Tata Institute of Fundamental Research
Survey No. 36/P, Gopanpally Village, Serilingampally, Ranga Reddy Dist., Hyderabad - 500107

Seminar

Viscoelastic and Ion Transport Properties of Solid State Electrolytes for Batteries and Water Electrolysis Cells

Sudeshna Patra

TCIS, Hyderabad

Selective and efficient ion transport membranes profoundly influenced the field of 'synthetic membranes' for modern energetics. In the recent past, mechanically robust materials such as carbon nanotubes, graphene oxide (GO) etc. based membranes have been the subject of extensive studies towards selective ion or molecular transport, both theoretically and experimentally. But the ion transport and mechanical properties of these nanostructured materials based membranes depend on several parameters such as the method of production, presence of residual ions, functional groups and their mesoscopic arrangement and interactions. The initial part of the talk will be on the role of intercalated bound water in deciding the mechanical properties of the GO paper using dynamic mechanical analysis.

Membranes play a crucial role in water electrolysis and rechargeable Li-ion batteries too. Inspired from the superior proton conductivity of GO membranes, a multifunctional Li ion transporting solid polymer electrolyte using polyethylene oxide (PEO), polydimethylsiloxane (PDMS), and lithium perchlorate ($LiClO_4$) is realized. Along with the studies on the role of polymer alignment in ionic conductivity, the synergistic role of polymer blends in the ion transport of a composite polymer electrolyte is explored. Later, the development of an efficient, cost-effective proton exchange membrane based on polymer electrolytes is demonstrated for water electrolysis. Li based coin cells and membrane electrode based water electrolysers are constructed and their performances are being compared with benchmarked ones.

Friday, Jun 21st 2019

4:00 PM (Tea/Coffee at 3:30 PM)

Auditorium, TIFR-H