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Giant Electro-Mechanical Energy Conversion in [011] cut Relaxor Ferroelectric Single Crystals PETER FINKEL, NUWC, WEN DONG, CHRIS LYNCH, UCLA, AHMED AMIN, NUWC — Giant electro-mechanical energy conversion is demonstrated under a ferroelectric/ferroelectric phase transformation in [011] cut and poled lead titanate-based relaxor perovskite morphotropic single crystals. It is found that under mechanical pre-stress, a relatively small oscillatory stress drives the material reversibly between rhombohedral and orthorhombic phases with a remarkably high polarization and strain jumps induced at zero bias electric field and room temperature. The measured electrical output per cycle is more than an order of magnitude larger than that reported for linear piezoelectric materials. Ideal thermodynamic cycles are presented for this electro-mechanical energy conversion followed by a presentation and discussion of the experimental data.

Peter Finkel
NUWC

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