

## **ECE FIELDS AND OPTICS SEMINAR SERIES PRESENTS:**

### **LEAD ZIRCONATE TITANATE (PZT) BASED PIEZOELECTRIC MEMS: MATERIALS, DEVICE DESIGN, AND APPLICATIONS FOR RF SYSTEMS**

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*Birck 2001; April 20, 2016 from 12:00noon to 1:15pm*

#### **Abstract**

As part of an on-going research activity at the US Army Research Laboratory, PiezoMEMS technology using lead zirconate titanate (PZT (52/48)) thin films have been developed in the area of RF electronics with a specific emphasis on reconfigurable component technologies. This presentation will provide an overview of current research activities in PZT thin film processing, device design, and experimental demonstrations of RF relays, tunable passives, resonators and filters, and reconfigurable RF systems. Film processing capabilities include both chemical solution deposition (CSD) and sputter deposition with a vast majority of the device demonstration to date using CSD material. In the area of device design, the key aspects to designing components for reconfigurable RF circuits will be provided with emphasis on the interaction of the electrical, electromechanical, mechanical, and process engineering aspects required to create large displacement, large force actuators. Example actuators highlighting the capabilities of using PZT thin films will include previous work on actuators for mobility including motors, flapping micro-flight, and ground robots. In the last section of the presentation, experimental data will be presented on the performance of RF relays, resonators, filters, and tunable passive components.

#### **Biography:**

Ronald G. Polcawich is a staff researcher in the Micro & Nano Materials & Devices Branch of US Army Research Laboratory (ARL), Adelphi, MD. He received a B.S. in Materials Science and Engineering from Carnegie Mellon University (1997), and a Ph.D. in Materials Science and Engineering from Penn State University (2007). He is currently the team lead for PiezoMEMS Technology at ARL with a focus on developing component technologies to enable cognitive RF communication and radar systems and MEMS inertial and aiding sensors to provide position, navigation, and timing (PNT) solutions for SWAP-C constrained platforms.

Dr. Polcawich and his colleagues were the recipients of the 2006 Department of the Army Research and Development Achievement Award for Piezoelectric RF MEMS Switch Using PZT Thin Films and the 2009 US Army Research Laboratory Engineering Award for ground-breaking work on Piezoelectric MEMS. Additionally, Dr. Polcawich received the 2012 Presidential Early Career Award for Scientists and Engineers (PECASE) and the 2015 IEEE UFFC Ferroelectrics Young Investigator Award.



