Argonne NATIONAL LABORATORY | CENTER FOR NANOSCALE MATERIALS

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This document CANNOT be uploaded into the CNM proposal system. This is only an aid to help you prepare information for entering into the electronic proposal fields. Do not attach this worksheet to your proposal.

CENTER FOR NANOSCALE MATERIALS RESEARCH PROPOSAL WORKSHEET

Use this worksheet to set up your proposal so when you are ready to submit, you have gathered all the information you will need in one place. **Proposals must be submitted online at http://www.pico.anl.gov/submit.**

General Information

Title of proposal	
How many visits needed to complete experiment	
How many days per visit	
Time frame for entire project (months, **12 max**)	

Please select all the research subject categories that pertain to this proposal

- ☐ Materials sciences (including condensed matter physics & materials chemistry)
- ☐ Physics (not condensed matter physics)
- ☐ Chemistry (not materials chemistry)
- ☐ Polymers
- ☐ Medical applications
- ☐ Biological and life sciences
- ☐ Earth sciences
- ☐ Environmental sciences
- ☐ Optics
- ☐ Engineering
- ☐ Instrumentation related to user facilities
- ☐ Other

Please select all the funding sources for this research

- ☐ DOE, Office of Basic Energy Sciences
- ☐ DOE, Office of Biological and Environmental Research
- ☐ DOE, Other (includes LDRD))
- ☐ DOD
- ☐ NSF
- ☐ NIH
- ☐ NASA
- ☐ USDA
- ☐ Other U.S. Government
- ☐ Industry
- ☐ Foreign
- ☐ Other
- ☐ NNSA
- ☐ Homeland Security
- ☐ Private or Public Research Foundation/Institution or Charitable Organization
- ☐ University/Education Institution

Are you collaborating with CNM personnel in performing this work or experiment?	☐ Yes ☐ No
Do you plan to perform this work or experiment with assistance from CNM personnel? (Prior permission is required to work without assistance)	☐ Yes ☐ No
Is it acceptable to disclose scientific content of this proposal to CNM personnel prior to experimental approval?	☐ Yes ☐ No
Are the data to be considered proprietary and therefore charged at cost recovery rates?	☐ Yes ☐ No
If this is a proprietary proposal, does the proposal itself disclose proprietary information that would necessitate non-disclosure agreements with reviewers?	☐ Yes ☐ No
Have you contacted CNM scientific staff to discuss the feasibility of your proposal?	☐ Yes ☐ No

Name of staff member:

How did you hear about the Center for Nanoscale Materials (CNM)? (select all that apply)

- ☐ CNM staff member
- ☐ CNM newsletter or email
- ☐ Conference presentation/booth, symposium, tour or other event
- ☐ Friend or colleague
- ☐ News article
- ☐ Scientific journal article
- ☐ Social media (e.g., LinkedIn, Facebook, Twitter, etc.)
- ☐ Trade publication (e.g., communication from an association you belong to or a trade-specific publication you read, etc.)

User Information

Principal Investigator (must be a registered user: http://beam.aps.anl.gov/pls/apsweb/ufr_main_pkg.usr_start_page)

Badge No.	Title, First, MI, Last	Affiliation and Address	Phone and Fax	Email	First Time User	Coming to CNM

Collaborators

Badge No.	Title, First, MI, Last	Affiliation and Address	Phone and Fax	Email	First Time User	Coming to CNM

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Abstract

Summarize the key scientific or engineering issues you would like to address through the use of CNM resources. In other words, summarize the technical aspects of the proposal.

-----Maximum 2000 characters (approximately 250 words) -------

Do not attach this worksheet to your proposal.

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Capabilities

THEORY AND MODELING

☐ CNM High Performance Computing Cluster (Carbon)
- ➤Total compute time requested (a value between 50,000 and 500,000 processor hours is typical):
- ➤List Computer Codes to be used that are EXTERNAL to CNM and parallelization capabilities:
- ➤Standard packages, compilers and libraries required:
- ➤Typical number of processors per job (Note: each node has 8 processors):
- ➤Typical memory per compute node:
- ➤Typical real-world time per job (hours):
- ➤Total storage capacity per job:
- ➤For real-time analysis of experimental data provide description of or reference to experimental part, bandwidth requirement for storage and processing, and characteristics for real-time processing (where applicable):
- ➤Expected number of production jobs:
- ➤Total persistent disk space required for project (GB):

☐ Computational Nanoscience Software and Modeling Expertise
- ➤Will this be used on a computing facility external to CNM? ☐Yes ☐No

☐ Dacapo

☐ Density-functional-based tight-binding (DFTB)
- ➤Will this be used on a computing facility external to CNM? ☐Yes ☐No

☐ GPaw, a real space, grid-based DFT-PAW code
- ➤Will this be used on a computing facility external to CNM? ☐Yes ☐No

☐ MPI-based parallel versions of the nanophotonics
- ➤Will this be used on a computing facility external to CNM? ☐Yes ☐No

☐ Time-domain nanophotonics simulation package
- ➤Will this be used on a computing facility external to CNM? ☐Yes ☐No

☐ VASP, ab-initio molecular dynamics calculations

☐ Other specialized analysis software or modeling expertise

QUANTUM & ENERGY MATERIALS

☐ Electrical characterization
- ➤Number of times of use:
- ➤Total hours of usage:

☐ associated high-sensitivity test systems
- ➤Number of times of use:
- ➤Total hours of usage:

☐ Keithley 4200-SCS/F Semiconductor Parameter Analyzer
- ➤Number of times of use:
- ➤Total hours of usage:

☐ Integrated Glove Box System OPV
- ➤Number of times of use:
- ➤Total hours of usage:

☐ Langmuir-Blodgett, Kibron MicroTrough X
- ➤Number of times of use:
- ➤Total hours of usage:

☐ Luminescence spectrometer, Perkin-Elmer LS 55
- ➤Number of times of use:
- ➤Total hours of usage:

☐ Magnetometry
- ➤Number of times of use:
- ➤Total hours of usage:

☐ Quantum Design MPMS-XL
- ➤Number of times of use:
- ➤Total hours of usage:

☐ Quantum Design PPMS-9
- ➤Number of times of use:
- ➤Total hours of usage:

☐ Ozone-assisted Molecular Beam Epitaxy, DCA Custom
- ➤Number of times of use:
- ➤Total hours of usage:
- ➤Number of film samples:

QUANTUM & ENERGY MATERIALS (Continued)

- ☐ Physical vapor deposition, common loadlock is shared
  - ➤Number of times of use:
  - ➤Total hours of usage:
  - ☐ Lesker e-beam evaporator (PVD250)
    - ➤Number of times of use:
    - ➤Total hours of usage:
  - ☐ Lesker sputtering system (CMS18)
    - ➤Number of times of use:
    - ➤Total hours of usage:
- ☐ Rheometer, AntonPaar Physica MCR301
  - ➤Number of times of use:
  - ➤Total hours of usage:
- ☐ Scanning probe microscope, Veeco MultiMode 8
  - ➤Number of times of use:
  - ➤Total hours of usage:
  - ☐ PeakForce quantitative nanomechanical mapping
  - ☐ PeakForce tapping
  - ☐ Torsional resonance mode
  - ☐ Contact or tapping mode
  - ☐ Fluid imaging
  - ☐ Low current scanning tunneling microscopy
  - ☐ Magnetic Force
  - ☐ Variable temperature imaging (-30 to 250 C)
- ☐ SEM/STM Omicron UHV Nanoprobe
  - ➤Number of times of use:
  - ➤Total hours of usage:
  - ➤Number of 8-hr workdays of use:
- ☐ Spin Coater, Laurell WS-400, not for lithography resist work
  - ➤Number of samples/devices:
- ☐ Synthesis Lab - inorganic crystals
  - ➤Number of times of use:
  - ➤Total hours of usage:
- ☐ Thermal analysis
  - ➤Number of times of use:
  - ➤Total hours of usage:
  - ☐ Differential scanning calorimetry, Mettler Toledo 823
  - ☐ Thermogravimetric analysis, Mettler Toledo 851
- ☐ Tube furnaces (1 in.)
  - ➤Number of times of use:
  - ➤Total hours of usage:
  - ☐ Argon gas
  - ☐ Oxygen gas
- ☐ UV-Vis-NIR spectrometer, Perkin-Elmer Lambda 950
  - ➤Number of times of use:
  - ➤Total hours of usage:
- ☐ VT-UHV-atomic force microscope/scanning tunneling microscope (AFM/STM; Omicron VT-AFM XA)
  - ➤Number of 8-hour workdays of use:
  - ☐ Contact AFM
  - ☐ Magnetic force microscopy
  - ☐ Non-contact AFM
  - ☐ Scanning tunneling spectroscopy
- ☐ Optical UHV VT STM/AFM
  - ➤Number of 8-hr workdays of use:
  - ☐ Lasers for Optical UHV VT STM/AFM
- ☐ UHV Cryo SFM with 6T magnetic field, Omicron
  - ➤Number of 8-hr workdays of use:
- ☐ Low temperature multimode scanning tunneling microscopy (LT-STM, Createc)
  - ➤Days per visit:
  - ➤Total number of days of use:
- ☐ Laser scanning interferometric microscope
  - ➤Number of 8-hr workdays of use:
- ☐ SPM Tip Etching
- ☐ West-Bond Wire Bonder
  - ➤Number of times of use:
  - ➤Total hours of usage:
- ☐ X-ray diffractometer (Bruker D2 Phaser XRD)
  - ➤Number of times of use:
  - ➤Total hours of usage:
- ☐ X-Ray diffractometer (Bruker D8 Discover, point detector, VANTEC-1 linear detector)
  - ➤Number of times of use:
  - ➤Total hours of usage:
  - ☐ Bragg-Brentano powder
  - ☐ Grazing incidence
  - ☐ High resolution four-circle
  - ☐ Reciprocal space mapping
  - ☐ Reflectivity
  - ☐ Rocking curves

NANOPHOTONICS & BIOFUNCTIONAL STRUCTURES

CHARACTERIZATION

- ☐ Bench-top spectroscopy
  - ☐ UV-Visible Absorption
    - ➤Number of times of use:
  - ☐ Emission
    - ➤Number of times of use:
    - ➤Total hours of usage:
  - ☐ FTIR Absorption
    - ➤Number of times of use:
    - ➤Total hours of usage:
  - ☐ Circular Dichroism
    - ➤Number of times of use:
    - ➤Total hours of usage:
- ☐ Raman spectroscopy
  - ➤Number of times of use:
  - ➤Total hours of usage:
  - ➤Total number of days of use:
  - ☐ Temperature-controlled stage
- ☐ Electron paramagnetic resonance spectroscopy (EPR)
  - ➤Number of times of use:
  - ➤Total hours of usage:
- ☐ Electrochemical Workstation (BASi Epsilon)
  - ➤Number of times of use:
  - ➤Total hours of usage:
- ☐ GC-MS (Agilent 5975C Series GC/MSD)
  - ➤Number of times of use:
  - ➤Total hours of usage:

FOR DEMONSTRATION PURPOSES

NANOPHOTONICS & BIOFUNCTIONAL STRUCTURES (Continued)

- ☐ HPC (LabAlliance)
  - ➤Number of times of use:
  - ➤Total hours of usage:
- ☐ ZetaSizer Nano, Malvern (particle size potential)
  - ➤Number of times of use:
  - ➤Total hours of usage:
- ☐ Time-resolved emission and photo correlation spectroscopy
  - ➤Total number of days of use:
  - ☐ Time-correlated single photon counting (TCSPC) spectroscopy
  - ☐ TCSPC Microscopy (400-800 nm)
    - ➤Number of times of use:
    - ➤Total hours of usage:
  - ☐ Visible and near-IR TCSPC with streak camera
  - ☐ Near-IR TCSPC with superconducting nanowire single photon detector
    - ➤Prior discussion with Dr. Xuedan Ma (xuedan.ma@anl.gov) is required. Have you had the discussion yet? If not, then Save the proposal without Submitting. If "Yes" then you can Submit.
- ☐ Transient absorption spectroscopy
  - ➤Days per visit:
  - ➤Total visits:
  - ➤Total number of days of use:
  - ☐ Visible probe
  - ☐ Near-IR probe
  - ☐ THz probe
    - ➤Prior discussion with Dr. Richard Schaller (schaller@anl.gov) is required. Have you had the discussion yet? If not, then Save the proposal without Submitting. If "Yes" then you can Submit.
  - ☐ Cryostat
- ☐ Visible and near-IR microscopy
  - ➤Total number of days of use:
  - ☐ Lamp illumination
  - ☐ Laser illumination
  - ☐ Visible detection
  - ☐ NEAR-IR detection
  - ☐ Cryostat
- ☐ Correlation/antibunching measurements
  - ➤Prior discussion with Dr. Xuedan Ma (xuedan.ma@anl.gov) is required. Have you had the discussion yet? If not, then Save the proposal without Submitting. If "Yes" then you can Submit.
  - ☐ Visible (350-800 nm) detection with APD detectors
  - ☐ NIR (800 nm - 2 µm) detection with Superconducting nanowire single-photon detectors (SNSPD)
- ☐ Drop Shape Analysis Tool
- ☐ Solar simulator, Oriel
  - ➤Number of times of use:
  - ➤Number of samples/devices:
- ☐ Internal/External Quantum Efficiency Measurement System (Oriel IQE-200)
  - ➤Number of samples/devices:

IMAGING

- ☐ Field Emission Scanning Electron Microscope, JEOL JSM-7500F
  - ➤Number of times of use:
  - ➤Total hours of usage:
- ☐ Laser Scanning Confocal Microscope, Zeiss LSM 510 Meta
  - ➤Number of times of use:
  - ➤Total hours of usage:
- ☐ Optical microscope, Zeiss Axio Imager Z1 M Upright
  - ➤Number of times of use:
  - ➤Total hours of usage:

SYNTHESIS/SAMPLE PREP

- ☐ General wet lab space for sample prep
  - ➤Total hours of usage:
  - ➤Total number of days of use:
- ☐ Surface Preparation
  - ☐ Harrick Plasma Cleaner
    - ➤Number of times of use:
    - ➤Total hours of usage:
  - ☐ UVO Surface Cleaner
- ☐ Autoclave
- ☐ Centrifuge
  - ➤Number of times of use:
  - ➤Total hours of usage:
  - ☐ Beckman Coulter Avanti J-E Centrifuge
  - ☐ Beckman Coulter Optima L-100 XP Ultracentrifuge
- ☐ Lyophilizer
  - ➤Number of times of use:
  - ➤Total hours of usage:
- ☐ Rotary Evaporator
  - ➤Number of times of use:
  - ➤Total hours of usage:
- ☐ Schlenk Lines
- ☐ Glove Box, MBraun LabMaster 130
- ☐ Biological Safety Cabinets, Labconco Purifier Delta Series (Class II, B2)
- ☐ Peptide Synthesizer
  - ➤Number of times of use:
  - ➤Total hours of usage:
- ☐ Synthesis
  - ☐ Surface modification of nanoparticles
  - ☐ Functionalization
  - ☐ Quantum Dots
  - ☐ Metal nanoparticles
    - ➤Number of times of use:
  - ☐ Metal oxide nanoparticles
- ☐ Post-self-assembly processing
  - ☐ External field
  - ☐ Ultrasound
  - ☐ Dip-coating

NANOFABRICATION AND DEVICES

- ☐ Lithography
  - ☐ Electron Beam Lithography System: JEOL 9300
    - ➤Number of times of use:
    - ➤Total hours of usage:
  - ☐ Heidelberg MLA 150 Maskless Lithography
    - ➤Number of times of use:
    - ➤Total hours of usage:
  - ☐ Electron Beam Lithography System: Raith 150
    - ➤Number of times of use:
    - ➤Total hours of usage:
  - ☐ Focused Ion Beam: FEI Nova 600 NanoLab
    - ➤Number of times of use:
    - ➤Total hours of usage:
  - ☐ Interferometric Lithography System
    - ➤Number of times of use:
    - ➤Total hours of usage:
  - ☐ Laser Pattern Generator (Microtech LW405, direct write optical lithography)
    - ➤Number of times of use:
    - ➤Total hours of usage:

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NANOFABRICATION AND DEVICES (Continued)

- ☐ SUSS MA6/BA6: Contact aligner for front side and front-to-back side alignment
  - ➤Number of times of use:
  - ➤Total hours of usage:
- ☐ Wafer priming oven: YES-TA series
- ☐ Stepper: ASML PAS 5000 wafer stepper
  - ➤Number of times of use:
  - ➤Total hours of usage:
- ☐ Post-Processing
  - ☐ AS-One 150 Rapid Thermal Processor
  - ☐ Critical Point Dryer (Leica CPD030)
    - ➤Number of times of use:
    - ➤Total hours of usage:
  - ☐ ADT Dicing Saw
- ☐ Wet Chemistry
  - ☐ Electroplating (Au, Cu, Fe, Ni, Pt)
  - ☐ Selective Wet Chemical Etching
    - ➤Number of times of use:
    - ➤Total hours of usage:
- ☐ Dry Etching
  - ➤Number of times of use:
  - ➤Total hours of usage:
  - ☐ Hydrofluoric acid vapor etcher
    - ➤Number of times of use:
    - ➤Total hours of usage:
  - ☐ RIE March CS-1701, Chlorine Chamber
    - ➤Number of times of use:
    - ➤Total hours of usage:
  - ☐ RIE March CS-1701, Fluorine Chamber
    - ➤Number of times of use:
    - ➤Total hours of usage:
  - ☐ RIE Oxford Plasmalab 100, Chlorine Chamber
    - ➤Number of times of use:
    - ➤Total hours of usage:
  - ☐ RIE Oxford Plasmalab 100, Fluorine Chamber
    - ➤Number of times of use:
    - ➤Total hours of usage:
  - ☐ Xactix X4 xenon difluoride etcher
    - ➤Number of times of use:
    - ➤Total hours of usage:
  - ☐ RIE Oxford ICP etcher (6-inch)
    - ➤Number of times of use:
    - ➤Total hours of usage:
- ☐ Inspection and Metrology
  - ☐ Laser Confocal Microscope OLS4100
  - ➤Number of times of use:
  - ➤Total hours of usage:
  - ☐ Filmetrics f40 Thin Film Analizer
  - ☐ Four Point Probe
  - ☐ Optical Microscope: Olympus MX-61
  - ☐ Potentiostat
  - ☐ Scanning Probe Microscope (PSIA Park Scientific XE-HDD)
    - ➤Number of times of use:
    - ➤Total hours of usage:
    - ☐ Contact and non-contact modes
    - ☐ Magnetic force microscopy
    - ☐ Scanning thermal microscopy
  - ☐ Scanning Vibrating Electrode: SVET M370
  - ☐ Three-Dimensional Contact Profilometer: Dektak 8
  - ☐ UVISEL Spectroscopic Ellipsometer: Horiba Jobin Yvon
  - ☐ Scanning Electron Microscope VEGA 3 (tungsten filament)
- ☐ Deposition
  - ☐ AJA Oxide Sputtering, 3 inch targets
    - ➤Number of times of use:
    - ➤Total hours of usage:
  - ☐ Temescal FC2000 Electron Beam Evaporator
    - ➤Film thickness:
    - ➤Materials requested (approval required):
    - ➤Number of times of use:
    - ➤Total hours of usage:
  - ☐ AJA Sputtering, 2 inch targets
    - ➤Number of times of use:
    - ➤Total hours of usage:
  - ☐ Lambda Microwave Plasma CVD System: nanocrystalline diamond deposition
    - ➤Number of times of use:
    - ➤Total hours of usage:
  - ☐ Oxford Plasmalab 100 Inductively Coupled Plasma Enhanced Chemical Vapor Deposition
    - ➤Number of times of use:
    - ➤Total hours of usage:
  - ☐ Thermal/PECVD System for CNT and Graphene Synthesis
    - ➤Number of times of use:
    - ➤Total hours of usage:
  - ☐ AJA Dielectric Sputtering System
    - ➤Number of times of use:
    - ➤Total hours of usage:
  - ☐ AJA Metal Sputtering System
    - ➤Number of times of use:
    - ➤Total hours of usage:
  - ☐ Atomic Layer Deposition (Arradiance Gemstar)
    - ➤Number of times of use:
    - ➤Total hours of usage:
  - ☐ Integrated UV-Ozone Cleaner and Molecular Vapor Coater (Nanonex Ultra-100)
- ☐ Wear/Friction Measurements
  - ☐ Multifunctional Tribometer: Friction and Wear Measurements in Controlled Environment
    - ➤Number of times of use:
    - ➤Total hours of usage:
    - ➤Prior discussion with Dr. Anirudha Sumant (sumant@anl.gov) is highly recommended. Have you had the discussion yet? If not, then Save the proposal without Submitting. If "Yes" then you can Submit.

ELECTRON AND X-RAY MICROSCOPY

- ☐ Hard X-ray Nanoprobe
  - ➤For which scheduling period are you applying:
  - ➤Number of 8-hour shifts requested for this particular cycle:
  - ➤Total 8-hour shifts requested for the duration of proposal (2 years max, 6 cycles):
  - ➤List any unsuitable dates:
- ☐ Chemical and Structural Nanoimaging
  - ➤Total 8-hour shifts requested for the duration of proposal (2 years max, 6 cycles):
  - ➤Number of 8-hour shifts requested for this particular cycle:
  - ➤Minimum number of unusable shifts per cycle:

FOR DEMONSTRATION PURPOSES

ELECTRON AND X-RAY MICROSCOPY (Continued)

☐ Scanning Nanodiffraction
➤Total 8-hour shifts requested for the duration of proposal (2 years max, 6 cycles):
➤Number of 8-hour shifts requested for this particular cycle:
➤Minimum number of unusable shifts per cycle:

☐ Synchrotron X-ray Scanning Tunneling Microscopy
➤Total 8-hour shifts requested for the duration of proposal (2 years max, 6 cycles):
➤Number of 8-hour shifts requested for this particular cycle:
➤Minimum number of unusable shifts per cycle:

☐ ACAT: Argonne Chromatic Aberration-corrected TEM
➤Summarize the work to be performed, the time requested (hours/week or hours/month for a period of X months) and the number of specimens:

☐ Cc/Cs - corrected HRTEM imaging and diffraction
➤TEM voltage:

☐ Cc/Cs - corrected EFTEM imaging and diffraction
➤TEM voltage:

☐ Other
➤Other use modes (eg., XEDS, special stages, etc.):

☐ Talos F200X (S)TEM
➤Summarize the work to be performed, the time requested (hours/week or hours/month for a period of X months) and the number of specimens:

☐ TEM imaging and diffraction (80, 120, & 200kV)
☐ STEM imaging (HAADF & BF; DF2, DF4, DPC, 80, 120, & 200 kV)
☐ XEDS, Super-X, 4SDD EDX system
☐ EDS mapping (profiles and/or maps)
☐ Lorentz imaging (200 kV)
☐ Tomography (200 kV)
☐ Other

☐ Field Emission Transmission Electron Microscope, JEOL JEM-2100F
➤Number of times of use:
➤Total hours of usage:
☐ TEM imaging and diffraction (200 kV)
☐ EFTEM imaging (200 kV)
☐ EELS (200 kV)
☐ XEDS
☐ Tomography (200 kV)
☐ Special specimen holders
☐ Liquid flow holder (room temp; may need to provide chips)
☐ Gas flow holder (room temp or 100-500C; may need to provide chips)
☐ Single-tilt heating specimen holder (T <= 900C)

☐ FEI Tecnai F20ST (S)TEM
➤Summarize the work to be performed, the time requested (hours/week or hours/month for a period of X months) and the number of specimens:

☐ TEM imaging and diffraction (80, 120, & 200 kV)
☐ STEM imaging (HAADF & BF; 80, 120, & 200 kV)
☐ EFTEM imaging and diffraction (120 & 200 kV)
☐ EELS (120 & 200 kV)
☐ XEDS
☐ Spectrum imaging (profiles and/or maps)
☐ Lorentz imaging (200 kV)
☐ Tomography (200 kV)
☐ Special specimen holders:
☐ Double-tilt liquid N2-cooled specimen holder (T >= 97 K)
☐ Double-tilt heating specimen holder (T <= 1270 K)
☐ Tilt-rotate liquid He-cooled specimen holder (T > 20 K; pre-funded user account required to purchase liquid He)
☐ Other
➤Other capabilities requested:

☐ Zeiss 1540XB FIB-SEM
➤Summarize the work to be performed, the time requested (hours/week or hours/month for a period of X months) and the number of specimens:

☐ TEM sample preparation
☐ 3D FIB-SEM serial sectioning
☐ SEI & BSE imaging (in conjunction with FIB cross-sectioning)
☐ Other
➤Other capabilities requested:

☐ Zeiss NVision FIB-SEM

☐ FEI Quanta 400F (E)SEM
➤Summarize the work to be performed, the time requested (hours/week or hours/month for a period of X months) and the number of specimens:

☐ SEI & BSE imaging (2-30 kV)
☐ XEDS mapping or spectrum imaging
☐ High-vacuum mode (P < 10^{-5} torr)
☐ Low-vacuum mode (P ~ 0.1-2 torr)
☐ ESEM mode (P ~ 2-20 torr)
☐ ESEM mode with a gas other than air or water vapor
➤Please identify the other gas or gasses:
☐ Peltier-cooled stage (T ~ 248-328 K)
☐ Heating stages (T < 1273 K or T < 1773 K)
☐ Other
➤Other capabilities requested:

☐ Hitachi S-4700-II SEM
➤Summarize the work to be performed, the time requested (hours/week or hours/month for a period of X months) and the number of specimens:

FOR DEMONSTRATION PURPOSES

ELECTRON AND X-RAY MICROSCOPY (Continued)

- ☐ SEI & BSE imaging (0.5-30 kV)
- ☐ XEDS mapping or spectrum imaging
- ☐ Specimen preparation resources (not FIB)
  - ➤Summarize the work to be performed, the time requested (hours/week or hours/month for a period of X months) and the number of specimens:
  - ☐ Cutting from bulk
  - ☐ Grinding/polishing
  - ☐ Dimpling
  - ☐ Ion-milling
  - ☐ Vacuum-coating with gold or carbon
- ☐ Electropolishing
  - ➤ Electropolishing details (chemistry, temperature, etc.):
- ☐ Other
  - ➤Other capabilities requested:
- ☐ Data Analysis
  - ☐ Image processing
  - ☐ HRTEM image simulation
  - ☐ Diffraction pattern simulation
  - ☐ XEDS analysis (including spectrum images)
  - ☐ EELS analysis (including spectrum images or EFTEM spectrum images)
  - ☐ Other
    - ➤Other capabilities requested:

Description of Research

Provide sufficient details within the text boxes below to justify your time request. Complete answers are required here or proposal will be returned (do not use attachments alone to answer the questions – attachments are for ancillary information only and should be no more than 1-2 pages in length)

1. Describe the scientific or technical purpose and the importance of the proposed research. *(4000 character limit)*

Do not attach this worksheet to your proposal.

2. Describe and justify the relevance of the proposed research to nanoscience/nanotechnology. *(2000 character limit)*

Do not attach this worksheet to your proposal.

3. Provide a justification for requesting CNM resources and the particular capabilities chosen especially if you have similar instruments in your institution. *(2000 character limit)*

Do not attach this worksheet to your proposal.

4. Describe your samples and procedures, and explain the basis for the time request(s). *(5000 character limit)*

Do not attach this worksheet to your proposal.

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5. Describe all of the participants' previous experience relevant to the proposed research AND any preliminary research results obtained. *(4000 character limit)*

Do not attach this worksheet to your proposal.

6. Describe briefly the outcome of prior allocated proposals to the CNM that are not included above. This is mandatory if this proposal is a continuation of a previous CNM proposal. Include:
   a. The previous proposal number(s).
   b. Restate the purpose.
   c. Briefly summarize the results and the role that CNM played.
   d. Provide a list of your publications and presentation that contain data obtained from using the CNM. *(7000 character limit)*

Do not attach this worksheet to your proposal.

7. References, including relevant publications. *(2000 character limit)*

Do not attach this worksheet to your proposal.

Safety

1. Will the proposed activity involve the use of carcinogens, mutagens, or reproductive hazards at the Argonne facility? ☐ Yes ☐ No
   If yes, please identify the chemicals.

Do not attach this worksheet to your proposal.

2. Will the proposed activity involve the use of biohazards at the Argonne facility? ☐ Yes ☐ No
   If yes, please identify the agents and their Risk Group.

Do not attach this worksheet to your proposal.

3. Will the proposed activity involve the use of human tissue/materials/cells at the Argonne facility? ☐ Yes ☐ No
   If yes, please indicate whether your home institution's Institutional Review Board has approved the proposed research on the specimens.

Do not attach this worksheet to your proposal.

4. Will the proposed activity require the transport of USDOT Select Etiological Agents to the Argonne facility? ☐ Yes ☐ No
   If yes, please identify the agents. Note: See List of Agents included in Appendix A of 42 CFR 72.6.

Do not attach this worksheet to your proposal.

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5. Will the proposed activity involve the use of characterization, or other handling of radioactive materials at the Argonne facility? ☐ Yes ☐ No

   If yes, please identify the radioactive materials. If the radioactive material is a sample that will be characterized using SEM or TEM at the Argonne facility, include an estimate of the activity (Bq or Ci). Note: For a self-supporting singly- or doubly-dimpled TEM specimen made from the bulk, assume a volume of 0.53 mm3 (0.53 x 10-3 cm3) per specimen. For other types of specimens, describe how you made your estimate.

Do not attach this worksheet to your proposal.

6. Will the proposed activity require the use of user-supplied equipment at the Argonne facility? ☐ Yes ☐ No

   If yes, describe the equipment to be brought to the Argonne facility. If the equipment is a laser or contains a laser, be sure to include the class of laser, for example, Class 1, Class 2, Class 3a, Class 3b, or Class 4.

Do not attach this worksheet to your proposal.

7. Will the proposed activity involve significant hazards (at the Argonne facility) that are not identified above? ☐ Yes ☐ No

   If yes, briefly describe (list) the hazards that will need to be managed at the Argonne facility.

Do not attach this worksheet to your proposal.

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