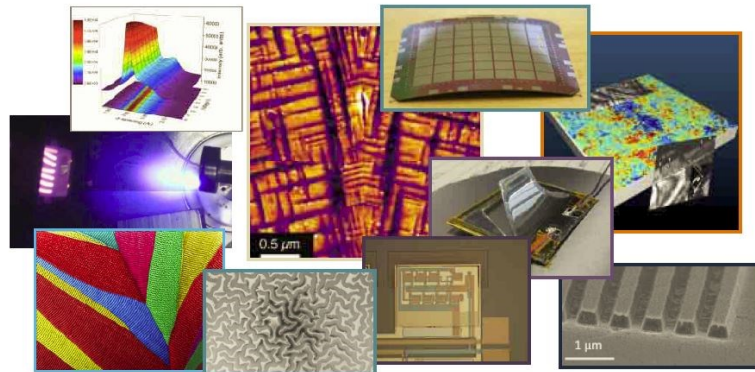


Professor Susan Trolier-McKinstry

Penn State University

Piezoelectric Films for MEMS Applications

Piezoelectric thin films are of increasing interest in low voltage microelectromechanical systems (MEMS) for sensing, actuation, and energy harvesting. They also serve as model systems to study fundamental behavior in piezoelectrics. The seminar will discuss how materials are optimized for these applications, as well as examples of the use of piezoelectric films over a wide range of length scales. The key figures of merit for actuators and energy harvesting will be discussed, with emphasis on how to achieve these on practical substrates. For example, control of the domain structure of the ferroelectric material allows the energy harvesting figure of merit for the piezoelectric layer to be increased by factors of 4 – 10. Likewise, control of crystallographic orientation and substrate clamping enables large increases in the figure of merit for actuators. To illustrate the functionality of these films, examples of integration into MEMS structures will also be discussed, including adaptive optics for Xray telescopes, low frequency and non-resonant piezoelectric energy harvesting devices, and piezoelectronic transistors as a potential replacement for CMOS electronics.



Susan Trolier-McKinstry is a professor of ceramic science and engineering at The Pennsylvania State University, where she also serves as the director of the Nanofabrication Facility and co-Director of the Center for Dielectrics and Piezoelectrics. She is a fellow of MRS, IEEE and the American Ceramic Society, and an academician of the World Academy of Ceramics. Her main research interests include thin films for dielectric and piezoelectric applications. She is also an Associate editor of Applied Physics Letters, and incoming vice-president of the Materials Research Society. Her group studies the fundamental mechanisms that contribute to the measured properties, processing studies for electroceramic films, and integration of functional materials into microelectromechanical systems. She has co-authored >350 papers in these areas, and has several patents. Twenty former members of her group are now faculty members around the world; others have taken jobs with companies and national laboratories.

Host:
Professor Alexei
Gruverman
Department of
Physics & Astronomy

Please Post

Wednesday, January 27, 4:00 pm | 136 Jorgensen Hall
3:45 – refreshments in Jorgensen Atrium