Abstract Submitted
for the MAR10 Meeting of
The American Physical Society

Ultrasonic Wave Propagation Study of Phase Transitions in PZN-PT and PMN-PT Relaxor Single Crystals PETER FINKEL, NUWC — Ultrasonic wave propagation provides an invaluable tool for the investigation of elastic properties of materials. The compressional and shear acoustic waves serve as an unique and sensitive noninvasive probe to investigate very subtle changes in the material (phase transition, onset of mechanical failure, etc), due to both the microstructure and also due to external mechanical parameters such as strain, applied field or temperature. The technique developed in this work is based on measuring attenuation variation and relative velocity change of ultrasonic pulse in the MHz frequency range while superimposing a harmonic or quasi-static bias load or during the temperature scan. Ultrasonic wave interaction with solids under stress at various temperatures in oriented, poled $(1–x)\mathrm{Pb}(\mathrm{Zn}_{1/3}\mathrm{Nb}_{2/3})\mathrm{O}_3 - x\mathrm{PbTiO}_3$ with x = 0.045, 0.06 and 0.08 (PZN-PT) single crystal is studied. A strong temperature and stress hysteresis of ultrasonic and in ferroelectric rhombohedral (R)-tetragonal (T) transition occurred under uniaxial compressive stress with magnitude similar to those used in sound projectors. Dramatic changes in the velocity and the attenuation of the acoustic wave in the sample was an indication of the stress induced rhombohedral-orthorombic phase transition. The effect of composition, stress, and temperature have been investigated and experimental results will be presented

Peter Finkel
NUWC

Date submitted: 19 Nov 2009 Electronic form version 1.4