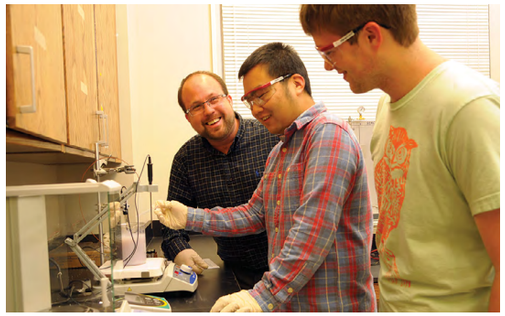
Financial Support

Graduate students may receive financial support through the Department of Chemical & Biomolecular Engineering or through fellowships administered through the University's Office of Financial Aid.

Interdisciplinary Initiatives

The department participates in interdisciplinary graduate programs in energy and sustainable science. The Bredesen Center for Interdisciplinary Research and Graduate Education provides unique research opportunities and financial support. For more information, visit »http://bredesencenter.utk.edu.



Contact Information

Graduate Program Coordinator
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THE UNIVERSITY OF TENNESSEE KNOXVILLE
DEPARTMENT OF CHEMICAL & BIOMOLECULAR ENGINEERING

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THE UNIVERSITY OF TENNESSEE KNOXVILLE

DEPARTMENT OF CHEMICAL & BIOMOLECULAR ENGINEERING

Graduate Studies in Chemical and Biomolecular Engineering

GUIDE FOR PROSPECTIVE STUDENTS

cbe.utk.edu

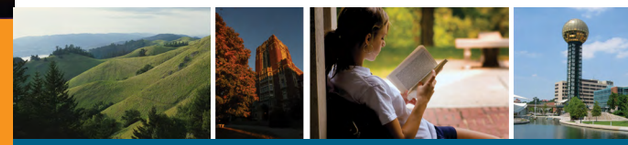
Resources and Facilities

Opportunities for research exist through the Computational Materials Research Group, Joint Institute for Advanced Materials, Joint Institute in Biological Sciences, Joint Institute in Computational Sciences and Sustainable Energy Educational and Research Center.

Admissions Requirements

As part of the on-line graduate application process, applicants will complete a department application and upload a statement of purpose and resume. Academic, research, and work backgrounds of prospective students will be reviewed to check that a good match exists between prospective students and the department to ensure students have a satisfying and rewarding graduate career.

All students interested in the College of Engineering graduate program must first be admitted through the UT Graduate School. Applications are available online at »gradschool.utk.edu/admissions.



The Future of Chemical and Biomolecular Engineering

Recent advances in the life sciences and nanotechnology have brought chemical engineering education to the threshold of significant changes. The Department of Chemical and Biomolecular Engineering (CBE) at the University of Tennessee has embraced these changes in order to meet global challenges in health care, the environment, renewable energy sources, national security and economic prosperity. Partnerships with other disciplines at UT, such as medical, life and physical sciences, as well as Oak Ridge National Laboratory (ORNL), help to create exceptional research opportunities for graduate students in CBE and develop leadership roles in the vital technologies of the future.

Partnerships between graduate students and faculty create exciting and productive research in three major areas:

- Advanced Materials
- Sustainable Energy
- Biomolecular Engineering

These research programs reach out to other engineering and science departments, the Oak Ridge National Laboratory and industry to form larger partnerships and create an unsurpassed research environment.

Advanced Materials

A highly integrated experimental and multiscale modeling/simulation approach is utilized to engineer a broad range of materials with a desired micro- or nano-structure. Specific areas of interest include dynamics of complex fluids, such as polymeric and biological fluids, fiber suspensions, colloidal systems as well as synthesis of functional nanoparticles and thin films. An exclusive relationship with ORNL has been established, which allows use of massively parallel supercomputers, access to the Spallation Neutron Source and a wide array of other state-of-the-art materials characterization facilities to accomplish research objectives.

Faculty

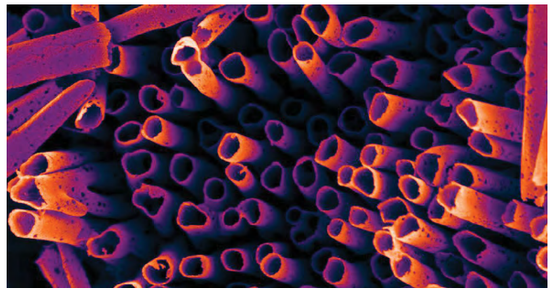
Dr. Manolis Doxastakis
Dr. Brian Edwards
Dr. Zhanhu Guo
Dr. Bamin Khomami
Dr. Michael Kilbey
Dr. Siris Laursen
Dr. Stephen Paddison
Dr. Joshua Sangoro
Dr. Gila Stein
Dr. Tom Zawodzinski

Current Faculty Research

Extended Metallic Catalyst Surfaces Via Templated Vapor Deposition

Dr. Tom Zawodzinski

Extended metal nanostructures are active, durable alternatives to conventional carbon-supported electrocatalyst architectures for oxygen reduction in energy conversion devices. Hollow tubular nanostructures are of particular interest, due to the prospect of accessing the inner metallic surface, which is not possible in a nanowire or a supported composite nanostructure.



Modified metalorganic chemical vapor deposition methods were used to synthesize the platinum nanotubes depicted in sacrificial aluminum oxide templates. The resulting catalysts are five times more active than carbon-supported Pt for oxygen reduction, potentially enabling next-generation vehicular technologies based on sustainable fuels.

Sustainable Energy

CBE currently has five highly interrelated research areas in sustainable energy:

- Fuel cells
- Photovoltaic materials
- Bio-fuels
- Flow batteries
- Catalysis

Current research projects include inorganic and hybrid polymeric/biological photovoltaic materials; polyelectrolyte membrane hydrogen fuel cells; hydrogen generation via water splitting; advanced battery design; metabolic engineering for biofuel production; and catalytic CO_2 reduction to fuels.

Faculty

Dr. Robert Counce
Dr. Brian Edwards
Dr. Paul Frymier
Dr. Bamin Khomami
Dr. Michael Kilbey
Dr. Siris Laursen
Dr. Stephen Paddison
Dr. Arthur Ragauskas
Dr. Joshua Sangoro
Dr. Cong Trinh
Dr. Tom Zawodzinski

Current Faculty Research

Catalytic Reduction of CO_2 to Fuels

Dr. Siris Laursen

Harvesting and storing the intermittent energy of the Sun in the form of molecular bonds promises truly sustainable and environmentally friendly fuels and chemicals. One focus of the work at UT is on developing the fundamental physical understanding needed to rationally design photo-catalytically active semiconductor materials. In the above photograph, CO_2 is being reduced to CH_4 and CH_3OH fuels over a light-activated nano-particulate semiconductor-supported metal.

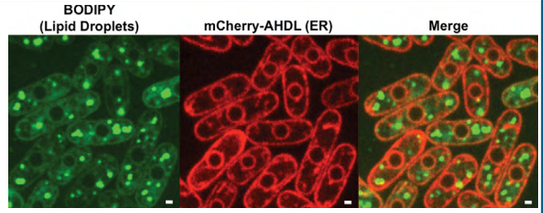
Biomolecular Engineering

Several faculty members have research programs at the interface of engineering and biology. Areas of research include protein engineering to manipulate surface displayed proteins for elucidating molecular recognition in the immune response; experimental engineering of photosynthetic systems to biologically produce hydrogen; and experimental and computational analysis of cell biological phenomena.

Faculty

Dr. Steve Abel
Dr. Eric Boder
Dr. Paul Dalhaimer
Dr. Manolis Doxastakis
Dr. Paul Frymier
Dr. Bamin Khomami
Dr. Cong Trinh

Current Faculty Research



Lipid droplet formation in eukaryotes

Dr. Paul Dalhaimer

Lipid droplets ("obesity organelles") store energy and precursors for phospholipids in the form of neutral lipids. When cellular fatty acids are in excess, droplets form from the endoplasmic reticulum (ER), although it is not known how this occurs. Excessive numbers and sizes of lipid droplets in cells called adipocytes can lead to obesity, which is so widespread in the United States that even in the state with the leanest population, two-fifths of the residents are obese. However, excessive neutral lipids in certain organisms, such as lower eukaryotes and certain prokaryotes, can be helpful to society—they are intriguing sources for biofuels. Therefore, the understanding of the cellular mechanisms of lipid droplet formation and breakdown is of utmost importance to the United States for the health, sustainability, and energy independence of its population. At UT, we are determining the mechanisms of droplet formation from the ER using quantitative tools that combine the engineering techniques of live-cell particle tracking with the spectacular genetic capabilities of the fission yeast, *S. pombe*.