Universal Phase Diagram for High Piezoelectric Perovskites

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X-ray diffraction experiments in PZT, PZN-PT and PMN-PT have revealed intermediate low-symmetry phases (monoclinic and orthorhombic) in which the polarization vector rotates between the tetragonal and rhombohedral states. Moreover, in-situ experiments have shown that the polarization rotation can also be induced by the application of an electric field, which causes extraordinary large piezoelectric deformations. Two different types of monoclinic phases have been observed, in agreement with both first principles calculations [1-3] and phenomenological theory [4], which points to the high anharmonicity of these extremely soft materials as the cause of their unusual piezoelectric response.

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