

MSE Seminar Friday, September 21, 2007

Non-Linear Dielectric and Piezoelectric Response in Oriented Ferroelectric Thin Films

Presented by

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ABSTRACT

Ferroelectric (FE) thin films find a wide range of applications in capacitive elements, non-volatile memories, microelectromechanical systems (MEMS), pyroelectric sensors, as well as wave guides and modulators in optical devices. Specifically, the very high dielectric constant of ferroelectric solid-solutions is particularly attractive for high energy density capacitors, while their large piezoelectric coefficients are very promising for high sensitivity MEMS sensors and large amplitude MEMS actuators.

One of the fundamental roadblocks to the wide commercialization of ferroelectric thin film-based devices is the lack of quantification of the extrinsic nonlinearities in dielectric and piezoelectric coefficients of the FE materials. The extrinsic contributions cause these coefficients to deviate from the low-field defined values, and lead to complex driving schemes and algorithms for controlling the devices in sub coercive field ranges. This talk will concentrate on the quantification of domain wall and phase boundary motion, the major source of extrinsic contributions to the dielectric and piezoelectric properties of FE thin films. The final goal is to quantify extrinsic contributions as affected by the ac field amplitude and frequency, crystallographic orientation, superimposed bias, biaxial stresses and temperature.

BIO

Dr. Nazanin Bassiri-Gharb is an assistant professor in the George W. Woodruff School of Mechanical Engineering at the Georgia Institute of Technology, Atlanta, GA. She obtained her Ph.D. in Materials Science from the Pennsylvania State University in 2005 and her laurea summa cum laude in Materials Engineering from University of Padua, Italy in 2001. Prior to her current appointment at Georgia Tech she was a senior research engineer at the MEMS Research and Innovation Center (MRIC) of QUALCOMM MEMS Technology, Inc in San Jose, CA.

Dr. Bassiri-Gharb's research interests are in ferroelectric materials and their application to nano- and micro-electromechanical systems as sensors, actuators and transducers. Her research integrates micro and nanofabrication techniques and processes, with fundamental science of ferroelectric materials. Contributions of domain walls and phase boundaries to the dielectric and piezoelectric properties, and size effects in thin films and nanostructures are some of the specific topics of focus.

She is a member of IEEE UFFC (Ultrasonic, Ferroelectrics and Frequency Control) Society, serving as an officer of the Education Committee and Associate Editor for the Society's Newsletter. She is also a member of IEEE WIE, MRS, SWE, and editorial board of Journal of Electroceramics.

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