Origin of the Electric Field-Induced Strain in Lead-Free Piezoelectric Ceramics

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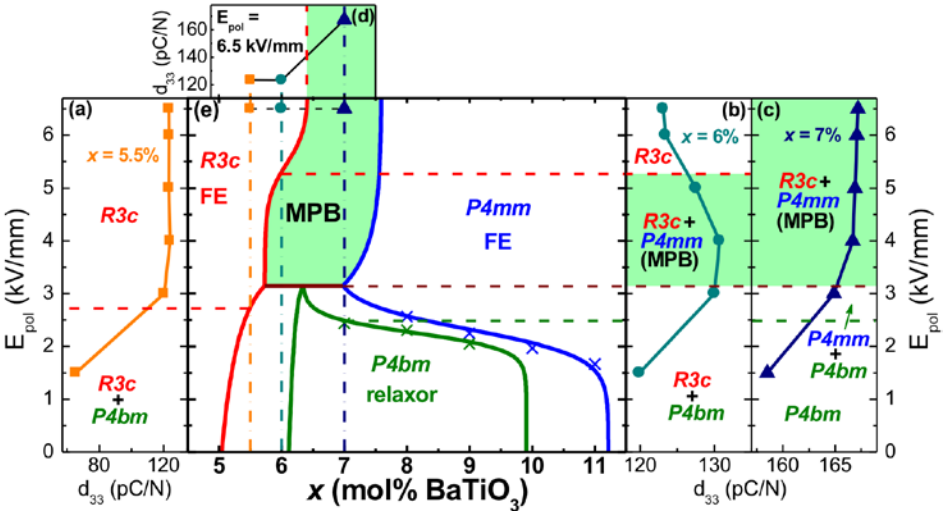
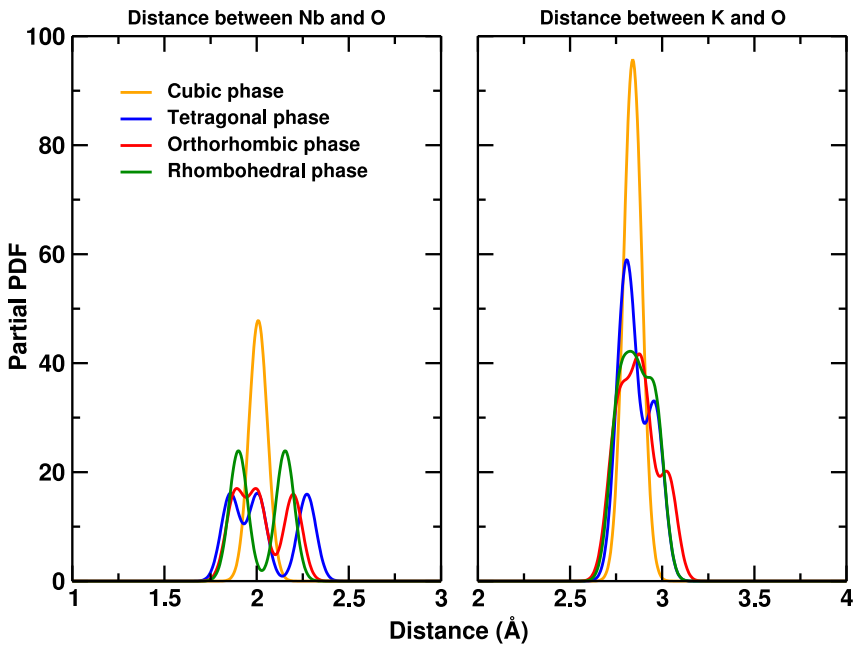
$Pb(Zr_{1-x}Ti_x)O_3$ has been the most widely used solid solution system for piezoelectric ceramics. However, their high content (>60 wt.%) of Pb has raised serious health and environmental concerns.



$(Bi_{1/2}Na_{1/2})TiO_3$–$x$$BaTiO_3$ Phase diagram Composition and Poling field

The computational effort has focused on the KNbO3-NaNbO3 alloy family.



Pair distribution function for the known phases of $KNbO_3$

By *in situ* TEM and bulk dielectric measurements we observe that the electric field used to poll as formed ceramics can induce a phase transition. This can both create and destroy MPB. The magnitude of the poling field can be selected to engineer the piezoelectric properties of the ceramic.