



Classroom Lesson Development

(to be posted on website)

Title of Lesson **Fabrication of Nanowires using Nanotemplates**

RET Project Connection During the RET 2008 program the teacher developed research in the Nanomanufacturing lab at NEU under the guidance of Prof. Latika Menon. The research work was oriented toward the fabrication of nanowires embedded in nanoporous alumina templates and the nano-optic characterization of metal-dielectric nanocomposites.

RET Teacher Carlos Coral-Gomez

School Middlesex Community College

Town/District Bedford / Lowell

Subject(s) taught RFID Systems, Communications Theory, Computer Programming

Subjects covered in lesson Electrochemistry, Elementary Nanoscience and Nanotechnology

Grades appropriate 2 yr. college

Lesson duration 1 week (4 hours)

Goals/Objectives of lesson Familiarize students with methods and techniques used for manufacturing of nanomaterials and nanostructures.
Create a nanotemplate and use it to produce nanowires

Background information Electrolysis and basic concepts of nanoscience and nanotechnology.
Knowledge of possible risks associated with manufacturing and use of nanomaterials

Essential questions What is the top-down nanofabrication method? What is the bottom-up nanofabrication method? What is electrolysis?, What is anodization of aluminum?, How does a nanoporous template form? How are nanowires produced? What are the dimensions of the nanostructures? Can they be controlled during fabrication?

Links to Frameworks and Standards

National

State

Local

Materials required A power source (10 VDC and 12VAC), Beaker, Aluminum foil, Platinum mesh, Chemicals (Sulfuric acid, gold solution), voltmeter, amperimeter and timer.

Lesson development During the first 2 hours the students will learn the background information to support the experimental part of the lesson. Additional information will be obtained by research and from previous lessons.

The students will make the electrochemical setup and produce the nanostructures. If possible, the nanostructures will be observed or photographed under an atomic force microscope. The students will write a report describing the circuit functionality including a plot of current vs. time and pictures of the nanostructures

References L. Menon, "Nanoarrays Fabricated Using Porous Alumina", in The Dekker Encyclopedia of Nanoscience and Nanotechnology, Marcel-Dekker Publishers (2004)

<http://www.nano.gov>

<http://nanoscience.cam.ac.uk>

[http://mitworld.mit.edu/video/483/Nanofabrication Technology](http://mitworld.mit.edu/video/483/Nanofabrication%20Technology)