Nano Science and Engineering

From biomedical products to computer chip technologies and energy-saving devices, nanotechnology is revolutionizing multiple fields based on innovative research occurring at one billionth of a meter. UNT researchers working at this scale are pioneering current and next-generation materials that will not only yield novel new applications and extend the lifetime of nanoscale materials but will transform the way research itself is performed. Robust technical facilities and a diverse knowledge base reflect UNT's commitment to transform its infrastructure and give researchers the tools needed to advance competitive projects. Among the resources available are an ultrafast spectroscopy and nanophotonics laboratory—unique in the nation for research in the UV-Visible region, and a Nanofabrication Analysis and Research Facility with powerful fabrication, characterization and synthesis tools for materials analysis. These investments have garnered the attention and financial support of top ranking industry leaders and government agencies and help recruit exceptional talent to its existing base of expertise.

- **Ultrafast spectroscopy for nanoscale materials beyond the diffraction limit; one of the only facilities available in the United States for the UV-Visible region**
- **Pioneering nano research** *1) organic light-emitting diodes; 2) structurally complex materials for use in bone repair and drug delivery systems; 3) thin film deposition and plasma processing of surfaces for innovative chip design and micro-/nanoelectronic devices; and 4) next-generation photovoltaic solar cells*
- **Renowned faculty maintain partnerships with distinguished collaborators such as INTEL, the Department of Defense, Department of Energy, Los Alamos National Laboratory, and the Semiconductor Research Corporation (SRC)**
- **New university Nanofabrication Analysis and Research Facility houses one of the most advanced university research laboratories in the nation for materials synthesis and analysis, with a clean room to fabricate, test and transfer materials in close proximity under controlled atmospheric conditions**

Representative Faculty

Raj Banerjee, Director of the Center for Advanced Research and Technology; and Professor of Materials Science and Engineering: *titanium and its alloys; nickel base superalloys; metal matrix composites; and nanostructured thin films*

Witold Brostow, Regents Professor of Materials Science and Engineering: *polymeric and composite systems and materials design*

Oliver Chyan, Professor of Chemistry: *analytical and materials chemistry*

Narendra Dahotre, Chair and Professor of Materials Science and Engineering: *laser materials interactions and laser surface engineering; and biomaterials*

Nandika D'Souza, Professor of Mechanical and Energy Engineering and Materials Science and Engineering: *renewable "green" bioproducts based on engineered polymers and composites*

Jincheng Du, Assistant Professor of Materials Science and Engineering: *atomistic modeling and the study of complex materials for use in bone repair and drug delivery systems*

Aleksandra Fortier, Assistant Professor of Mechanical and Energy Engineering: *nano-based Pb-Free technology*

Jeffry Kelber, Regents Professor of Chemistry: *thin film deposition; plasma processing; and novel electronic materials*

Saraju Mohanty, Associate Professor of Computer Science and Engineering: *innovative chip technology; and computer aided design (CAD) for nanoscale VLSI*

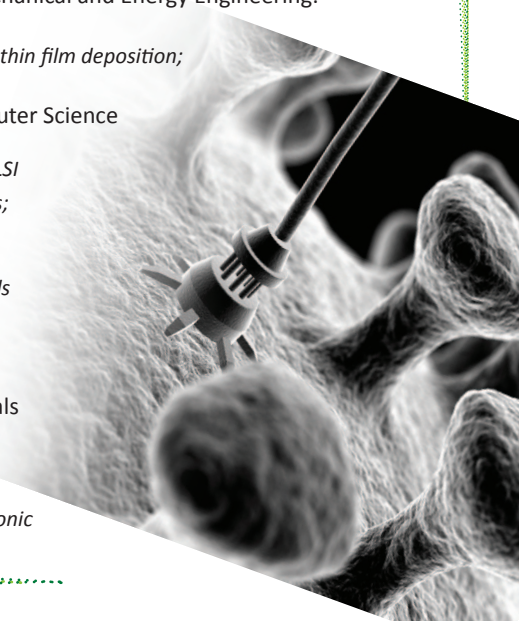
Arup Neogi, Professor of Physics: *quantum dots; plasmonic nanomaterials; and biophotonics*

Mohammad Omary, Professor of Chemistry: *bio/nano-photonics; and transition metal compounds on wide band gap semiconductors*

Usha Philipose, Assistant Professor of Physics: *semiconductor nanowires*

Thomas Scharf, Associate Professor of Materials Science and Engineering: *surface engineering of nanostructural materials*

Justin Youngblood, Assistant Professor of Chemistry: *design and synthesis of organic electronic materials for photovoltaic solar cells*



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Select Research Resources

CART: Center for Advanced Research and Technology
research.unt.edu/cart

CART is one of the most advanced university research facilities in the nation for materials analysis, from atomic to macro scales. The facility offers a suite of sophisticated analytical instruments used for true 3-D characterization and processing with an adjoining clean room so that materials can be synthesized, tested, and controlled in close proximity, creating a powerful combination of capabilities in one location.

ISES: Institute for Science and Engineering Simulation
research.unt.edu/ises

ISES uses advanced characterization, simulation and modeling of aerospace components and materials to maintain and extend the life of aging U.S. Air Force aircraft, prevent catastrophic engine failure, and develop better materials for the next generation of aircraft.

CEMPI: Center for Electronic Materials Processing and Integration
research.unt.edu/cempi

CEMPI studies advanced plasma processes and insulators used in manufacturing state-of-the-art semiconductor chips, with a mission to increase performance. The center is jointly funded by UNT and the Semiconductor Research Corporation (SRC), the world's leading industry consortium for research in semiconductors and related technologies.

Advanced Thin Films Laboratories
www.mtse.unt.edu/LaMMA; www.mtse.unt.edu/OTFL/index.html

Laboratories include the **Laboratory for Moving Mechanical Assemblies**, which supports the synthesis and processing of thin films and laser processed bulk composites, characterization, and interrelationships of ceramic, metallic and polymeric materials; and the **Optoelectronics and Thin Films Laboratory**, which investigates the growth of compound semiconductor thin films and their optical and carrier transport properties.

Surface Science Laboratory
www.chem.unt.edu/research/centers/ssl

Research focuses on atomic level understanding and control of chemistry at surfaces and interfaces in various environments, including ultra-high vacuum (UHV), high pressure, gas phase environments, and aqueous solutions. Important applications include microelectronics fabrication, nanocatalysis, and corrosion.

Ultrafast Spectroscopy and Nanophotonics Laboratory
www.phys.unt.edu/research/photonic/index.htm

UNT offers one of the only facilities available in the United States for the UV-Visible region. A complement of optical, electronic characterization, and device modeling computational facilities additionally advance experiments ranging from time-resolved photoluminescence and absorption spectroscopy, to differential transmission spectroscopy, etching, and electrical device fabrication.

TALON: High-Performance Computing System
citc.unt.edu/hpc/content/talon

Unique to the region, the TALON supercomputer features computing clusters supported by high-speed networks, high performance storage, and advanced software. The Talon HPC system greatly increases the computational resources available to UNT researchers.

Contributing Research Clusters:

Bio/Nano-Photonics
photonics.unt.edu

Materials Modeling
mmrc.unt.edu

Multi-scale Surface Science and Engineering
surfaces.unt.edu