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AUSTIN, Texas ? Researchers in the Cockrell School of Engineering and the College of Natural Sciences at The University of Texas at Austin have received a $15.6 million grant from the National Science Foundation (NSF) to discover and advance new types of materials for use in many applications including energy storage, medical devices and information processing.

The NSF grant, distributed over a six-year period through its Division of Materials Research, will launch a new Materials Research Science and Engineering Center (MRSEC) headquartered at UT Austin and aimed at advancing materials through fundamental science. The UT Austin Center for Dynamics and Control of Materials (CDCM) will include 23 faculty members from the university?s Cockrell School and College of Natural Sciences and one researcher from Rice University. The grant will go toward funding research, graduate student researchers and K-12 and undergraduate education outreach.

Created by the NSF to support multidisciplinary materials research and education while addressing fundamental problems in science and engineering that are important to society, the MRSEC program now encompasses a network of more than 20 centers located at academic institutions throughout the United States, each with its own focus area. UT Austin?s will be only the second MRSEC ever headquartered in Texas.

Researchers at the UT Austin center are particularly interested in developing materials that have the ability to form, reform and reconfigure with different properties as they are being used. These new capabilities could pave the way for new technologies in medicine, electronics and other areas.

?In addition to pursuing scientific goals, our hope is that the CDCM will enable substantial progress toward expanding the way people think about materials science and engineering and its potential to advance technology and benefit society,? said Edward Yu, the CDCM?s director and a professor in the Department of Electrical and Computer...
Today, researchers tend to think about materials in terms of their structure (how the atoms are arranged), the way they are processed (how they are created), how they are assembled, their properties (electronic, optical) and their performance. Materials are typically thought of as static structures, meaning they don’t change.

The CDCM’s mission is to explore various aspects of how to dynamically control the structure and properties of materials as a function of time and to reconfigure the structure of materials to allow for a change to their functionality.

The concept of dynamic control can be found in the natural world in applications like camouflage, Yu said. “Many of us are familiar with the gecko’s ability to lighten or darken its skin depending on the brightness of its immediate environment or with the octopus’s ability to mimic the appearance of its surroundings. Essentially, we are working to bring this same type of dynamic control and reconfigurability to a wide range of material properties.”

UT Austin’s new center will boast two interdisciplinary research groups that will bring together experts from various disciplines including physics, chemistry, mechanical engineering, electrical engineering, molecular biosciences and chemical engineering.

The first research group, called Porous Nanoparticle Networks, will explore solid nanoparticles connected to each other by various types of molecules. Research advances in this group are expected to enable responsive, reconfigurable materials based on the integration of nanoparticles and macromolecules for applications in drug delivery, mechanical actuators, components of energy systems, materials for sensing, electrolytes for energy storage and robust membranes for water purification. Chemical and materials engineer Delia Milliron and organic chemist Eric Anslyn will lead this effort.

The second research group, called Materials Driven by Light, will explore a rapidly emerging area of study that uses illumination to control the structure of a material and its properties. Research advances in this group are expected to lead to a better understanding of material behavior by using temporally structured light, with potential applications in a broad range of technologies for communications and information processing. Physicists Elaine Li and Greg Fiete will lead this group.

As part of the NSF grant, Brian Korgel, professor in the McKetta Department of Chemical Engineering, will lead efforts to develop and implement education and outreach programs to increase interest in materials science and the diversity of young people entering the field. CDCM participants plan to train elementary school teachers and help them design new tools to engage younger students in science and engineering. Additionally, they will leverage existing efforts, such as UT Austin’s Freshman Research Initiative, to connect undergraduates to the materials research on campus and create new programs to connect graduate students and postdoctoral researchers to mentors in the research, commercial and entrepreneurial communities. Through an artist-in-residence program, artists will work closely with scientists to make scientific ideas more accessible through
We think artists will provide a unique perspective and help us improve the accessibility of many scientific concepts, Yu said. And, on the other hand, we believe they will inspire new and interesting materials science and engineering.


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