

## 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 <https://pico.cnm.anl.gov/proposals>.**

### 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

- |  |  |  |
|--|--|--|
| <input type="checkbox"/> Materials sciences (including condensed matter physics & materials chemistry)<br><input type="checkbox"/> Polymers<br><input type="checkbox"/> Earth sciences<br><input type="checkbox"/> Engineering | <input type="checkbox"/> Physics (not condensed matter physics)<br><input type="checkbox"/> Medical applications<br><input type="checkbox"/> Environmental sciences<br><input type="checkbox"/> Instrumentation related to user facilities | <input type="checkbox"/> Chemistry (not materials chemistry)<br><input type="checkbox"/> Biological and life sciences<br><input type="checkbox"/> Optics<br><input type="checkbox"/> Other |
|--|--|--|

### Please select all the funding sources for this research

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

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?  Yes  No  
(Prior permission is required to work without assistance)

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

Does this proposal involve research related to COVID-19?  Yes  No

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](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

# CENTER FOR NANOSCALE MATERIALS RESEARCH PROPOSAL WORKSHEET

## 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.

## Capabilities (examples only; this information is subject to change)

### THEORY AND MODELING

- |   |   |
|---|---|
| <ul style="list-style-type: none"><li><input type="checkbox"/> CNM High Performance Computing Cluster (Carbon)<ul style="list-style-type: none"><li>➤ Total compute time requested (a value between 50,000 and 500,000 processor hours is typical): [REDACTED]</li><li>➤ List Computer Codes to be used that are EXTERNAL to CNM and parallelization capabilities: [REDACTED]</li><li>➤ Standard packages, compilers and libraries required: [REDACTED]</li><li>➤ Typical number of processors per job (Note: each node has 8 processors): [REDACTED]</li><li>➤ Typical memory per compute node: [REDACTED]</li><li>➤ Typical real-world time per job (hours): [REDACTED]</li><li>➤ Total storage capacity per job: [REDACTED]</li><li>➤ 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): [REDACTED]</li><li>➤ Expected number of production jobs: [REDACTED]</li><li>➤ Total persistent disk space required for project (GB): [REDACTED]</li></ul></li></ul> | <ul style="list-style-type: none"><li><input type="checkbox"/> Computational Nanoscience Software and Modeling Expertise<ul style="list-style-type: none"><li>➤ Will this be used on a computing facility external to CNM? <input type="checkbox"/> Yes <input type="checkbox"/> No</li></ul></li><li><input type="checkbox"/> Dacapo</li><li><input type="checkbox"/> Density-functional-based tight-binding (DFTB)<ul style="list-style-type: none"><li>➤ Will this be used on a computing facility external to CNM? <input type="checkbox"/> Yes <input type="checkbox"/> No</li></ul></li><li><input type="checkbox"/> GPaW, a real space, grid-based DFT-PAW code<ul style="list-style-type: none"><li>➤ Will this be used on a computing facility external to CNM? <input type="checkbox"/> Yes <input type="checkbox"/> No</li></ul></li><li><input type="checkbox"/> MPI-based parallel versions of the nanophotonics<ul style="list-style-type: none"><li>➤ Will this be used on a computing facility external to CNM? <input type="checkbox"/> Yes <input type="checkbox"/> No</li></ul></li><li><input type="checkbox"/> Time-domain nanophotonics simulation package<ul style="list-style-type: none"><li>➤ Will this be used on a computing facility external to CNM? <input type="checkbox"/> Yes <input type="checkbox"/> No</li></ul></li><li><input type="checkbox"/> VASP, ab-initio molecular dynamics calculations</li><li><input type="checkbox"/> Other specialized analysis software or modeling expertise</li></ul> |
|---|---|

### QUANTUM & ENERGY MATERIALS

- |   |  |
|---|--|
| <ul style="list-style-type: none"><li><input type="checkbox"/> Electrical characterization<ul style="list-style-type: none"><li>➤ Number of times of use: [REDACTED]</li><li>➤ Total hours of usage: [REDACTED]</li></ul></li><li><input type="checkbox"/> associated high-sensitivity test systems<ul style="list-style-type: none"><li>➤ Number of times of use: [REDACTED]</li><li>➤ Total hours of usage: [REDACTED]</li></ul></li><li><input type="checkbox"/> Keithley 4200-SCS/F Semiconductor Parameter Analyzer<ul style="list-style-type: none"><li>➤ Number of times of use: [REDACTED]</li><li>➤ Total hours of usage: [REDACTED]</li></ul></li><li><input type="checkbox"/> Integrated Glove Box System OPV<ul style="list-style-type: none"><li>➤ Number of times of use: [REDACTED]</li><li>➤ Total hours of usage: [REDACTED]</li></ul></li><li><input type="checkbox"/> Langmuir-Blodgett, Kibron MicroTrough X<ul style="list-style-type: none"><li>➤ Number of times of use: [REDACTED]</li><li>➤ Total hours of usage: [REDACTED]</li></ul></li></ul> | <ul style="list-style-type: none"><li><input type="checkbox"/> Luminescence spectrometer, Perkin-Elmer LS 55<ul style="list-style-type: none"><li>➤ Number of times of use: [REDACTED]</li><li>➤ Total hours of usage: [REDACTED]</li></ul></li><li><input type="checkbox"/> Magnetometry<ul style="list-style-type: none"><li>➤ Number of times of use: [REDACTED]</li><li>➤ Total hours of usage: [REDACTED]</li></ul></li><li><input type="checkbox"/> Quantum Design MPMS-XL<ul style="list-style-type: none"><li>➤ Number of times of use: [REDACTED]</li><li>➤ Total hours of usage: [REDACTED]</li></ul></li><li><input type="checkbox"/> Quantum Design PPMS-9<ul style="list-style-type: none"><li>➤ Number of times of use: [REDACTED]</li><li>➤ Total hours of usage: [REDACTED]</li></ul></li><li><input type="checkbox"/> Ozone-assisted Molecular Beam Epitaxy, DCA Custom<ul style="list-style-type: none"><li>➤ Number of times of use: [REDACTED]</li><li>➤ Total hours of usage: [REDACTED]</li><li>➤ Number of film samples: [REDACTED]</li></ul></li></ul> |
|---|--|

# CENTER FOR NANOSCALE MATERIALS RESEARCH PROPOSAL WORKSHEET

## QUANTUM & ENERGY MATERIALS (Continued)

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

## NANOPHOTONICS & BIOFUNCTIONAL STRUCTURES

<b>CHARACTERIZATION</b> <input type="checkbox"/> Bench-top spectroscopy	<input type="checkbox"/> Raman spectroscopy >Number of times of use: [REDACTED] >Total hours of usage: [REDACTED] >Total number of days of use: [REDACTED] <input type="checkbox"/> Temperature-controlled stage
<input type="checkbox"/> UV-Visible Absorption >Number of times of use: [REDACTED]	<input type="checkbox"/> Electron paramagnetic resonance spectroscopy (EPR) >Number of times of use: [REDACTED] >Total hours of usage: [REDACTED]
<input type="checkbox"/> Emission >Number of times of use: [REDACTED] >Total hours of usage: [REDACTED]	<input type="checkbox"/> Electrochemical Workstation (BASi Epsilon) >Number of times of use: [REDACTED] >Total hours of usage: [REDACTED]
<input type="checkbox"/> FTIR Absorption >Number of times of use: [REDACTED] >Total hours of usage: [REDACTED]	<input type="checkbox"/> GC-MS (Agilent 5975C Series GC/MSD) >Number of times of use: [REDACTED] >Total hours of usage: [REDACTED]
<input type="checkbox"/> Circular Dichroism >Number of times of use: [REDACTED] >Total hours of usage: [REDACTED]	

# CENTER FOR NANOSCALE MATERIALS RESEARCH PROPOSAL WORKSHEET

## NANOPHOTONICS & BIOFUNCTIONAL STRUCTURES (Continued)

- HPC (LabAlliance)
  - Number of times of use: [REDACTED]
  - Total hours of usage: [REDACTED]
- ZetaSizer Nano, Malvern (particle size potential)
  - Number of times of use: [REDACTED]
  - Total hours of usage: [REDACTED]
- Time-resolved emission and photo correlation spectroscopy
  - Total number of days of use: [REDACTED]
  - Time-correlated single photon counting (TCSPC) spectroscopy
  - TCSPC Microscopy (400-800 nm)
    - Number of times of use: [REDACTED]
    - Total hours of usage: [REDACTED]
  - 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](mailto: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: [REDACTED]
  - Total visits: [REDACTED]
  - Total number of days of use: [REDACTED]
  - Visible probe
  - Near-IR probe
  - THz probe
    - Prior discussion with Dr. Richard Schaller ([schaller@anl.gov](mailto: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: [REDACTED]
  - Lamp illumination
  - Laser illumination
  - Visible detection
  - NEAR-IR detection
  - Cryostat
- Correlation/antibunching measurements
  - Prior discussion with Dr. Xuedan Ma ([xuedan.ma@anl.gov](mailto: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: [REDACTED]
  - Number of samples/devices: [REDACTED]
- Internal/External Quantum Efficiency Measurement System (Oriel IQE-200)
  - Number of samples/devices: [REDACTED]

### IMAGING

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

### SYNTHESIS/SAMPLE PREP

- General wet lab space for sample prep
  - Total hours of usage: [REDACTED]
  - Total number of days of use: [REDACTED]
- Surface Preparation
  - Harrick Plasma Cleaner
    - Number of times of use: [REDACTED]
    - Total hours of usage: [REDACTED]
  - UVO Surface Cleaner
- Autoclave
- Centrifuge
  - Number of times of use: [REDACTED]
  - Total hours of usage: [REDACTED]
  - Beckman Coulter Avanti J-E Centrifuge
  - Beckman Coulter Optima L-100 XP Ultracentrifuge
- Lyophilizer
  - Number of times of use: [REDACTED]
  - Total hours of usage: [REDACTED]
- Rotary Evaporator
  - Number of times of use: [REDACTED]
  - Total hours of usage: [REDACTED]
- Schlenk Lines
- Glove Box, MBraun LabMaster 130
- Biological Safety Cabinets, Labconco Purifier Delta Series (Class II, B2)
- Peptide Synthesizer
  - Number of times of use: [REDACTED]
  - Total hours of usage: [REDACTED]
- Synthesis
  - Surface modification of nanoparticles
  - Functionalization
  - Quantum Dots
  - Metal nanoparticles
    - Number of times of use: [REDACTED]
  - 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: [REDACTED]
    - Total hours of usage: [REDACTED]
  - Heidelberg MLA 150 Maskless Lithography
    - Number of times of use: [REDACTED]
    - Total hours of usage: [REDACTED]
  - Electron Beam Lithography System: Raith 150
    - Number of times of use: [REDACTED]
    - Total hours of usage: [REDACTED]
- Focused Ion Beam: FEI Nova 600 NanoLab
  - Number of times of use: [REDACTED]
  - Total hours of usage: [REDACTED]
- Interferometric Lithography System
  - Number of times of use: [REDACTED]
  - Total hours of usage: [REDACTED]
- Laser Pattern Generator (Microtech LW405, direct write optical lithography)
  - Number of times of use: [REDACTED]
  - Total hours of usage: [REDACTED]

## NANOFABRICATION AND DEVICES (Continued)

- SUSS MA6/BA6: Contact aligner for front side and front-to-back side alignment
  - Number of times of use: [REDACTED]
  - Total hours of usage: [REDACTED]
- Wafer priming oven: YES-TA series
- Stepper: ASML PAS 5000 wafer stepper
  - Number of times of use: [REDACTED]
  - Total hours of usage: [REDACTED]
- Post-Processing
  - AS-One 150 Rapid Thermal Processor
  - Critical Point Dryer (Leica CPD030)
    - Number of times of use: [REDACTED]
    - Total hours of usage: [REDACTED]
  - ADT Dicing Saw
- Wet Chemistry
  - Electroplating (Au, Cu, Fe, Ni, Pt)
  - Selective Wet Chemical Etching
    - Number of times of use: [REDACTED]
    - Total hours of usage: [REDACTED]
- Dry Etching
  - Number of times of use: [REDACTED]
  - Total hours of usage: [REDACTED]
  - Hydrofluoric acid vapor etcher
    - Number of times of use: [REDACTED]
    - Total hours of usage: [REDACTED]
  - RIE March CS-1701, Chlorine Chamber
    - Number of times of use: [REDACTED]
    - Total hours of usage: [REDACTED]
  - RIE March CS-1701, Fluorine Chamber
    - Number of times of use: [REDACTED]
    - Total hours of usage: [REDACTED]
  - RIE Oxford Plasmalab 100, Chlorine Chamber
    - Number of times of use: [REDACTED]
    - Total hours of usage: [REDACTED]
  - RIE Oxford Plasmalab 100, Fluorine Chamber
    - Number of times of use: [REDACTED]
    - Total hours of usage: [REDACTED]
  - Xactix X4 xenon difluoride etcher
    - Number of times of use: [REDACTED]
    - Total hours of usage: [REDACTED]
  - RIE Oxford ICP etcher (6-inch)
    - Number of times of use: [REDACTED]
    - Total hours of usage: [REDACTED]
- Inspection and Metrology
  - Laser Confocal Microscope OLS4100
    - Number of times of use: [REDACTED]
    - Total hours of usage: [REDACTED]
  - Filmetrics f40 Thin Film Analyzer
  - Four Point Probe
  - Optical Microscope: Olympus MX-61
  - Potentiostat

- Scanning Probe Microscope (PSIA Park Scientific XE-HDD)
  - Number of times of use: [REDACTED]
  - Total hours of usage: [REDACTED]
  - 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: [REDACTED]
    - Total hours of usage: [REDACTED]
  - Temescal FC2000 Electron Beam Evaporator
    - Film thickness: [REDACTED]
    - Materials requested (approval required): [REDACTED]
    - Number of times of use: [REDACTED]
    - Total hours of usage: [REDACTED]
  - AJA Sputtering, 2 inch targets
    - Number of times of use: [REDACTED]
    - Total hours of usage: [REDACTED]
  - Lambda Microwave Plasma CVD System: nanocrystalline diamond deposition
    - Number of times of use: [REDACTED]
    - Total hours of usage: [REDACTED]
  - Oxford Plasmalab 100 Inductively Coupled Plasma Enhanced Chemical Vapor Deposition
    - Number of times of use: [REDACTED]
    - Total hours of usage: [REDACTED]
  - Thermal/PECVD System for CNT and Graphene Synthesis
    - Number of times of use: [REDACTED]
    - Total hours of usage: [REDACTED]
  - AJA Dielectric Sputtering System
    - Number of times of use: [REDACTED]
    - Total hours of usage: [REDACTED]
  - AJA Metal Sputtering System
    - Number of times of use: [REDACTED]
    - Total hours of usage: [REDACTED]
  - Atomic Layer Deposition (Arradiance Gemstar)
    - Number of times of use: [REDACTED]
    - Total hours of usage: [REDACTED]
  - 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: [REDACTED]
    - Total hours of usage: [REDACTED]
    - Prior discussion with Dr. Anirudha Sumant ([sumant@anl.gov](mailto: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: [REDACTED]
  - Number of 8-hour shifts requested for this particular cycle: [REDACTED]
  - Total 8-hour shifts requested for the duration of proposal (2 years max, 6 cycles): [REDACTED]
  - List any unsuitable dates: [REDACTED]
- Chemical and Structural Nanoimaging
  - Total 8-hour shifts requested for the duration of proposal (2 years max, 6 cycles): [REDACTED]
  - Number of 8-hour shifts requested for this particular cycle: [REDACTED]
  - Minimum number of unusable shifts per cycle: [REDACTED]

# CENTER FOR NANOSCALE MATERIALS RESEARCH PROPOSAL WORKSHEET

## ELECTRON AND X-RAY MICROSCOPY (Continued)

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

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

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:  
 [REDACTED]

Cc/Cs - corrected HRTEM imaging and diffraction  
 ▶ TEM voltage: [REDACTED]

Cc/Cs - corrected EFTEM imaging and diffraction  
 ▶ TEM voltage: [REDACTED]

Other  
 ▶ Other use modes (eg., XEDS, special stages, etc.):  
 [REDACTED]

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:  
 [REDACTED]

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: [REDACTED]  
 ▶ Total hours of usage: [REDACTED]

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:  
 [REDACTED]

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:  
 [REDACTED]

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:  
 [REDACTED]

TEM sample preparation

3D FIB-SEM serial sectioning

SEI & BSE imaging (in conjunction with FIB cross-sectioning)

Other  
 ▶ Other capabilities requested:  
 [REDACTED]

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:  
 [REDACTED]

SEI & BSE imaging (2-30 kV)

XEDS mapping or spectrum imaging

High-vacuum mode (P < 10<sup>-5</sup> 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:  
 [REDACTED]

Peltier-cooled stage (T ~ 248-328 K)

Heating stages (T < 1273 K or T < 1773 K)

Other  
 ▶ Other capabilities requested:  
 [REDACTED]

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:  
 [REDACTED]

# CENTER FOR NANOSCALE MATERIALS RESEARCH PROPOSAL WORKSHEET

## ELECTRON AND X-RAY MICROSCOPY (Continued)

<input type="checkbox"/> SEI & BSE imaging (0.5-30 kV) <input type="checkbox"/> XEDS mapping or spectrum imaging <input type="checkbox"/> 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: [REDACTED] <input type="checkbox"/> Cutting from bulk <input type="checkbox"/> Grinding/polishing <input type="checkbox"/> Dimpling <input type="checkbox"/> Ion-milling <input type="checkbox"/> Vacuum-coating with gold or carbon	<input type="checkbox"/> Electropolishing > Electropolishing details (chemistry, temperature, etc.): [REDACTED] <input type="checkbox"/> Other > Other capabilities requested: [REDACTED] <input type="checkbox"/> Data Analysis <input type="checkbox"/> Image processing <input type="checkbox"/> HRTEM image simulation <input type="checkbox"/> Diffraction pattern simulation <input type="checkbox"/> XEDS analysis (including spectrum images) <input type="checkbox"/> EELS analysis (including spectrum images or EFTEM spectrum images) <input type="checkbox"/> Other > Other capabilities requested: [REDACTED]
---	---

## 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).

Optional: Attach ancillary files (PDF format only) here

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.

5. Describe all of the participants' previous experience relevant to the proposed research

# CENTER FOR NANOSCALE MATERIALS RESEARCH PROPOSAL WORKSHEET

AND any preliminary research results obtained.

(4000 character limit)

Do not attach this worksheet to your proposal.

6. If not included above, briefly describe the outcome of prior CNM proposals. This is mandatory if this proposal is a continuation of a previous CNM proposal. In the latter case include:
- The previous proposal number(s) for the past 2 years.
  - Restate the purpose.
  - Briefly summarize the results and CNM's role.
  - Provide a list of your publications containing CNM data from the past 2-3 years.

(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?  
If yes, please identify the chemicals.

Yes  No

Do not attach this worksheet to your proposal.

2. Will the proposed activity involve the use of biohazards at the Argonne facility?  
If yes, please identify the agents and their Risk Group.

Yes  No

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?  
If yes, please indicate whether your home institution's Institutional Review Board has approved the proposed research on the specimens.

Yes  No

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?  
If yes, please identify the agents. Note: See List of Agents included in Appendix A of 42 CFR 72.6.

Yes  No

Do not attach this worksheet to your proposal.



## CENTER FOR NANOSCALE MATERIALS RESEARCH PROPOSAL WORKSHEET

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 mm<sup>3</sup> (0.53 x 10<sup>-3</sup> cm<sup>3</sup>) 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.

FOR DEMONSTRATION PURPOSES