

Call for User Proposals: High-Impact Nanoscience Research

Center for Nanophase Materials Sciences

Oak Ridge National Laboratory

Deadline for submission: Friday, October 2, 2009

Successful applicants will be able to use CNMS facilities starting February 1, 2010

The [Center for Nanophase Materials Sciences \(CNMS\)](#) at [Oak Ridge National Laboratory \(ORNL\)](#) is [soliciting proposals](#) for user-initiated nanoscience research that will make effective use of CNMS facilities and staff expertise. The CNMS nanoscience research program provides users with access to a broad range of capabilities for nanomaterials design, synthesis, characterization, and theory/modeling/simulation in order to carry out studies that will significantly advance our understanding of nanoscale phenomena and develop functional nanomaterials systems. Access is provided at no cost to users for research that is in the public domain and intended for publication in the open literature.

Scientifically high-impact proposals are sought that take advantage of any of the CNMS research capabilities listed below. In particular, prospective users are encouraged to submit proposals that utilize and exploit synergies of research capabilities in two or more of the areas listed below, and proposers of experimental nanoscience research are encouraged to request theory/modeling/simulation collaborations as appropriate. Visit the [Capabilities section](#) of the CNMS website to learn more.

Macromolecular Nanomaterials

Synthesis and molecular level characterization of organic and hybrid nanophase materials and interfaces, including polymers and biologically inspired systems; deuterated molecules and polymers for neutron scattering studies.

Highlighted capabilities:

Synthesis of topologically-complex polymers

Controlled free-radical polymerization

Multiscale Functionality

Synthesis and characterization of inorganic and hybrid nanomaterials including carbon and oxide nanostructures, and catalytic nanomaterials and systems; Advanced characterization of nanoscale functionality by spectroscopy, scattering, and reaction methods.

Highlighted capabilities:

Computerized microactivity high-pressure catalytic reactor

In situ x-ray diffraction

Controlled atmosphere dual glove box evaporator system for wet/dry assembly of organic/inorganic/metal multilayered heterostructures

Calibrated OLED efficiency measurement

Photomodulated AC Impedance Spectroscopy

Ultrafast (40 fs) tunable pump-probe laser spectroscopy

Operando FTIR and *in situ* tunable micro- / macro-Raman spectroscopy

A pair of nanomanipulators installed in the CNMS FEG-SEM specimen chamber provides new capabilities for *in situ* interaction, mechanical and electrical sample characterization with 10 nm precision

Access to a JEOL 2200FS-AC aberration-corrected electron microscope (ACEM) for the analysis of nanostructured materials

Scanning Probes

Advanced scanning probe capabilities to study the effects of reduced and experimentally variable dimensionality; magnetism, transport, and ferroelectricity in nanostructured materials.

Highlighted capabilities:

Ambient and liquid force-based scanning probes with electrical and electromechanical spectroscopies including Band Excitation and Switching Spectroscopy PFM, and nanoscale thermal analysis

Magnetic property measurement system (SQUID)

Scanning Electron Microscope with Polarization Analysis (SEMPA), used to characterize nanoscale magnetic domain structures under an external magnetic field

PLD growth of ultrathin oxides with *in situ* characterization by variable temperature AFM, STM, PFM, LEED, RHEED, and XPS

Electronic transport with cryogenic 4-independent probe STM in UHV

Variable temperature, UHV scanning probe microscopy and spectroscopy, AFM/STM/STS

Materials synthesis by UHV MBE in UHV characterization systems (STM, 4-probe STM, SEMPA, AFM)

Nanomaterials Theory Institute

Integrated support for experimental research; development of theoretical and computational nanoscience methods to address Grand Challenges of quantum correlations and transport in nanostructures, multi-scale modeling, nanomaterials design, and virtual synthesis; user-proposed [Nanoscience Focused User Laboratories \(NanoFocULs\)](#) aimed at development and dissemination of community-based methods/codes for user-initiated research.

Highlighted capability:

Support for large-scale molecular dynamics and *ab initio* electronic structure calculations

Nanofabrication Research Laboratory

10,000-ft² cleanroom environment for nanoscale patterning, nanomaterials processing, and development of controlled synthesis and directed assembly methods; functional integration of soft and hard materials.

Highlighted capabilities:

E-beam lithography (20-nm linewidth)

Dual-beam SEM/FIB with Raith lithography

Bio-Inspired Nanomaterials

Full capabilities to manipulate and image hydrated biological samples; synthesis of vertically aligned carbon nanofiber arrays; integration of engineered nanomaterials with biological systems.

Highlighted capabilities:

Biocompatible AFM-based lithography, e.g., patterning of SAMS on substrates

Multimodality (AFM, confocal, epifluorescence, etc.) live-cell imaging, with special emphasis on imaging cell-nanomaterial interfaces and stochastic processes in cells

The CNMS website provides detailed descriptions of specific [CNMS Research Capabilities](#) that are offered to users, and this list of capabilities is duplicated in checklist form on the downloadable [CNMS User Proposal Form](#). Prospective users *are invited and strongly encouraged* to contact CNMS [staff members](#) in the respective research areas to discuss their proposal ideas and learn more about the specific capabilities of interest to them.

Design and Synthesis of Materials for NEUTRON SCATTERING. The CNMS can assist its users in developing separate proposals to use the new neutron scattering facilities at ORNL through the ORNL Neutron Science Program http://neutrons.ornl.gov/neutron_science/, which provides access to beamlines at both the Spallation Neutron Source and the High Flux Isotope Reactor. The CNMS offers two types of sample design and synthesis capabilities to encourage forefront neutron scattering investigations:

- Organic and polymer synthesis capabilities are available to prepare deuterated small molecules, monomers, and polymers for neutron scattering studies.
- The CNMS offers design and synthesis capabilities for multilayered oxide heterostructures grown with atomic-layer control, and is soliciting user proposals to explore growth methods and provide samples sufficiently thick for fundamental neutron scattering investigations of the origins of cooperative phenomena in artificial crystals.

The **deadline for submission** of user research proposals is **October 2, 2009**. Please review the Guidelines for Submission of a CNMS User Research Proposal (below) and the [Instructions for Submitting a Proposal](#). Approved projects will be granted access to CNMS facilities during the period February 1, 2010 through January 31, 2011.

The CNMS also encourages the nanoscience community to participate in and/or propose topics for the CNMS [Computational Nanoscience Focused User Laboratories \(NanoFocULs\)](#), which are intended to make available and rapidly develop powerful community-based software and methods for user-initiated research projects.

The CNMS is a highly collaborative national user research facility dedicated to the synthesis, characterization, theory/modeling/simulation, and design of nanoscale materials, and their integration into functional systems. The CNMS cannot provide direct research funding to users.

Guidelines for Submission of a CNMS User Research Proposal

1. **Content:** Each user proposal must describe clearly and *specifically* which part of the work is to be done using CNMS facilities: What CNMS tools and expertise will be needed to carry out which steps and on what timeline? Each user proposal must also clearly define the expected outcomes from the CNMS component: What are the targets or milestones that the CNMS contribution must meet in order for the overall research project to succeed? Please keep in mind that you are proposing a *specific* user project; describe the overall research program only so far as is necessary to establish the context and impact of the user proposal.
2. Priority must be given to proposals that lie within current CNMS [Capabilities](#). Proposals that require capabilities from more than one area are encouraged, as are requests for theory/modeling/simulation support for experimental projects.
3. Proposals will be reviewed by selected members of the [CNMS Proposal Review Committee](#) (according to subject area) using evaluation criteria proposed by the IUPAP in its recommendations on the operation of user facilities. Please see the DOE NSRC [Evaluation Criteria and Process](#) and [Evaluation Criteria for CNMS Research Proposals](#).
4. Prospective users are encouraged to contact one of the [staff members](#) listed for each set of related research [capabilities](#) to discuss the suitability of any particular CNMS capability for the proposed research. General questions about the proposal process can be directed to the CNMS User Program Manager, [Dr. Tony Haynes](#).

 [Go to **Instructions for Submitting a Proposal**](#)

