# Exploring the science and application space for the metastable phase in the relaxor ferroelectric PIN-PMN-PT

**Thomas Mion**
Materials Science and Technology Division, US Naval Research Laboratory | thomas.r.mion.civ@us.navy.mil

Relaxor ferroelectrics are a family of piezoelectric ceramics with high electrostriction and dielectric constants and are found in multiple technological fields from medical ultrasound to actuators and sonar systems. Development of these lead-based ferroelectric single crystals, such as the binary $PbMg_{1/3}Nb_{2/3}O_3$–$PbTiO_3$ (PMN–PT) as well as the trinary indium-doped $Pb(In_{1/2}Nb_{1/2})O_3$–$Pb(Mg_{1/3}Nb_{2/3})O_3$–$PbTiO_3$ (PIN–PMN–PT) with compositions near the morphotropic phase boundary (MPB) has yielded reliable systems with extremely large electromechanical coupling coefficients. For most applications these materials are required to be robust against external stimuli capable of diminishing the large piezoelectric constants such as variations in temperature or preload stress. Due to the inherent metastability of crystals at the MPB, most work on these relaxor ferroelectrics focuses on compositions away from the phase boundary to increase stability and reliability for multiple technological applications that require high linearity. Often overlooked are the potential applications to exploit the transient phase transition that occurs from a ferroelectric Rhombohedral to ferroelectric Orthorhombic within the PIN-PMN-PT system under compressive stress that can also be driven electrically.

The Multiferroics group at the US Naval Research Laboratory has been exploring the ultra-high effective piezoelectric and electro-optic properties associated with this phase transition in developing multiple technologies designed to exploit this metastable phenomenon. In this presentation, I will explore the coupling of this large transitional strain to magnetostrictive layered films, time dynamics of the structural properties, and the correlation of the ferroelectric domain reconfiguration to function an optical switch.

Friday, April 4, 2025
10:45 AM (UTC-05:00) Eastern Time (US & Canada) | Hybrid format, remote presentation
Attend in person (room K04B, NCNR) if you have access to the NIST campus, or remotely using the link below. NCNR access is not required.

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