

Department of Materials Science and Engineering

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Michael J. Kaufman, Chair

Faculty

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Introduction

The Department of Materials Science and Engineering addresses the education and technological challenges of creating, applying and characterizing new materials for the 21st century. The department of Materials Science and Engineering is committed to training students at the graduate level in all aspects of modern materials including metals, ceramics, polymers, electronic and optical materials and materials characterization. Students have opportunities for hands-on research with modern equipment and facilities. The department has strong collaborative programs with other universities in the Dallas-Fort Worth region and with industry throughout the world. Students have an opportunity to develop highly marketable skills and have readily obtained jobs with high-technology companies in electronics, chemical, electric power and environmental industries and in academia.

Undergraduate students who are interested in materials science may enroll in specialized undergraduate research courses with the consent of their adviser and the graduate adviser of the Department of Materials Science and Engineering.

Research

The Laboratory of Polymers and Composites works on reliability and prediction of service performance, polymer liquid crystals and their blends, fiber reinforced composites and polymer solutions. Mechanical, thermophysical and rheological properties are investigated using computer simulations, statistical mechanics and a variety of experimental techniques (DMTA, TMA, TSD, DSC, TGA, PV-T relations, computerized tension, compressions, blending and impact testing).

The Electron Microscopy Laboratory is currently investigating a wide variety of materials including

quantum-confined semiconductor nanoparticles, particulate contamination in semiconductor processing chemicals, dental amalgams, thin film ferroelectrics, integrated circuits, steels used in electric power generation plants, and aluminum alloys for aerospace applications. Equipment includes a Hitachi H-9000 high resolution transmission electron microscope capable of 0.17 mm resolution, a JEOL 200CX analytical transmission electron microscope, a JEOL 100CX analytical electron microscope and several scanning electron microscopes.

The Material Mechanics Laboratory is engaged in investigations of interrelationships between morphology and mechanical properties through the influences of time and temperature. A Mechanical Testing System (MTS810) equipped with an environmental chamber, video and thermal wave imaging provide stress pattern-temperature relationships around propagating cracks. Dynamic Mechanical Thermal Analysis provides viscoelastic and rheological property evaluation. The laboratory is also engaged in thermally stimulated Depolarization experimental techniques of polymer blends.

The Materials Synthesis and Processing Laboratory has research interests focused on the development of ferroelectrics, aerogels, and other novel ceramics for energy, sensor, and high temperature applications. Equipment includes a critical point dryer, a BET surface area analyzer, electrical conductivity apparatus, high temperature furnaces and a controlled atmosphere glove box.

The Laboratory for Electronic Materials and Devices is working on basic and applied research for novel materials for advanced electronic devices of all kinds. The laboratory provides semiconductor-related materials growth and characterization capabilities that are available in only a few academic laboratories in the world. The laboratory is centered around a multichamber MBE/materialization/dielectric Group IV deposition system, coupled to a comprehensive surface science system as well as a 3 MV particle acceleration for in-situ materials characterization. Research areas include advanced dielectric materials, devices for high field chemical reactions, and molecular electronic devices.

Programs of Study

The department offers graduate programs in the following areas:

- Master of Science, and
- Doctor of Philosophy, both with a major in materials science and engineering.

Courses of Instruction

All Courses of Instruction are located in one section at the back of this catalog. The "Course and Subject Guide," found in the Courses of Instruction section of this book, serves as a table of contents and provides quick access to subject areas and prefixes.