Center for Functional Nanomaterials

A Window Into the Ultrasmall

Purpose:
- Grow and prepare new nanomaterials
- Develop new methods to study and learn about nanomaterials
- Fabricate ultra-small structures and devices

Sponsor:
U.S. Department of Energy's Office of Basic Energy Sciences

Project Funding:
$87 million over four years

Features:
- Clean rooms
- General laboratory space
- Wet and dry laboratory space
- Materials-synthesis equipment
- Scanning-probe and surface-characterization facilities
- Electron microscope
- Spectroscopy facilities
- Lithography-based fabrication facilities
- Office space for users and staff
- Dedicated beam lines at the NSLS

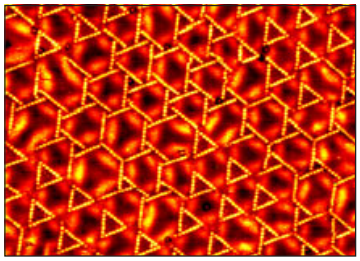
Collaborators:
24 university and industrial participants

Users:
An estimated 300 users annually

http://www.bnl.gov/nanocenter

The Nanoscience Center will complement the Lab's NSLS.

The Brookhaven National Laboratory Center for Functional Nanomaterials will provide researchers with state-of-the-art capabilities to fabricate and study nanoscale materials. These materials — typically on the scale of billionths of a meter — offer different chemical and physical properties than bulk materials, and could form the basis of new technologies.



Nanoscale arrangement: Sulfur atoms form "dancing triangles" on copper.

The Brookhaven nanocenter is one of five proposed by the U.S. Department of Energy (DOE), all to be located at DOE national laboratories. The center at Brookhaven will complement the other DOE centers, as well as university centers supported by the National Science Foundation. These centers will greatly enhance scientists' ability to investigate the effects of nanoscale dimensions on materials' properties by providing new fabrication techniques and other experimental tools.

Brookhaven's Strengths

Brookhaven brings three major strengths to the research program of nanoscience materials. First, the Laboratory operates key facilities for studying the properties of functional nanomaterials:

- The National Synchrotron Light Source (NSLS), renowned for its ability to probe small-scale structures
- The Laser-Electron Accelerator Facility, which will help uncover charge-transfer dynamics at the nanoscale
- A Transmission Electron Microscope Facility, which focuses on understanding nanoscale crystal structure and structural defects

Other tools are also available, such as scanning tunneling microscopes and atomic force microscopes, used to further characterize and understand the composition and properties of materials on the nanoscale.

Secondly, Brookhaven's scientific staff and users have had a long and established history in probing structures of new materials.

Finally, Brookhaven is an integral partner of the university community in the Northeast, where nanoscience has emerged as a major research thrust.

Brookhaven's Nano Research Areas

The nanocenter will focus on six areas:

- Metal oxides: examining changes in the electronic response of metal oxides with nanoscale dimensions
- Magnetic interactions: probing magnetic interactions in nanomaterials
- Nanocatalysts: studying new ways to form nanocatalysts and look at their electronic structure and reactivity
- Charge transfer: understanding electronic conduction in molecular wires and dots
- Nanometer-thin films of organic materials: studying how thin films self-assemble as well as their molecular and electronic structure
- Applications of nanomaterials: building new devices and biological assemblies, such as nanoscale electronic devices, ultrathin-film optical devices, and advanced fuel cell catalysts.

nanocenter

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