Center for Nanoscale Materials

Interim Director: Andreas Roelofs
Manager of User & Outreach Programs: Katie Carrado Gregar
cnm_useroffice@anl.gov

Electronic & Magnetic Materials & Devices

Group Members

Anand Bhattacharya, anand@anl.gov,
- oxide MBE

Seth Darling, darling@anl.gov
- solar energy, organic PV, AFM, QEMS

Brandon Fisher, fisher@anl.gov,
- magnetometry, STM/SEM, XRD

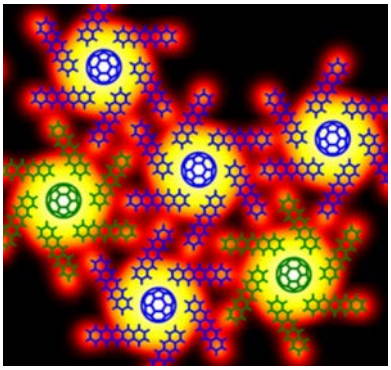
Jeffrey Guest, jrguest@anl.gov
- STM, AFM, ultrafast microscopy

Nathan Guisinger, nguisinger@anl.gov
- STM, AFM, graphene

Saw Wai Hla (Group Leader), shla@anl.gov
- LT-STM, SP-STM, AFM

Xiao-Min Lin, xmlin@anl.gov
- synthesis of nanocrystal building blocks

Dan Rosenmann, rosenmann@anl.gov
- Kurt Lesker evaporation, deposition, sputtering, oxide MBE



Major Tools

- UHV SPM (AFM/STM) (Omicron Nanotechnology)
- 4-probe STM/SEM (Omicron UHV Nanoprobe)
- VT-AFM (Omicron XA)
- Scanning probe microscope (Veeco Multimode)
- Complex Oxide MBE (DCA R450D Custom)
- Electron beam evaporator and sputtering deposition
- Magnetometry (QD PPMS & MPMS)
- Rheometer
- Solar simulator, QEMS (Oriel)
- TGA/Luminescence/UV-vis-NIR
- X-ray diffractometer (Bruker D2 & D8)

NanoBio Interfaces

Group Members

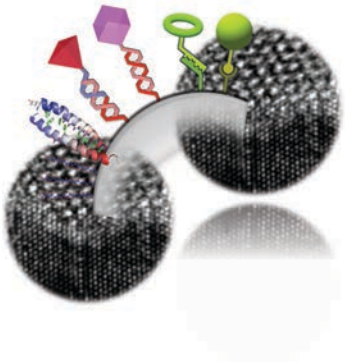
Chris Fry, hfry@anl.gov
- synthesis, peptide synthesis, HPLC, CD

Yuzi Liu, yuziliu@anl.gov
- analytical TEM

Tijana Rajh (Group Leader), rajh@anl.gov
- EPR, quantum dots, semiconductor-bio composites, LSCM

Elena Rozhkova, rozhkova@anl.gov
- bio(in)organic, biological chemistry, synthetic biology, GC/MS

Elena Shevchenko, eshevchenko@anl.gov
- 2-D and 3-D nanoparticle assembly, SEM



Major Tools

- Field-emission TEM (JEOL 2100F)
- Field-emission SEM (JEOL JSM7500F)
- Electron paramagnetic resonance
- Circular dichroism spectrometry
- Functionalization, electro/photochemical
- HPLC, GCMS
- Laser Scanning Confocal Microscope (Zeiss LSM)
- Post-self-assembly processing
- Schlenk Lines
- Solvent Purification
- Peptide synthesizer
- Synthesis & surface modification of nanoparticles
- ZetaSizer Nano, Malvern

Nanofabrication & Devices

Group Members

David Czaplewski, dczaplewski@anl.gov
- MEMS/NEMS technology

Ralu Divan, divan@anl.gov
- lithography, nanogels, MEMS/NEMS

Daniel Lopez (Group Leader), dlopez@anl.gov
- MEMS/NEMS technology

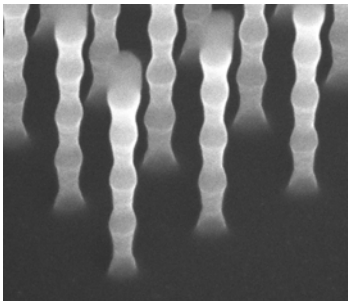
C. Suzanne Miller, csmiller@anl.gov
- dicing saw, ALD, Karl Suss aligner

Leo Ocola, ocola@anl.gov
- nanofabrication, electron beam lithography

Liliana Stan, lstan@anl.gov
- PVD, sputtering, IBAD, evaporation

Anirudha Sumant, sumant@anl.gov
- diamond-based NEMS, ALD, CNT, graphene

Il Woong Jung, ijung@anl.gov
- focused ion beam lithography



Major Tools

- JEOL 9300 FS, 100 kV Electron Beam Lithography
- Raith 150, 30 KV Electron Beam Lithography
- FEI Nova 600 NanoLab DualBeam FIB/SEM
- Karl Suss MA6 Optical mass aligner
- Nanonex NX-3000 Step and Repeat Nanoimprint
- Direct write optical lithography
- Interferometric lithography
- Resist processing
- Plasma processing (chlorine, fluorine chambers barrel asher system)
- Wet chemistry & metrology
- SPM, PSIA XE-HDD
- Deposition (ebeam evaporator and sputtering, ALD, MOCVD)
- CNT, graphene, nanocrystalline diamond synthesis

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Nanophotonics

Group Members

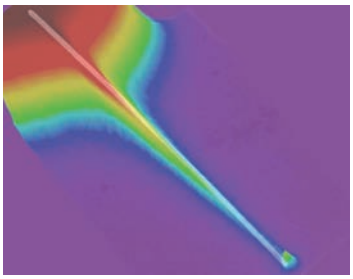
David Gosztola, gosztola@anl.gov
- laser spectroscopy, Raman, near-IR, NSOM

Richard Schaller, schaller@anl.gov
- transient absorption/emission spectroscopy

Yugang Sun, ygsun@anl.gov
- synthesis/fab of functional nanomaterials
- optical, electronic, mechanical properties

Stefan Vajda, vajda@anl.gov
- size selected cluster facility

Gary Wiederrecht (Group Leader), wiederrecht@anl.gov
- microscopy of spatial resolution below diffraction limit, NSOM, UTAS



Major Tools

- NSOM
  - CW laser excitation
  - ultrafast laser excitation
- Colloidal synthesis
- Confocal Raman microscope, Renishaw
- Size-selected cluster facility
- Time-correlated single photon counting
- Ultrafast transient absorption spectroscopy
- Ultrafast microscope
- VIS/NIR microscopy

Theory & Modeling

Group Members

Maria Chan, mchan@anl.gov
- photovoltaics, photocatalysts, nanostructured thermoelectrics, lithium battery electrodes

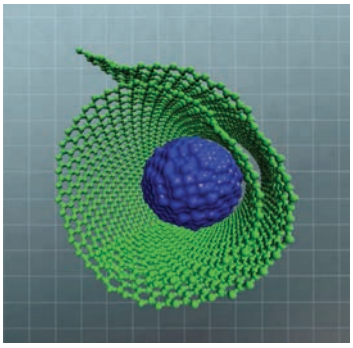
Larry Curtiss, curtiss@anl.gov
- quantum chemical studies

Stephen Gray (Group Leader), gray@anl.gov
- nanophotonics, electrodynamic simulations

Jeff Greeley, jgreeley@anl.gov
- nanocatalysis (also Purdue Univ)

Michael Sternberg, sternberg@anl.gov
- software development

Subramanian Sankaranarayanan,
- ssankaranarayanan@anl.gov
- nanoscale oxide energy materials



Major Tools

- Nanoscience Computational Facility
  25 TFlop cluster for:
  - Density-functional-based tight-binding (DFTB) electronic structure package
  - Time-domain nanophotonics simulation
  - MPI-based parallel versions of nanophotonics and tight-binding codes
  - GPAW; real space, grid-based DFT-PAW
- Access to Argonne computer facilities
- Support for experimental projects
- Support for theoretical projects

X-ray Microscopy

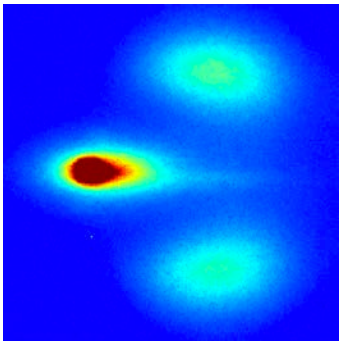
Group Members

Martin Holt, mvholt@anl.gov
- x-ray diffraction and fluorescence

Ian McNulty (Group Leader), mcnulty@anl.gov
- diffraction, holography, x-ray microscopy, optics

Volker Rose, vrose@anl.gov
- synchrotron x-ray scanning tunneling microscopy

Robert Winarski, winarski@anl.gov
- x-ray imaging and tomography



Major Tools

- Hard X-ray nanoprobe beamline, sector 26 of APS
- Scanning probe X-ray diffraction microscopy
- Scanning probe X-ray fluorescence microscopy
- Full-field two-dimensional transmission imaging and tomography
- Heating/cooling specimen stage
- 30 – 50 nm resolution, 8 - 12 keV