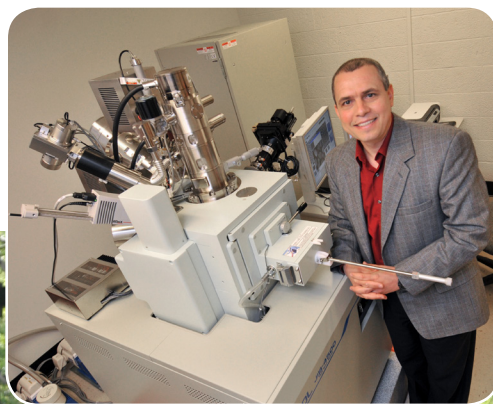


Admission to the Program

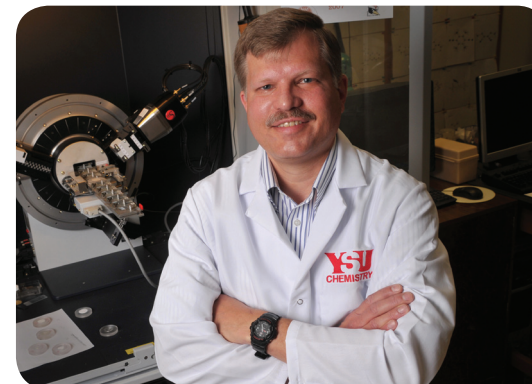
Students with a B.S. or M.S. in materials science, materials engineering, or related fields (including chemistry, physics, or mechanical, chemical, or electrical engineering) can be admitted through the School of Graduate Studies and Research on a space-available basis (see process outlined at <http://www.yzu.edu/gradschool/admission.shtml>.) Typical requirements for admission to the Ph.D. include the following:

- a B.S. or M.S. degree in a materials relevant field
- an un-recalculated cumulative undergraduate grade-point average of at least 3.0 on a 4.0 scale, or an un-recalculated graduate GPA of 3.3/4.0.
- GRE scores that would generally be reviewed favorably: Verbal = 500-800, Quantitative = 650-800, and Analytical Writing = 4.0-6.0.
- A statement of purpose of approximately 1,000 words indicating intent and proposed area of specialization;
- Three letters of recommendation
- For students whose native language is not English, a TOEFL score of 600 (or comparable score on a similar test).

All applications will be reviewed by an admissions committee consisting of the program director and a small group of program faculty of sufficient breadth to interpret the credentials of all members of the applicant pool. Applications received as complete by January 15 will have full consideration for fall admissions and scholarship (graduate assistant) opportunities.



Applications are now being accepted for the Fall 2013 Semester. Students interested can apply online at: <http://www.yzu.edu/stem/phd/>. Assistantships are available on a competitive basis. For more information on the Ph.D. program in Materials Science and Engineering, please contact the program director (see back page), or e-mail questions to: phdadmit@yzu.edu.



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Youngstown
STATE UNIVERSITY

Ph.D in
**Materials
Science
and Engineering**

Youngstown
STATE UNIVERSITY

Ph.D in Materials Science and Engineering



The College of Science, Technology, Engineering, and Mathematics, STEM, at Youngstown State University now offers the Doctor of Philosophy (Ph.D.) in materials science and engineering. This interdisciplinary cutting-edge program employs a broad range of state-of-the-art analytical

materials instrumentation to connect material properties with performance parameters. It has as one of its primary goals the synergistic interaction of industrially focused research efforts of faculty, students, and commercial research partners leading to economic development of the region.

Research Clusters

Multi-Functional Advanced Materials

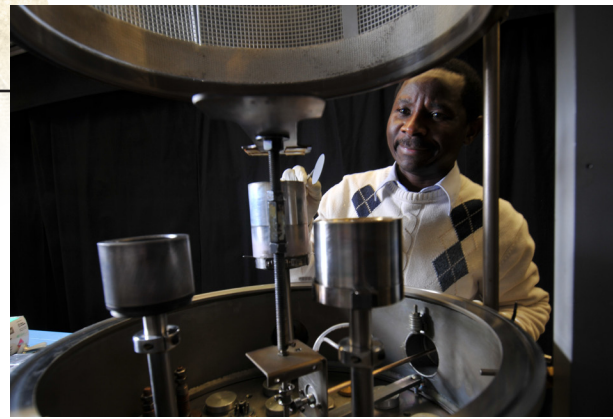
Researchers at YSU working in the Multi-Scale Multi-Functional Advanced Materials group focus largely on metals, alloys, ceramics, and ceramic-metallic composites for applications ranging from oxide nanocatalysts to armor for military vehicles.

Materials for Energy Application

Research in the Energy-Related Materials group include nanocatalysts for treating automotive exhaust, solid electrolytes for intermediate temperature fuel cells, and development of cathode materials for lithium ion batteries.

Photonic Optic Electronic Materials

The Photonic, Optical, and Electronic Materials (POEM) Group evaluates new materials and their applications in rapidly expanding fields such as optical information storage & processing, tunable laser fabrication, biological and chemical sensors, and more.



Program Highlights

- Interdisciplinary in nature, with collaborative efforts across multiple STEM departments.
- Emphasis on applied research and YSU's partnerships with regional materials industries.
- Recognizes YSU's designation as a Center of Excellence in Materials Science and Engineering.
- Supports efforts in technology-based economic development, positioning the region as a leader in 21st materials technologies, as required for the growing sustainable energy sector.
- Capitalizes on the new National Additive Manufacturing Innovation Institute, a major research initiative of the Department of Defense that is centered in Youngstown, and investigates new materials and new processes for additive manufacturing technologies.

Facilities and Research Equipment

Electron Microscopy

- **JEOL 2100 Transmission Electron Microscope (TEM/STEM)**
- **JIB 4500 Dual Beam Focused Ion Beam (FIB) / Scanning Electron Microscope (SEM)**
- **Two new SEM instruments, to be installed by Fall 2013, including one variable pressure system fully equipped with high resolution imaging, chemical analysis, crystallography, and electron beam lithography capabilities for research, and another system for training and routine analysis.**

X-Ray Diffraction Facility

The YSU structure center diffraction facility consists of state-of-the-art instruments for both single crystal and powder diffraction, including:

- **Bruker-Nonius D8 Advance Powder Diffractometer**
- **Rigaku Miniflex II Powder Diffractometer**
- **Bruker-Nonius SMART APEX CCD Diffractometer**
- **S2 Ranger X-Ray Fluorescence Spectromete**

Thermal Analysis Laboratory

This facility contains equipment for measuring thermal and transition properties of materials, and includes:

- **TA Instruments 2910 Differential Scanning Calorimeter;**
- **TA Instruments 2050 TGA** (i.e. for thermal gravimetric analysis);
- **Cannon CT-518** constant temperature bath for viscometry measurements; and
- **Micromeritics Autosorb 2010** for measuring adsorptive properties.

Nuclear Magnetic Resonance (NMR) Laboratory

The NMR facility features two new Bruker Biospin Avance III 400 MHz nuclear magnetic resonance spectrometers. One of the instruments has a three channel console; Z-axis gradient system; variable temperature unit; PFG {1H,19F}13C triple resonance probe; PFG {1H-19F}X(15N-31P) broad-band probe; and a 120-position sample changer for remote operation. The other instrument features two full channels in the console; a Z-axis gradient system; and a PFG {97Mo-31P}1H inverse probe. Two additional probes are available, one an alternate triple resonance probe optimized for preliminary macromolecular structural studies and the other optimized for small-molecule work.

Materials Macroscopic Properties Laboratory

The materials macroscopic testing facility contains equipment for testing of hardness, creep, and stress/strain, including: MTS fatigue testing machine; Instron universal testing machine capable of tension/compression/flexure testing up to 30,000 pounds; Satec creep rupture tester; Zeiss metallographic stereomicroscope and Nikon stereomicroscope; light microscopes with digital cameras linked to adjustable 21-inch LCD display for metallurgical inspection; manual hardness testers; ballistics testing chamber; split hopkinson pressure bar; multi-scale hardness measurement (e.g., Indentron) capable of wide range of tests; and surface profilometry.

