A Strain-Driven Morphotropic Phase Boundary in $BiFeO_3$

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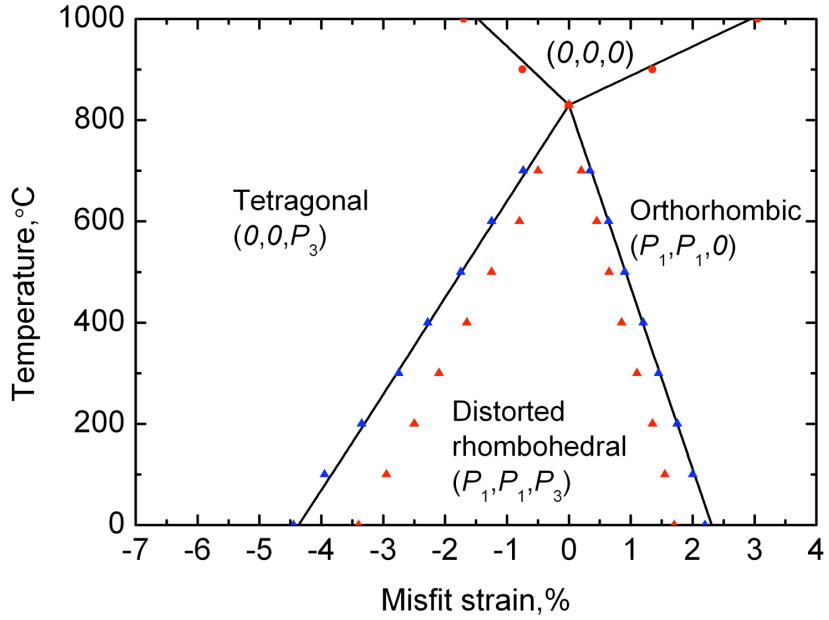

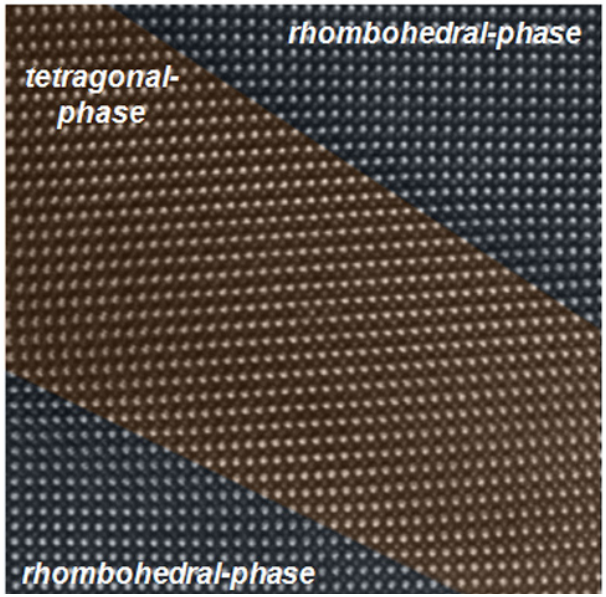

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Piezoelectric materials, which convert mechanical to electrical energy and vice versa, typically require the coexistence of two phases across a morphotropic phase boundary. Electrically switching between phases yields large electromechanical coupling. Using epitaxial constraints, MRSEC researchers have generated a morphotropic phase boundary in *lead-free* piezoelectric bismuth ferrite films, $BiFeO_3$. A tetragonal-like phase can be reversibly converted into a rhombohedral-like phase by application of electric field, accompanied by measurable displacements of the surface. This new lead-free system is of interest for probe-based data storage and actuator applications.