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Spontaneous ferroelectric-ferroelectric phase transitions and giant electro-mechanical energy conversion in [011] cut relaxor ferroelectric crystals PETER FINKEL, AHMED AMIN, Naval Undersea Warfare Center, WEN DONG, UCLA — We report on giant electro-mechanical energy conversion is demonstrated under a ferroelectric/ferroelectric phase transformation in [011] cut and poled lead titanate-based relaxor perovskite morphotropic $Pb(In_{1/2}Nb_{1/2})O_3$-$Pb(Mg_{1/3}Nb_{2/3})O_3$-$PbTiO_3$ (PIN-PMN-PT). 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. The stress dependence of thermally driven polarization change is reported for a ferroelectric rhombohedral to ferroelectric orthorhombic phase transformation in [011] cut and poled. A giant jump in polarization and strain is associated with the phase transformation of the ferroelectric material. The phase transition temperature can be tuned, over a broad temperature range, through the application of bias stress. This phenomenon results in a new approach to applications in the field of energy harvesting

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