The Electrochemical Society

Seminar Notice: Wednesday, Jan 27, 2010

Magnetic Effects on Electrochemical Systems: Batteries, Fuel Cells, Academically Interesting Probes, and CO Oxidation

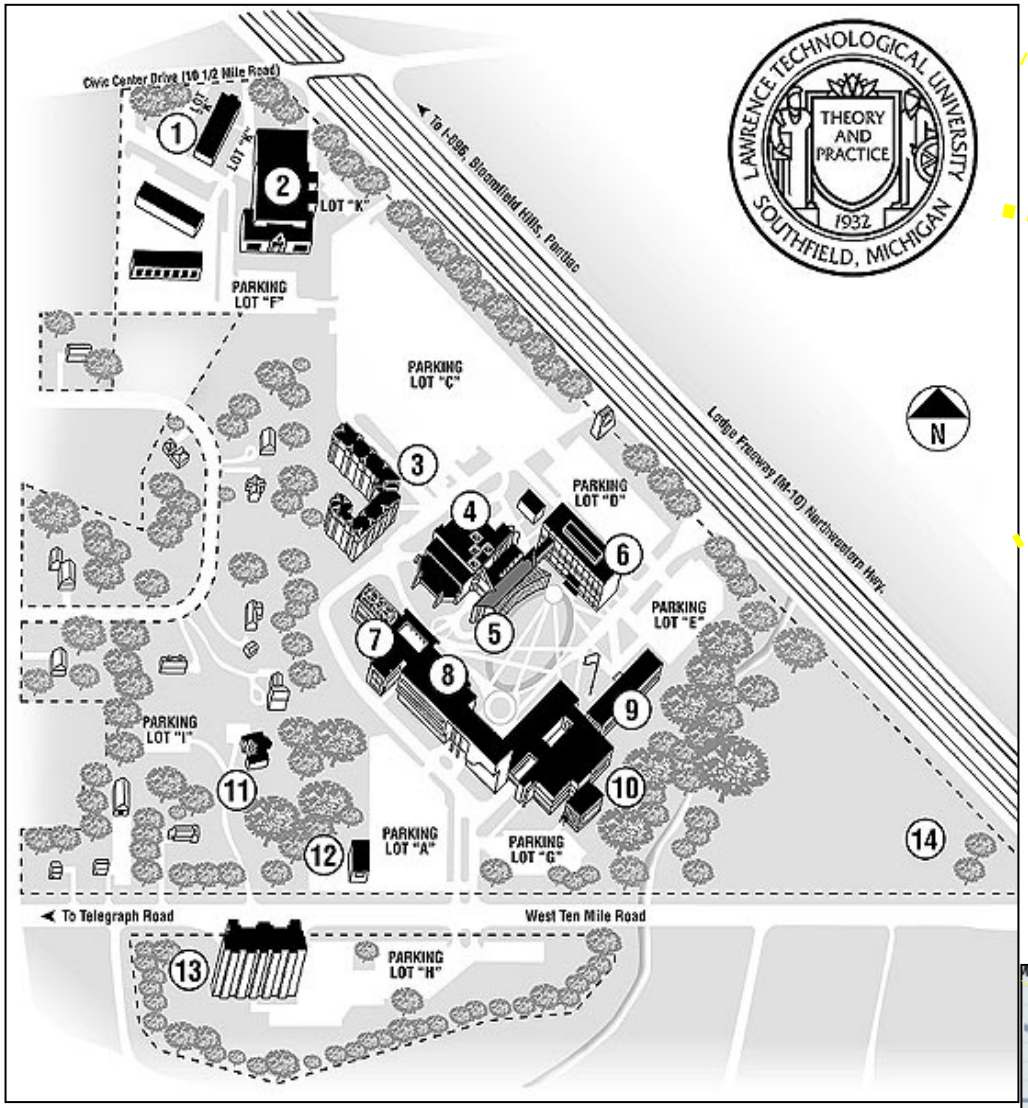
Johna Leddy, Ph.D.

Department of Chemistr , University of Iowa

In systems of slow transport and high concentration, introduction of a magnetic field increases electron transfer rates in electrochemical systems. Increased rate is manifest as increased current, which is useful in electrochemical energy systems such as fuel cells and batteries. Academically interesting redox species provide some access to a fundamental appreciation of these effects. Specific energy systems improved by magnetic modification include: Proton exchange membrane (PEM) fuel cells, MnO_2 alkaline battery electrodes and Nickel metal hydride battery electrodes. Electrodes are readily modified with magnetic microparticles by embedding microparticles in films on electrodes and in battery electrode matrices. When compared to similarly modified electrodes that contain nonmagnetic microparticles, magnetically modified electrodes yield significantly higher currents. A simple transition state model for the self exchange process describes electron transfer as a process where enthalpy is almost entirely driven by the electric field and charge; entropy arises from spin states. Data for the near diffusion limited oxidation of CO on Pt will be presented. The mass of platinum used in the oxygen reduction electrodes of current fuel cell vehicles must be reduced 4 to 8-fold to allow mass production at costs competitive with those of internal-combustion powertrains. Concepts of surface science suggest several pathways to the required activity gains. Improved methods for the atomic-scale characterization and control of the surface and near-surface compositions and structures of practical catalysts are accelerating the development of new oxygen reduction catalysts with the necessary combination of activity and durability.

Johna Leddy received her BA in chemistry from Rice University in 1978 and a PhD from the University of Texas in 1984. She worked with Allen J. Bard on characterization of modified electrodes. After a postdoctoral appointment in the Fuel Cell Program at Los Alamos National Laboratories, where she worked with Nick Vanderborgh, Leddy joined the faculty at Queens College, City University of New York. In 1991, she moved to the University of Iowa where she is now Associate Professor of Chemistry. Her research interests include electrochemistry, the effects of magnetic fields on electrochemical systems including fuel cells and batteries, modeling and simulation, and breath sensors. She serves as Secretary of the Electrochemical Society and Treasurer for the Society for Electroanalytical Chemistry.

Date:	**Wednesday, *Jan 27, 2010***
Location:	Lawrence Technological University
	21000 West Ten Mile Road, Southfield, MI 48075
	Building #5 (Taubman Welcome Center), 4th Floor, Room 406
	Use Parking Lot A, C or D (Lots C & D are accessed off NW Highway)
Time:	5:30 pm Reception / 6:30 pm Dinner / 7:30 pm Speaker
Price:	$20 Members / $22 Guests / $10 Students **Payment**: Cash or Check
RSVP by:	**Wednesday Jan 20, 2010 to Mr. Kent Snyder**
	Ksnyde13@ford.com
	http://www.electrochem.org/ecs/sections/detr/detr.htm


LAWRENCE TECHNOLOGICAL UNIVERSITY
THEORY AND PRACTICE
1932
SOUTHFIELD, MICHIGAN
Civic Center Drive (10 1/2 Mile Road)
To I-696, Bloomfield Hills, Pontiac
Lodge Freeway (M-10) Northwestern Hwy.
LOT "K"
PARKING LOT "F"
PARKING LOT "C"
PARKING LOT "D"
PARKING LOT "E"
PARKING LOT "I"
PARKING LOT "A"
PARKING LOT "G"
PARKING LOT "H"
N
To Telegraph Road
West Ten Mile Road
1
2
3
4
5
6
7
8
9
10
11
12
13
14


NOVI
ROYAL OAK
LTU
SOUTHFIELD
11 MILE ROAD
10 MILE ROAD
9 MILE ROAD
8 MILE ROAD
DETROIT CITY AIRPORT
1
96
75
696
275
5
10
102