



# The Electrochemical Society – Detroit Section

## *Seminar Notice: Tuesday, February 28, 2006*

### **Nanospheres Of Pt And Pt/Ru For Fuel Cells**

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The recent explosion of interest in nanotechnology and science has generated a wealth of nanostructured materials, with potential applications in miniature sensors, in separation systems and in catalysis. Often, the materials are synthesized within template hosts, both hard and soft. The work presented here is a contribution to electrocatalysis by nanospheres of Pt and Pt/Ru – formed without templates of any type.

Uniquely nano-structured platinum and platinum/ruthenium fuel cell catalysts were deposited directly onto carbon black (Ketjen Black) via potentiostatic methods and monitored coulometrically for loading. The process resulted in highly porous 200 nm catalyst spheres formed throughout the carbon black matrix. Characterizations include scanning electron microscopy (SEM), and surface area measurements by hydrogen adsorption/desorption in acid solution.

SEM micrographs were taken at several coulombic loadings. Nano-spheres nucleated and grew rapidly to a maximum size of 200 nm. High-resolution SEM micrographs revealed pores at the surface of all the spheres, and cleaved spheres showed porosity throughout the bulk of the spheres.

Hydrogen adsorption/desorption measurements on Pt nanospheres demonstrated an electrochemically active specific surface area of 50 m<sup>2</sup>/g of Pt catalyst over a range of loadings. A sharp decrease at high loadings was caused by agglomeration. The morphology of the Pt/Ru nanospheres was identical to that of Pt, but the surface areas of the former have not been determined at this time. We note that a similar morphology for Pt/Ru catalyst spheres was reported recently in the literature, but surfactants were utilized for that synthesis, and the surface areas were lower by more than a factor of two.

XPS analysis of the Pt/Ru spheres showed a constant ratio of 78% platinum to 22% ruthenium with our given deposition conditions over the entire range of loadings studied. The deposition was done potentiostatically just positive of hydrogen adsorption and the background current measured was very small.

The Pt/Ru catalysts have been tested successfully as anode materials in a direct methanol fuel cell and exhibit specific power densities of 34 mW/mg and 130 mW/mg at room temperature and 90°C, respectively.

**Date:** *Tuesday, February 28, 2006*

**Location:** Lawrence Technological University  
21000 West Ten Mile Road  
Southfield, MI 48075

**Building # 7 Galleria: Enter from  
10 Mile Rd. Park in Parking Lot A or H**

**Time:** 5:30 pm Reception / 6:30 pm Dinner / 7:30 pm Speaker

**Price:** \$20 Members  
\$22 Guests  
\$15 Students

**Payment:** Cash or Check

**Please RSVP by Friday, February 24, 2006**  
Lisa Abajian [labajian@ovonic.com](mailto:labajian@ovonic.com) or (248) 293-7002

#### **For Directions**

**Area Map:** <http://www.ltu.edu/contacts/directions.asp>

**Campus Map:**  
<http://www.ltu.edu/contacts/campusmap.asp>

