare Earth Association of India (REAI)** and **Indian School of Mines Alumni Association (ISMAA)**, Kolkata Chapter, along with **Deloitte** as knowledge partner, brought together 24 distinguished speakers around the globe to discuss the critical role of heavy minerals and lithium in enhancing energy efficiency and security.

सीएसआईआर-सीईसीआरआई
CSIR-CECRI
CSIR-CENTRAL ELECTROCHEMICAL RESEARCH INSTITUTE
Your Destination for Innovative Research

INSIDE THIS ISSUE

Dr. D. Singh, President, REAI and CMD, IREL delivered the Presidential Address and **Dr. N. Kalaiselvi**, Secretary, DSIR and Director General, CSIR was the Chief Guest on the occasion. The inaugural function featured the launch of a pioneering industry report titled '***Heavy Minerals and Lithium for India's Energy Security'*** presented by Deloitte and IREL. The conference unfolded across six sessions, each exploring vital aspects of the heavy minerals and lithium industry. Eminent speakers shared invaluable insights and presented cutting-edge research on the role of heavy minerals and lithium in sustainable energy solutions.

Heavy Minerals & Lithium are found in poly-metallic deposits which are essential for the functioning of our modern technologies, economies or energy security. There is a risk that its supply chains could be disrupted. They are characterized by their significant economic importance, high supply risk, and critical role in supporting key industries. They are the foundation on which modern technology is built. From EVs to solar panels to semiconductors, wind turbines to advanced batteries for storage and transportation, the world needs these minerals to build these products. They are presently the backbone of emerging green technologies. Being an aspiring trillion-dollar economy, and development prospects in changing geo-political situation, the country is poised to leverage its resource for unleashing the niche values, for achieving self reliance in energy security of the country. Besides, there is a need to develop self reliance in these emerging technologies to achieve '**Aatmanirbhar Bharat**' and '**Make in India**' mission.

This award is bestowed as a recognition of CSIR-CECRI's continuous R&D efforts in Heavy Minerals. In the Indian context, heavy mineral sands comprise a group of seven minerals, *viz.,* ilmenite, leucoxene (brown ilmenite), rutile, zircon, sillimanite, garnet and monazite. These minerals are the commercial resources for many critical elements such as rare earths, thorium, titanium, zirconium. Secondary resources such as spent magnets / batteries, electronic waste, slag, ash, etc. are also considered potentially viable for recovering these critical elements.

Both primary and secondary resources are processed by physical metallurgy followed by hydrometallurgy and electrometallurgy. Depending on the reduction potential of the target element, either electro-hydrometallurgy or molten salt metallurgy is used to electrowin the metal. Rare Earths, lights metals, refractory metals are electrowon by molten salt metallurgy and transition metals such as Zn, γ-MnO_2, Sn, Ni, Co, Cu are extracted through aqueous electrometallurgy.

CSIR-CECRI has a legacy of more than six decades in electrometallurgy and has collaborated with numerous ferrous and non-ferrous industries, including the steel, aluminium, and other industries. It has also worked closely with strategic agencies such as Department of Atomic Energy and its labs (IGCAR, BARC), ISRO, DRDO, IREL, Ministry of Mines, Ministry of Environment and Forests, major private industries such as Tata Steel, Hindustan Zinc, JSW among others.

Molten Salt Electrolysis, a niche area of CSIR-CECRI, is a unique process adopted for the production of high purity metals with high reduction potentials. The electrolytic process can use either chloride or oxide as the raw materials for the production of metals and alloys. The process can be controlled by adjusting the electrowinning parameters such as current density, cell voltage and bath composition.

High purity metals can be produced with a moderate current efficiency of the order of 35-50%. The metals produced, can be tapped in the molten condition followed by continuous casting of the metal into ingots. The targeted metals and alloys are produced in the temperature range between 650-950^{o}C using molten salt electrolysis. The efficiency of the process can be improved by the use of advanced cell designs, automated feeding and tapping systems. Using molten salt electrolysis, many critical metals and alloys can be produced economically and holds advantage over conventional metallothermic reduction which suffers from contamination of light metal, additional purification steps, additional step to produce Ca/Mg.

Significant achievements of CSIR-CECRI include:

- Indigenous Molten Salt Electrowinning of Rare Earths from primary and secondary resources
- Recovery of Lithium from Primary and Secondary Sources
- Extraction of Tin, Zinc, Chromium Oxide and other heavy minerals from various secondary sources
- Extraction of metal values from Ferro-chrome slag
- Electrowinning of γ-MnO_2 from Low grade Mn Ore.
- Extraction of Zinc oxide and Metallic Zinc from galvanizer ash.

National Sports Day - 2024

National Sports Day is an annual celebration on August 29th in honour of **Major Dhyan Chand**, India's iconic hockey player. Known as ***The Hockey Wizard***, Dhyan Chand's unparalleled skills and dedication to the sport left an indelible mark. Over a career from 1926 to 1948, Dhyan Chand scored more than 1000 goals, leading India to three consecutive Olympic gold medals in 1928, 1932, and 1936.

National Sports Day reminds people of the importance of physical fitness, sports, and overall well-being. Over the years, Govt. of India has utilised this day as a platform to launch various sports schemes, such as the **Khelo India** movement in 2018. It is also an occasion to honour India's sporting heroes with prestigious awards and these recognitions celebrate the achievements of athletes and coaches who have significantly contributed to Indian sports.

CSIR-CECRI Club celebrated the National Sports Day in a grand gala way with the following events for CECRIans - Staff, Scholars and BTech Students [August 29 to September 2, 2024]:

Volleyball (Men): 64 participants registered from which six teams were formed and matches were held in round robin format and the top four teams played the Semi-Finals and the Winners clashed in the Finals.

Throwball (Women): 20 participants registered from which two teams were formed and Finals was held.

Badminton (Men): Out of 44 participants registered eight teams were formed and matches were held in round robin format and the top four teams played the Semi-Finals and the Winners proceeded to the Finals.

Badminton (Women): 20 participants registered from which four teams were formed and matches were held in round robin format with top two teams competing in the Finals.

At the Valediction, **Dr. K. Ramesha**, Director, CSIR-CECRI appreciated the elaborate arrangements made by CSIR-CECRI Club and distributed the Prizes to the Winners. He suggested that fitness activities like this should be practiced year long for a healthy and active life. Earlier, he also administered the Fit India Pledge to all the Participants. National Sports Day is more than just a commemoration of Dhyan Chand's birth anniversary; it is a celebration of his spirit of sportsmanship, excellence, and dedication.

Recent Research Projects Sanctioned

Industry Funded:

- Designing of Sacrificial Cathodic Protection for Hydraulic Drain Valve in Sea Water Intake Channel, M/s. L&T Valves Ltd., Cuttack, Rs. 1.75 Lakhs, 3 months wef 01-08-2024 [CNP 02/2024]
- Lithium Ion Cell Analysis, M/s. Matter Energy Pvt. Ltd., Ahmedabad, Rs. 3.55 lakhs, 2 months wef 22-07-2024 [TSP 07/24]
- Enhancement of ORR activity of the carbon brush cathodes for Mg-air sea water battery and feasibility studies thereof (Phase I), M/s. High Energy Batteries, Pudukkottai, Rs. 5.85 Lakhs, 6 months wef 07-08-2024 [SSP 13/2024]

Institute Funded:

- Operation Management of Under Graduate Program on Chemical & Electrochemical Engineering for 2024-25 CSIR-CECRI, Rs. 113.60 Lakhs, 12 months wef 01-07-2024 [TSP 06/2024]

CSIR Funded:

- Indigenous Development and Manufacturing of Machines, Devices and Assembly Lines, Rs. 74.45 Lakhs, 3 years wef 23-08-2024 [MMP015202]

Official Events

- Selection Committee Meeting for engagement of Project Personnel [Aug 5, 6]
- Meeting on Fire Safety by LASAC [Aug 6]
- Meeting with CSIR HQ on Monthly Utilization Monitoring [Aug 12]
- Awareness Campaign on Drugs under ***Nasha Mukt Bharat Abhiyaan*** – Invited Talk by Shri. Sivaramakrishnan, Drug Control Officer, Karaikudi Range [Aug 13]
- 83rd CSIR Foundation Day – Meeting of the Core Committee [Aug 13], Publicity Committee [Aug 21]
- iSAEST-13 Technical Committee Meeting [Aug 14]
- Performance Review-Technical Assistants [Aug 14]
- Hindi Handwriting Competition [Aug 20]
- Hindi Competition for Wards of Staff [Aug 25]
- Hindi Word Building Competition [Aug 27]
- Hindi Poster Presentation Competition [Aug 28]
- Laboratory Strategic Group Meeting [Aug 28]
- Invited Lecture by Prof. Thilagar P, IPC Department, IISc, Bengaluru [Aug 29]

Business Development and CSIR Theme Leads

Signing of NDA

- **NDA signed with Periba Hycoco LLP, Gujarat and CSIR-NCL, Pune on *Evaluation and Testing of High Temperature Polymer Electrolyte Membrane (HTPEM) Fuel Cell Stack(s) and Methanol Reformation Studies*.**

- Meeting with officials of Watsan Envirotech Pvt. Ltd. [Aug 1]
- Discussion Meeting with NMRRL (DRDO), Mumbai on Water Electrolysers [Aug 2]
- Review Meeting on Redox Flow Battery Mission Project [Aug 6]
- Project Review Meeting with GFCL, Gujarat [Aug 7]
- Review Meeting of ongoing MSE Projects [Aug 7]
- Meeting with M/s. Indi Energy on R&D collaboration [Aug 8]
- Project Review Meeting - Adsorbents for Sr extraction from Seawater [Aug 9]
- Monthly Project Review Meeting [NTTM (GAP-02/2024) & CSIR-4M FBR080302W1] [Aug 9]
- Meeting to review progress under Hydrogen Mission (H2T) [Aug 12]
- Review Meeting on Redox Flow Battery [Aug 12]
- Internal Discussion on Green Hydrogen [Aug 20]
- Meeting with MeitY on R&D collaboration [Aug 26]
- Meeting with ISRO, Mahendragiri (Online) [Aug 30]

Skill Development Activities

Skill Development Training Programmes:

- A Skill Development Training Programme on ***Electroplating: Principles and Practices*** was organized by CSIR-CECRI during August 19-23, 2024. A total of 24 participants from various organizations all over India *viz*. Bharatiya Reserve Bank Note Mudran (P) Ltd., Mysuru, Bharath Dynamics Limited, Hyderabad, Indian Airforce Station, Nasik, Naval Aircraft Yard, Kochi, Janatics India Pvt. Ltd., Coimbatore, Synergy Global Sourcing, Hosur, Shree Sai Electro Coating & Polishing Pvt. Ltd., Pune, Khyaati Leather Innovations Pvt. Ltd., Mumbai, Vishnu Chemicals Ltd., Hyderabad, Brakes India Ltd., Chennai, Sai Delta Inspection & Testing Laboratory, Chennai and Silverglow, Thane underwent the training.

JIGYASA:

- Under CSIR-JIGYASA Programme, the following events took place during August 2024:

Visit of College Students: 47 students and 5 faculty members from the Department of Physics, St. Mary's College, Thoothukudi visited the following R&D Divisions at CSIR-CECRI, Karaikudi on August 23, 2024 and had a glimpse of the ongoing R&D Activities:

1) Electrochemical Power Sources
2) Corrosion & Materials Protection,
3) Electro-organic and Materials Chemistry
4) Electroplating and Electrometallurgy
5) Hydrogen Lab and
6) Central Instrumentation Facilities.

State Level Workshop on *Green Hydrogen Technologies - A Way Towards National Hydrogen Mission* (Aug 29 & 30, 2024): More than 100 Students and 18 teachers from 23 schools all over Tamil Nadu took part in the Workshop and got immensely benefited from the lectures delivered by Eminent Scientists and AcSIR Scholars of CSIR-CECRI. Prototype model, sciencewreck (pros and cons of next generation fuels), quiz competition etc. were also conducted.

AcSIR Faculty Lecture Series

In continuation of the inspiring initiatives for invigorating the skillsets and enlightening the scholars and projects staff on all aspects of Electrochemistry, a new initiative of **AcSIR Faculty Lecture Series** was mooted by AcSIR Science Club, CSIR-CECRI, Karaikudi. In the Inaugural Lecture on August 31, 2024, **Dr. V. Ganesh**, Senior Principal Scientist, CSIR-CECRI delivered an interesting talk on *Electrochemical Impedance Spectroscopy (EIS).* The talk was thought-provoking and garnered the attention of participants by shedding light on this indispensable fundamental area of Electrochemistry.

Health Awareness Lecture

As a part of the Ministry of Health and Family Welfare, Govt. of India's ***Angdaan Jan Jagrukta Abhiyaan*** Campaign, 3rd August 2024 was designated as the **Indian Organ Donation Day**. The Healthcare Committee, CSIR-CECRI organized Awareness Lectures on 1) Brain Death and 2) Importance of Organ Donation by Dr. J. Suresh, MD, DNB, EDAIC (Anaesthesiologist), Transplant Physician and Dr. S. Sridhar Babu, MD, DNB, DRNB (Nephrologist) from Preethi Hospital, Madurai August 6, 2024 for the benefit of Staff Members, Scholars, Pensioners and B.Tech. Students.

CFE and AcSIR Highlights

- Meeting of CFE Faculty Members [Aug 8]
- Screening Committee Meeting for Admission to B.Tech. under Other State Quota [Aug 8]
- Online Counselling for Admission to B.Tech. under Other State Quota [Aug 21]
- Meeting with new PhD & IDDP Scholars of AcSIR (August 2024 Session) [Aug 1]
- DAC-I for Mrs. V. Meena, UGC-JRF (Guide: Dr. V. Ganesh) [Aug 1]
- DAC-III for Mr. Bonagiri Sai Charan (Guide: Dr. Deepak K. Pattanayak) [Aug 9]
- DAC-I for Mr. Raghava Krishna Kanala (Guide: Dr. S.M. Senthil Kumar) [Aug 9]
- DAC-III for Mr. M. Ragunath, AcSIR Scholar, (Guide: Dr. Subrata Kundu) [Aug 14]
- JRF to SRF Upgradation of Mr. S. Singha Roy, AcSIR Scholar, (Guide: Dr. Subrata Kundu) [Aug 14]
- JRF to SRF Upgradation of Mr. P. Murali, AcSIR Scholar, (Supervisor: Dr. M. Kathiresan) [Aug 14]
- Synopsis Submission of Ms. P. Viji, AcSIR Scholar – Thesis Title: *Electrochemical Chiral Sensors: Enantioselective Differentiation of Amino Acids Using Chirality Induced Conducting Polymers* (Guide: Dr. V. Ganesh) [Aug 16]
- Student Academic Committee Meeting [Aug 19]
- DAC-III of for Mr. K. Venkatesan, AcSIR Scholar (Guide: Dr. Deepak K. Pattanayak) [Aug 19]
- DAC-I for Mr. E. Subramani, AcSIR Scholar (Guide: Dr. C. Jeyabharathi) [Aug 21]
- DAC-III for Ms. Jyothy Mol, AcSIR Scholar (Guide: Dr. C. Arunchandran) [Aug 27]
- Synopsis Submission of Mr. K. Vinoth, AcSIR Scholar – Thesis Title: *Chitosan-grafted Polyphenol and Metal Oxide as Biocompatible Sensor Platforms for precision Point-of-Need Analysis* (Guide: Dr. V. Murugan) [Aug 28]
- AcSIR Faculty Members Meeting [Aug 28]
- DAC-III for Mr. Shubham Pant, IDDP Scholar (Guide Dr. V. Ravi Babu) [Aug 29]
- PhD Viva Voce Examination for Ms. M. Sornambigai, AcSIR Scholar – Thesis Title: *Studies on new co-reactants and functionalized luminophores for electrochemiluminescence based sensing applications* (Guide: Dr. S. Senthil Kumar) [Aug 29]
- Synopsis Submission of Mr. Krishnendu Bera, AcSIR Scholar – Thesis Title: *Development of non-precious transition metal based electrocatalysts for water splitting application* (Guide: Dr. Subrata Kundu) [Aug 30]

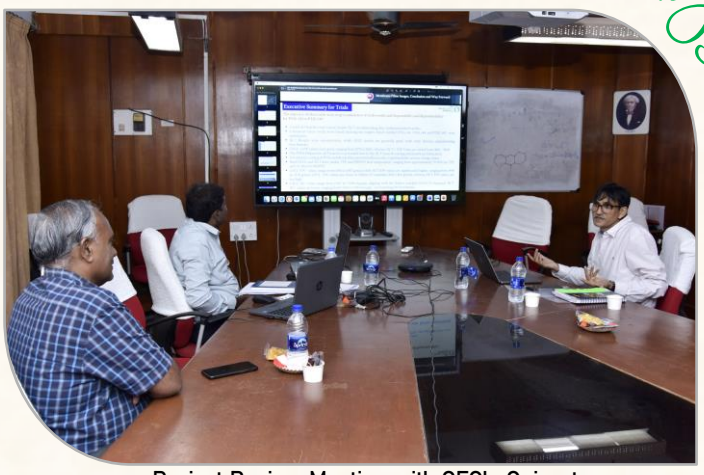
78th Independence Day Celebrations

The 78th Independence Day was celebrated with great enthusiasm and patriotic fervor on August 15, 2024 at CSIR-CECRI, Karaikudi. After receiving a Guard of Honour by the Security Guards, at 8.05 AM, Dr. K. Ramesha, Director, CSIR-CECRI hoisted the National Flag in front of the main building and paid homage to the Father of the Nation.

He also addressed the gathering on the various recent developmental activities in CSIR-CECRI especially on our role in Nation building and called for more sustained efforts towards **Viksit Bharat**.

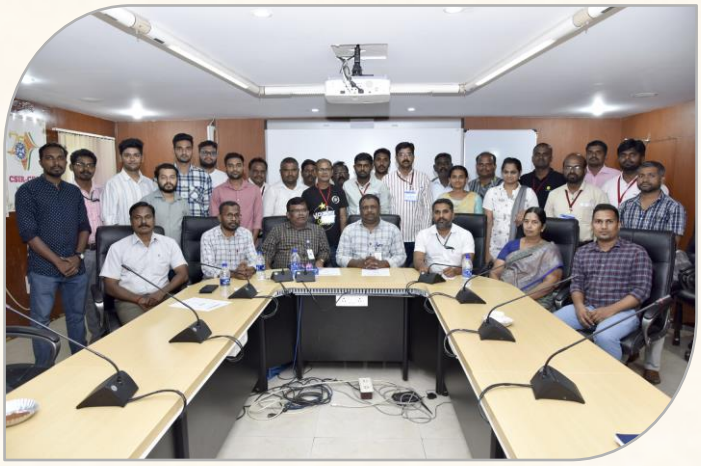
As part of the Celebrations, under the **Har Ghar Tiranga** Campaign, all the staff members and students were encouraged to hoist the National Flag in their premises and uploading selfies with the Tiranga at www.harghartiranga.com during August 13-15, 2024. Also, in commemoration, a plantation drive of 300 saplings inside campus was carried out.

Snapshots



Project Review Meeting with GFCL, Gujarat

Project Discussion with NMRRL (DRDO), Mumbai



Industry Oriented Refresher Course on Electroplating Principles & Practices

Two days State Level Workshop on Green Hydrogen Technologies for School Students

Visit of College Students

Awareness Lecture on Drugs

TECHNOLOGY COMPENDIUM OF CSIR-CECRI

- Indigenous Li-ion battery
- Indigenous Sodium Ion Battery
- Performance Improved Lead Acid Battery
- CO_2 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 CO_2 and butadiene to Adipic Acid; CO_2 to Formic Acid; CO_2 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- Homocystine
- Electrochemical Perfluorination of Sulfolane to Perfluro Butane Sulfonyl Fluoride
- Electrochemical Preparation of Calcium Lactobionate and Calcium Gluconate
- Electrochemical Production of KIO_3
- 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.cecri.res.in

https://www.twitter.com/CSIR_CECRI

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

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

Published by: PPMG Section, CSIR-CECRI, Karaikudi – 630003 (Tel: 04565-241204; Email: medianodal@cecri.res.in)