

2.625J/10.625J Electrochemical Energy Conversion and Storage: Fundamentals, Materials and Applications

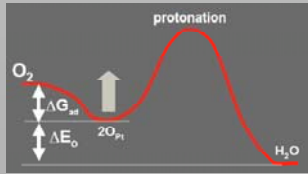
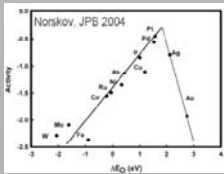
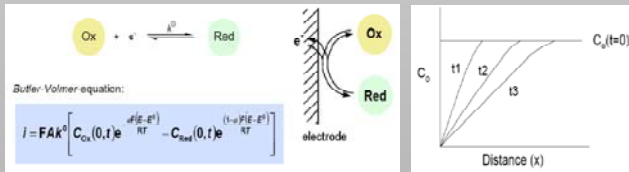
Fall 2008
Prof. Shao-Horn

Schedule

Lecture: Tues and Thurs 2:30-4 (Rm1-132) | Recitation: Weds 4-5

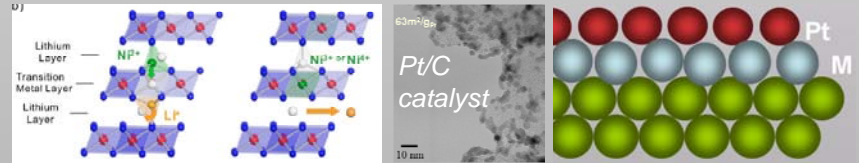
1. Fundamental Principles

Thermodynamics and kinetics of electrochemical and surface reactions, and transport



2. Materials for Storage and Catalysis

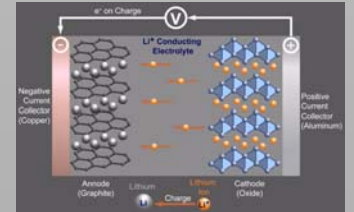
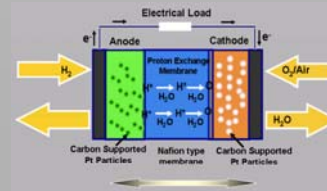
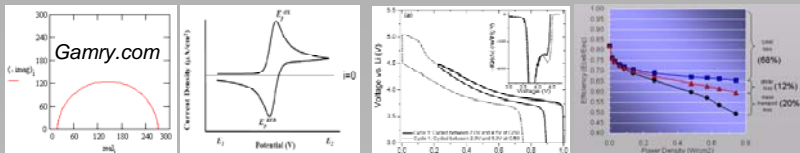
Intercalation compounds, nanostructured catalysts, ionic and/or electronic conductors, etc.



4. Energy Storage and Conversion Technologies

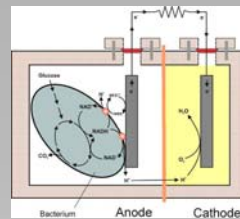
3. Electrochemical Measurements

Galvanostatic/potentiostatic measurements, CV, impedance, modeling etc.



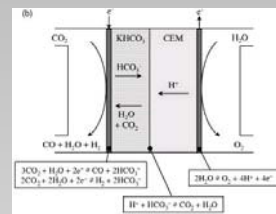
Li-ion Batteries

Fuel Cells (PEMFC, SOFC etc.)



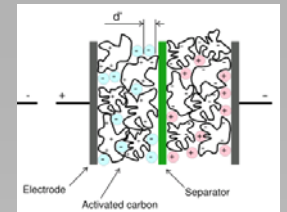
Rabaey, Trends Biotech, 2005

Bio fuel cells



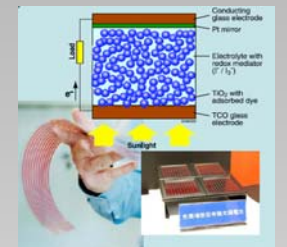
Newman, JECS, 2007

CO₂ reduction cells



Ultracapacitors.org

EC Capacitors

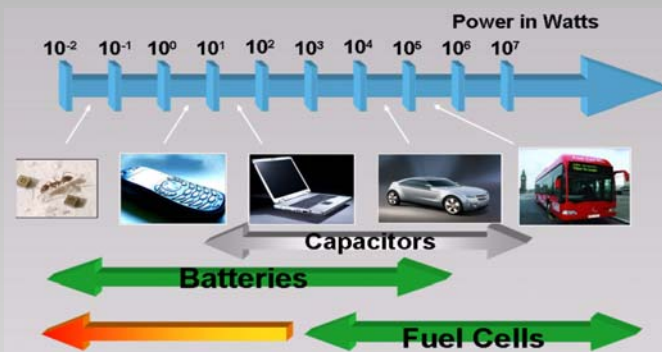


M. Graetzel

Dye-sensitized solar cells

5. Systems and Scale

From micro-Watts to Mega-Watts



DESCRIPTION: Thermodynamics of electrochemical systems, surfaces and interfaces (electrical double layer), surface reaction and electrochemical kinetics (Butler-Volmer), electrochemical techniques, catalyst, storage and conversion. Material structures and properties for lithium battery electrodes, ultracapacitors, fuel cells, and photo-electrochemical cells. Theoretical and experimental techniques for materials design, cell testing, surface and interfacial transport measurements.