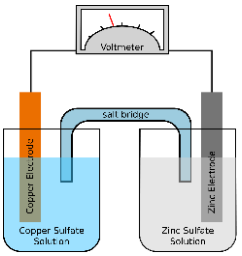
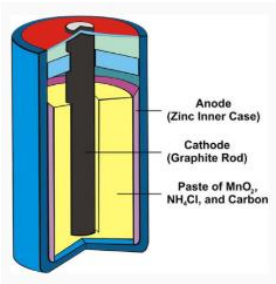
Energy Conversion and Storage Facility

Energy Conversion and Storage Facility is a state of the art at Centre for Advanced Studies, Dr. A.P.J Abdul Kalam Technical University, Lucknow. This lab is equipped with most advanced electrochemical analyzer wherein electrochemical methods are utilized to control the flow of electrons to: produce electricity from chemical reactions, drive chemical reactions, and perform analytical measurements of chemical phenomena. This facility in conjunction with the materials chemistry and synthesis laboratory Under Energy Science and technology and Nanotechnology program is the housing facilities giving single point solution from material synthesis, their testing, and their optimization as application via fabrication lab.

Research focus:

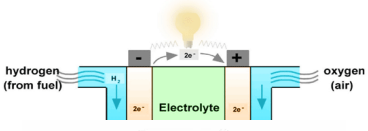


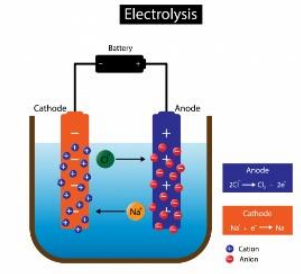
Galvanic cell When redox reactions are combined to a favorable overall standard potential, a spontaneous reaction occurs as in the galvanic cell shown above where zinc solid is oxidized and copper ions are reduced. The salt bridge keeps the solutions separated while allowing ion migration to maintain charge neutrality.



Battery Currently developing improved Li-ion batteries through better understanding of their electrochemical reactions. A dry cell battery (e.g., AAA, AA, C, D) is used to provide energy for numerous portable devices. Like the galvanic cell, the cathode and anode are separated to prevent reactant mixing, but the paste between them allows ion (i.e., electrolyte) migration. The dry cell is so named because it contains no free-flowing solutions.

Fuel cell A fuel cell uses the chemical energy of hydrogen or another fuel to cleanly and efficiently produce electricity. Fuel cells combine an anode fuel (e.g., hydrogen, ethanol, formate) with a cathode oxidant (typically oxygen from air) to produce energy spontaneously. While a dry cell battery must be discarded when the reactants are consumed, the fuel compartment in a fuel cell is easily replenished with fuel and the fuel cell continues to produce power.





Electrolysis The research area is metal powder production via electrolysis. This research will significantly increase energy efficiency and reduce greenhouse gas emissions for metal production. When two half reactions are combined that do not lead to spontaneous production of energy, electric potential must be applied for the overall redox reaction to proceed. In the example electrolytic cell above, molten NaCl is converted into chlorine gas and sodium metal via electrolysis.

Objective of ECSF

- Techno-economic improvement in conversion and storage of energy that can minimize the dependency on fossil fuels
- Reduction in the investment cost with the compact design of the conversion and storage system
- Improvement in the efficiency of the developed energy conversion and storage system

Key Highlights:

• Availability of both version of Anova 1.1 and anova 2.1 software.
• Autolab Potentiostat/Galvanostat
• Electrochemical Impedance Spectroscopy
• Three Electrode Setup
• Rotating Ring Disc Electrode
• Battery Testing Facility
• Analyses of cylic-voltametry

Electrochemical Workstation