

## Advanced Materials

The synthesis, characterization, and utilization of novel materials occupy a central role in modern science and technology. All classes of materials, from metallic, ceramic, and polymeric to hybrid and plant-based materials, are investigated at UNT by some of the most distinguished scientists and engineers in the field. Extensive expertise bridges plant sciences and genetics with chemistry and engineering to promote earth sustainable fuels and biodegradable materials. UNT also offers a state-of-the-art research infrastructure to advance both the theoretical and applied pursuit of materials research. Close interaction and synergy between the experimental and computational researchers foster a thorough understanding of material structure, properties, performance and integrity that distinguishes this program from others in the nation. Applications include semiconductor materials for ultrafast electronic devices; new materials for solar cells and biomedical implants; nano/bio photonics for drug delivery and medical devices; composite materials to improve aircraft; and “green” industrial bioproducts and fuel. UNT offers one of the most advanced university research facilities in the nation for cross-analysis of materials, with a suite of powerful analytical and characterization instruments and adjoining clean room where materials can be synthesized, tested and transferred under controlled atmospheric conditions.

- Suite of sophisticated analytical and characterization instruments and adjoining clean room creates a powerful combination of capabilities in one location
- Technology incubator fosters partnerships between researchers, industries, and government agencies to test and commercialize cutting edge technologies
- Innovative research base combines surface science and multi-scale engineering for materials synthesis and analysis, from atomic to macro scales
- UNT-based, Semiconductor Research Corporation supported, multi-university research center focuses on electronic materials processing and integration

### 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 materials design*

**Mohamed El Bouanani**, Associate Professor of Materials Science and Engineering: *growth, processing and characterization of inorganic thin film nanostructures*

**Stevens Brumbley**, Associate Professor of Biological Sciences: *plant metabolic engineering*

**Oliver M.R. Chyan**, Professor of Chemistry: *microelectronic materials chemistry; plasma assisted functional thin-film materials; and novel materials for alternative energy production*

**Pete Collins**, Assistant Professor of Materials Science and Engineering: *advanced characterization techniques; and fundamentals of advanced titanium alloys*

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

**Jeffrey A. Kelber**, Regents Professor of Chemistry: *chemical vapor deposition and the chemistry of oxide surfaces*

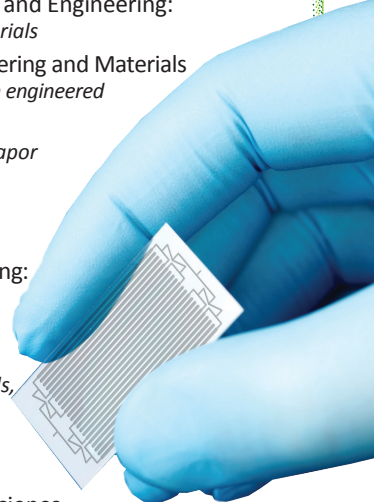
**Yuankun Lin**, Associate Professor of Physics and Electrical Engineering: *photonics; laser optics; and sensors*

**Alan Needleman**, Professor of Materials Science and Engineering: *continuum mechanics; and computational modeling of deformation and fracture processes in structural materials*

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

**Nigel Shepherd**, Assistant Professor of Materials Science and Engineering: *optoelectronics and thin film materials*

**Srinivasan Srivilliputhur**, Assistant Professor of Materials Science and Engineering: *structure property-relations in metals and alloys*



## Select Research Resources

### **CART: Center for Advanced Research and Technology**

[research.unt.edu/cart](http://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 powerful 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. UNT is among an elite group of public institutions nationwide to offer these open access resources.

### **CEMPI: Center for Electronic Materials Processing and Integration**

[research.unt.edu/cempi](http://research.unt.edu/cempi)

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

### **Advanced Polymer Laboratories**

[www.unt.edu/LAPOM](http://www.unt.edu/LAPOM)

UNT houses two important advanced polymer laboratories. The *Laboratory of Advanced Polymers and Optimized Materials* specializes in the development of materials, components and coatings. The *Polymer Mechanical and Rheology Laboratory* focuses on structure property relationships to increase the reliability of materials using thermally controlled new equipment and sophisticated instruments.

### **Surface Science Laboratory**

[www.chem.unt.edu/research/centers/ssl](http://www.chem.unt.edu/research/centers/ssl)

Research in this laboratory 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.

### **Laboratories for Ultrafast Spectroscopy and Nanophotonics; and Imaging Mass Spectrometry**

[www.phys.unt.edu/research/photonic/index.htm](http://www.phys.unt.edu/research/photonic/index.htm);

[www.chem.unt.edu/facilities/UNTLIMS/index.htm](http://www.chem.unt.edu/facilities/UNTLIMS/index.htm)

UNT offers one of the only facilities available in the US for the UV-Visible region, with ultrafast spectroscopy for nanoscale materials beyond the diffraction limit. Optical, electronic characterization, and device modeling computational equipment advance experiments ranging from time-resolved photoluminescence and absorption spectroscopy, to etching, and electrical device fabrication. Mass spectrometry and imaging instruments support local, national, and international research.

### **ISES: Institute for Science and Engineering Simulation**

[research.unt.edu/ises](http://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 aid the U.S. Air Force in developing better materials for the next generation of aircraft.

### **Contributing Research Clusters:**

#### **Materials Modeling**

[mmrc.unt.edu](http://mmrc.unt.edu)

#### **Multi-scale Surface Science and Engineering**

[surfaces.unt.edu](http://surfaces.unt.edu)

#### **Renewable Bioproducts**

[renewablebioproducts.unt.edu](http://renewablebioproducts.unt.edu)

