Structure- property relationships in nanostructured ceramic composites

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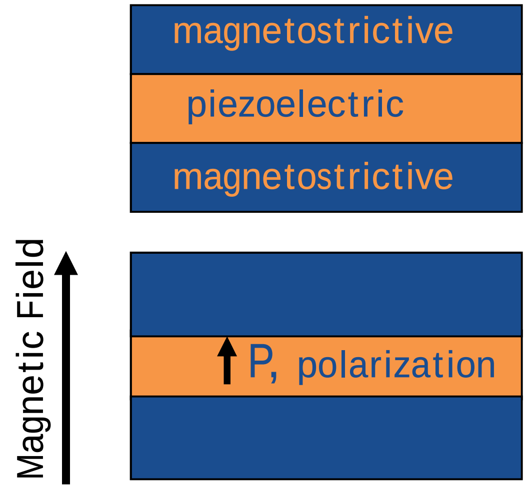
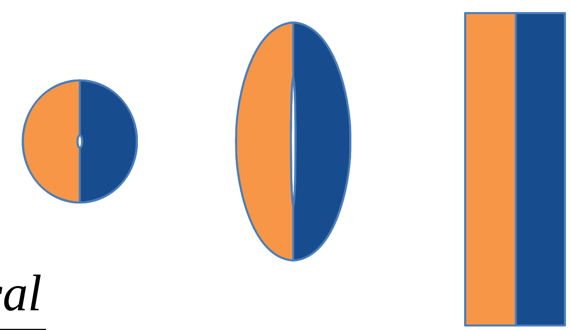
Composites present a method to combine materials properties that do not tend to exist in single- phase materials. This combination of multiple phases often leads to additional degrees of ordering and new product properties. Examples of this property dichotomy are high electric permittivity and high magnetic permeability, soft and hard magnetic properties, strength and toughness.



Polarization ∝ Strain

At the University of Florida we have developed a strategy to produce composite ceramic materials with controlled nanostructure through the assembly of bi-phasic particles, ellipsoids, and fibers. These materials are being utilized to study fundamental structure-property relationships in composite materials by correlating interfacial area and nature (e.g. epitaxial) with resultant properties (e.g. magnetoelectric effect). These materials provide insight into how to design composite properties for applications in electronic and biomedical application.



$$\text{Direct magnetoelectric effect} = \frac{magnetic}{mechanical} \times \frac{mechanical}{electric}$$