CECRI news

CENTRAL ELECTROCHEMICAL RESEARCH INSTITUTE, KARAIKUDI - 630006
[Council of Scientific and Industrial Research]

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Dr.V. Yegnaraman took charge as Acting Director on 26.02.2009

Dr. V. Yegnaraman, Scientist 'G' assumed charge as the Acting Director of Central Electrochemical Research Institute, Karaikudi on February 26, 2009 consequent to Professor A.K.Shukla laying down office as the Director of the Institute and rejoining his parent organization, Indian Institute of Science, Bangalore.

Shri Yegnaraman, after graduating in Chemistry from Madras University obtained his M.Sc. and Ph.D. degrees from Banaras Hindu University, Varanasi. His doctoral dissertation was on "Exponential relaxation techniques to corrosion systems". Joining CECRI, he has actively contributed to research in the areas of underpotential deposition of metals, chemically modified electrodes for molecular recognition & electrocatalysis, electro-painting and electrochemical marking of metals. He has to his credit more than eighty publications and four patents. He has significantly contributed to the development and subsequent release of technologies on electrochemical marking of metals, Ag/AgCl electrodes for ECG measurements and a novel electrochemical sensor for assessing the status of diabetic mellitus through the estimation of glycated hemoglobin in blood. His research activities were amply supported by funding from various agencies and multinational firms. He teaches basic courses in Electrochemistry to students of B.Tech.(Chemical and Electrochemical Engineering) of Anna University. He has delivered invited lectures in India and abroad.

Dr. Yegnaraman was honoured with "Raman Research Fellowship" by CSIR in 1995 to visit Department of Chemistry, RUTGERS University, U.S.A. As a "Visiting Scientist" he worked in Technical University of Dresden and Kurt-Schwabe Institute of Sensor and Measurement Technology, Germany in 2007 and in the Department of Chemistry, Universite de Provence, France in 1990.

He served as Secretary (1999-2001) and Vice-President (2005-2007) of the Society for Advancement of Electrochemical Science and Technology, (SAEST). He has successfully organized a number of national and international symposia. He is a reviewer for a number of leading electrochemical journals like Journal of Electrochemical Society (USA) and has rendered editorial service to journals like Bulletin of Electrochemistry, Current Titles in Electrochemistry and Transactions of SAEST. He is a Life Fellow of SAEST and a Life Member of the Computer Society of India.

CECRI Ladies Forum (CLF)

One day Science Awareness Program for Rural School children was organized by CECRI Ladies Forum (CLF) & CECRI, Karaikudi on 7th January 2009 at CECRI. The program was inaugurated by Ms.Sheila Sangwan, Joint Secretary and Financial Advisor, CSIR, New Delhi. Students of 20 rural schools in and around Karaikudi participated in the program along with one teacher per school. Invited lectures on Thrust areas of science by CECRI Scientists were arranged along with an Elocution competition on Scientific topics for student

participants. Certificates for prize winners and participants were distributed during the Valedictory function. Dr. V.Yegnaraman, Scientist-G and Patron, CLF gave away the prizes and addressed the gathering.

National Science Day

CECRI celebrated the National Science Day on February 28, 2009 at Kamban Mani Mandapam, a prominent place in Karaikudi to attract students and public along with the going events of Karaikudi Book Festival – 2009. Dr. Nellai S. Muthu, a renowned Tamil Science Writer and a Scientist from ISRO delivered a special lecture on "Shall we go to Moon?" The actual functioning of earth, need and significance of space travel, chronological developments made in Space travel by different countries with a special

reference to India and the recent advancements – cum – achievements of Indian Space Research Organization etc, were elaborated by Dr. Nellai S. Muthu in his special lecture using colorful photographs. A large number of students from various colleges, schools, Teachers, Scientists from CECRI and the Public attended the function. Earlier, Dr. V. Yegnaraman, Acting Director, CECRI welcomed the gathering and explained the importance of National Science Day while recalling the Scientific inventions of our Indian Scientist Sir. C. V. Raman.

Syed Hussain Zaheer Medal Lecture

The prestigious Syed Hussain Zaheer Medal of the Indian National Science Academy (INSA) for the year 2007 has been awarded to Professor K.T.Jacob, INSA Distinguished

Professor, Department of Materials Engineering, Indian Institute of Science, Bengaluru. The medal awarding function was organized by the INSA Madurai chapter at Central Electrochemical Research Institute, Karaikudi on February 12, 2009. Professor Jacob was presented the Medal with citation by the Distinguished Professor J.C. Ahluwalia, former Professor of Chemistry, IIT, Delhi and former INSA Council Member.

Accepting the Award, Professor Jacob delivered the Medal Lecture on 'High temperature electrochemical route for the extraction of titanium from rutile'.

Professor Jacob commenced his lecture by highlighting the industrial importance of titanium metal, due to its high 'strength vs weight' ratio. Owing to its unique properties, especially its low weight, it has replaced much

of steel in aircraft industry. Other major areas of its use are in chemical industries and in marine environment due to its excellent corrosion resistant characteristics. Also, it can replace the steel in all transport sectors but for its cost acting as the constraint.

He mentioned that Hunter and Kroll's processes are the current methods of production of titanium metal in the form of sponge. These processes use sodium and magnesium metal to reduce titanium tetrachloride at 900°C. The sponge metal has to be melted and subjected to downstream production. Oxygen is soluble in metallic titanium upto 32 atom %, above which it starts to form compounds. Hence, these operations, including the primary production has to be done in air-free environment. Otherwise, the metal will become brittle and useless. Among these two metallothermic reduction processes, Hunters process is rarely used due to the hazardous nature of sodium, although the quality of sponge produced by Hunter process is better than

Kroll's process.

India possesses good quality ilmenite as well as some quantity of rutile. However, our nation currently meets her requirements of titanium and its alloys through import. Hence, to meet our needs of titanium and to add value to our ilemenite, DMRL, Hyderabad has developed a modified Kroll's Process, whose energy requirement is high and is around 30 kWh/kg of the metal. Further intensive efforts are needed for minimizing the energy requirement.

Subsequently, Professor Jacob pointed out that global research activities aiming electrochemical production of titanium metal are in progress. The recent studies on reduction of titanium chloride by two compartment method developed by Ginatta of Italy advocate for total energy consumption of around 18 kWh/kg of titanium particles. In early 1990s, a Japanese group (K.Ono et al) indicated the possibilities for the electrocleaning of titanium surface, i.e, removal of oxide layer and oxygen on titanium surface to about 50 ppm by treating the titanium sheet as cathode in molten calcium chloride electrolyte. In late 1990s, D.J. Fray, T.W. Farthing and G.Z..Chen (Cambridge University) reported a process for removal of oxygen from a pellet of titanium dioxide and claimed the production of titanium particles with less than 200 ppm of dissolved oxygen. Another group in Japan (Ono/ Suzuki, Kyoto Univ.) also declared their success in deoxidation of titanium dioxide in molten chloride melt. However, voltammetric studies have revealed that the titanium particles obtained on larger scale operations contained around 500 ppm of dissolved oxygen which could not be used for high tech production. These studies have generated a lot of discussion and analysis of the processes involved in the electrochemical production of titanium metal, in terms of phenomena such as oxygen ion transport and diffusion, calciothermic reduction, formation of phases with low oxygen and non-stoichimetric oxides, oxygen potential in melt etc. Nevertheless, these extensive investigations have paved way for obtaining very high pure titanium metal required for sputtering applications. However, the cost of high purity titanium is about 9 times higher than commercially pure titanium. Further, thin foils of titanium metal can be deoxygenated electrolytically in molten calcium chloride. Thus the area of electrochemical extraction of titanium poses still challenging research issues.

Earlier, Dr.V.Yegnaraman, Scientist 'G' and Head, Electrodics and Electrocatalysis Division of CECRI welcomed the gathering. Dr.G. Marimuthu, Head, Department of Animal Behaviour & Physiology, Madurai Kamaraj University, Madurai and Secretary of INSA Madurai Chapter proposed vote of thanks.

Technical Services Undertaken:

SL.No,	Title	Organisation	Amount
1.	Design, fabrication and supply of Filter Press	Department of Chemical Engineering, Annamalai University	1,40,450
2.	To test the sample batteries 12V/40Ah and 12V/75Ah as per IS 13369:1992 and sulphation test as per IRS 88/2204	M/s Vishkarma Associates Pvt.Ltd., New Delhi	1,23,596
3.	Testing of CPCC coated reinforcement rods used in construction of new major bridge No.1274 at KM 881/10-882/9 as per CECRI code of practice	M/s Cherian Verkey Construction Co., Cochin	59719
4.	Testing of non-organo phosphonate samples	Neyveli Lignite Corporation Ltd., Neyveli	56,180
5.	To supply a 250 A Electrolyser of active area 60 cm x 40 cm with anode, cathode and membrane	M/s Tatva Chintan Pharma Chemicals, Ankleshwar	67,416

Foreign Deputation

Dr.S.Gopukumar, Scientist and Dr.R.Thirunakaran, T.O have been deputed to Japan during 6-16 February 2009 for discussions on the Joint collaborative project on "Development of high performing electrode materials for lithium ion batteries. Their visit was sponsored by DST, New Delhi and JST, Japan.

Grant-in-aid/Sponsored Projects taken up:

SL.No,	Title	Organisation	Amount
a.	Feasibility study on gold plating on Cu-Be alloy fixtures for Satellite applications	ISRO Inertial systems Unit, Thiruvananthapuram	1,98,877
b.	Development of Micro sensor for Biomedical food and environmental applications	Aeronautical Development Agency, Bangalore	84,88,350
c.	Development of Nano scale multilayered and Nano composite Super Hard Coatings by reactive magnetron sputtering for biomedical applications	DST, New Delhi	22,34,600
d.	Electrochemical Process for the synthesis of C3 & C4 perfluoroalkanoyl fluorides	DRDO, New Delhi	22,50,000
e.	To study suitable coating system for corrosion protection of steel structures	Neyveli Lignite Corporation Ltd., Neyveli	2,92,136
f.	Signal amplification by Gold Nanoparticles in Bioelectrocatalysis and Biosensing	Department of Biotechnology, New Delhi	28,43,000

MC Meeting

48th meeting of the Management Council of CECRI was held at CECRI on February 20, 2009.

Consultancy Projects taken up:

SL.No,	Title	Organisation	Amount
1.	Soil resistivity survey for HPCL pipeline	NIO, Goa	1,68,540
2.	Corrosion condition survey of Sabarmathi River Bridges for the land area of Gandhi Bridge (125 mts) and Sardar Bridge (232 mts)	Sabarmathi River Front Development, Ahmedabad	10,50,566

RC Meeting

47th meeting of the Research Council of CECRI was held at Indian Institute of Technology, Chennai on February 13, 2009.

Industry Oriented Technology Courses:

S.No.	Name of the Course	Duration	No.of participants	Amount
1.	Surface coatings by Physical Vapour Deposition (PVD), Chemical Vapour Deposition (CVD) and Surface Analyses	2.2.09 to 7.2.09	03	14,000/-
2.	Industrial Practices of Electroplating & Metal Finishing	9.2.09 to 14.2.09	12	84,000/-
3.	Maintenance of Electroplating Baths	16.2.09 to 21.2.09	08	56,000/-
4.	Electroplating of Copper, Nickel, Chromium & Precious Metals	23.2.09 to 28.2.09	13	91,000/-

Retirements on Superannuation on 31.01.2009

Dr. K. Raghupathy,
Scientist Gr. IV (5)

Mr. Y. Vincent Soundararajan,
TO Gr. III (4)

Mr. S. Muthiah,
Private Secretary

Retirements on Superannuation on 28.02.2009

Dr. R. Pattabiraman, Gr.IV(5)

Shri K. Chinnathambi, Gr.II(4)