



The fourth and the final issue of this year is on “**Materials Electrochemistry, Electrochemical Processes and Systems**” Guest Edited by Aninda Jiban Bhattacharyya, Solid State and Structural Chemistry Unit, Indian Institute of Science brings the latest developments in the area from several experts. The state of the art articles in the area bring in the awareness on many recent developments involving nano-structured materials and their impact on *several* electrochemical processes. The seven authoritative reviews have been compiled in an exemplary manner by the guest editor such that it almost makes up as chapters in a text book of advanced materials electrochemistry. The editorial board thanks Prof. A.J. Bhattacharyya for his efforts in getting the issue ready well within time and the relentless efforts of the technical editorial team is acknowledged.

The editorial board after prolonged discussions with Springer has decided to co-publish with them starting from the first issue of 2017. Springer, India will contact all the subscribers for subscription. However, the overall handling of articles and the choice of guest editors will remain with the editorial board and the current version of the online availability within India will remain as such. We look forward to the co-publishing venture with Springer with interest and hope that the Journal will soon find its place at a higher echelon among the major journals.

T.N. Guru Row

Editor

ssctng@sscu.iisc.ernet.in



Materials Electrochemistry, Electrochemical Processes and Systems

Currently, the energy requirements of mankind are predominantly met by fossil fuels. Due to growing demands, the last few decades have witnessed increasing activities towards the development of newer advanced and efficient methods of energy processes based on carbon fossil fuels. However, high and uncontrolled consumption have firstly, led to extremely rapid depletion in global fossil fuel stocks and secondly, detrimental implications on environment and sustainable growth. As a consequence, research and development efforts have diversified towards technologies based on alternative sources of energy such as wind, solar, hydro and geothermal. Though the method of direct generation of electricity from such renewable sources is clean and attractive, they are very intermittent in nature and are dependent on the geophysical location. Thus, efficient and economic management of electrical energy obtained from renewable energy sources requires integration with energy storage systems. Energy storage as well as generation via electrochemical methods offers diverse opportunities for the development of affordable alternative technologies. Although the yield and efficiency of electrochemical processes are not subject to Carnot cycle limitations, the electrochemical (redox) reaction pathways are in general non-trivial and depend on several parameters. Comprehensive and in-depth understanding of the electrochemical processes thus, become very pertinent as their outcomes can be employed in effective optimization of system functions. Simultaneously, the selection and processing of (electroactive) materials are equally pertinent as their physicochemical character determines the efficiency of the electrochemical reaction and effective performance of the device.

In this issue of the *Journal*, we focus exclusively on electroactive materials and the associated electrochemical processes and systems. The issue covers diverse range of topics related to mechanisms of electrochemical processes (e.g., corrosion, electrocatalysis, sensing), materials design and properties in the context of devices, e.g., fuel cells, solid-state batteries, and water splitting/oxygen generation and theoretical insights into the role of surface characteristics on electrochemical response. In this issue two articles deal with steel. While *Mondal et al.* use a conducting polymer modified steel electrodes for non-enzymatic sensing of a sweet alcohol (e.g., D-sorbitol), *Somers et al.* explore various rare-earth carboxalates as effective corrosion inhibitors for mild steel. Electrocatalysis and electrocatalysts have been presented in two different contexts. *Ghosh et al.* discuss various electrocatalysts and their function at nanometer length scales for ORR/OER with special reference to fuel cells. On the other hand, *Saha et al.* discuss the function of (nanostructured) catalysts for OER in the context of water splitting. Design criteria for highly stable and active acidic and alkaline medium electrocatalysts (including support) have been discussed based on catalyst surface characteristics and engineering. The article also discusses the challenges in designing of cost-effective electrolyzers. The influence of surface disorder on thermodynamic, kinetic and charge transport has been dealt in detail by *Rama Kant et al.* The article through various stochastic theoretical models highlights the synergistic influences of morphological features and phenomenological length scales in disordered electrochemical systems. Finally, contributions from *Singha et al.* and *Yamada* focus on electroactive materials, viz., inorganic-organic hybrid membranes for the proton exchange membrane fuel cells and solid electrolytes, and various interface characteristics in solid-state batteries. Both these articles critically review materials design, physico-chemical properties, device performance and future scope for their application in commercial electrochemical systems.

I thank Prof. T.N. Guru Row (Chief Editor) and the editorial committee of the *Journal* for providing me with this opportunity as a guest editor for this issue. I am also grateful to the authors for their excellent articles and adhering to strict time-schedules for submissions. Special thanks to Mrs. Kavitha Harish and her team for compilation of the articles. Finally, thanks to the reviewers, copy editors and proof readers for helping me complete this issue in time.



Prof. Aninda Jiban Bhattacharyya
Solid State and Structural Chemistry Unit,
Convener, Integrated Ph.D. Program,
Division of Chemical Sciences,
Indian Institute of Science,
Bangalore 560012, India.
aninda_jb@sscu.iisc.ernet.in