

MSE SEMINAR

March 2, 2018

113 McBryde Hall

3:30 – 4:30 PM

Refreshments at 3:00 PM

Professor Elizabeth Dickey

Materials Science and Engineering
North Carolina State University

“Point Defects Dynamics in Electroceramic Materials”

ABSTRACT

Lattice point defects and their coupling with electronic defects dominate the overall electrical properties of electroceramic materials, and thus great effort is expended on controlling the defect equilibria via oxygen activity during processing and/or doping. In device applications, because the lattice defects are typically charged, the applied voltage provides a strong driving force for defect migration. When the electrodes are impermeable to mass transport, the spatio-temporal redistribution of defects can cause time-dependent increases in conductivity in many electroceramic devices. Our research into this phenomenon combines electrical transport measurements with electron microscopy analyses to understand the mesoscopic redistribution of point defects as a function of temperature, electric field and time. In systems for which electronic transport is limited by injection at the electrode, we find that the accumulation of the charged defects can modulate the electrode Schottky barrier, allowing for greater carrier injection. At high electrical potentials, the non-stoichiometry in the near-electrode regions can become very large, inducing defect clustering and ordering. The implications of this defect redistribution process and its reversibility are discussed within the context the overall electrical transport characteristics.

BIOSKETCH

Elizabeth Dickey is a Professor in the Department of Materials Science and Engineering at North Carolina State University where she is the Director of the Center for Dielectrics and Piezoelectrics, an NSF University/Industry Cooperative Research Center with 26 international members. A primary focus of her research aims to develop processing-structure-property relationships for materials in which the macroscopic physical properties are governed by point defects, grain boundaries or internal interfaces. She has over 150 peer-reviewed journal publications, which have over eleven-thousand citations and an ISI H-index of 45. Early in her career she received the Presidential Early Career Award for Scientists and Engineers for her work on metal-ceramic interfaces. She is a fellow of the American Ceramic Society, has served on the Board of Directors, and was awarded the Fulrath Award by the Society in 2012. She is currently an Editor for the Journal of the American Ceramic Society and serves as a Physical Sciences Director for the Microscopy Society of America.