

## Compositional Dependence of Disorder in $\text{Na}_{1/2}\text{Bi}_{1/2}\text{TiO}_3$ - $x\%$ $\text{BaTiO}_3$

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Fundamental research to understand the electro-mechanical mechanisms that govern lead-free piezoelectrics is ongoing. A material of interest is the perovskite solid-solution of  $\text{Na}_{1/2}\text{Bi}_{1/2}\text{TiO}_3$ - $x\%$  $\text{BaTiO}_3$  (NBT- $x\%$ BT). One of the difficulties in this material system is that a thorough understanding of the crystallography over the unusual phase boundary at a composition of approximately NBT-7%BT is lacking. This difficulty is caused by complex disordered structures that exist in the material meaning conventional crystallographic methods can provide misleading results.

Single-crystal compositions of NBT-0%BT, NBT-3.6%BT, NBT-6.9%BT and NBT-13.1%BT were chosen to resolve the local disorder across the morphotropic phase boundary using diffuse scattering methods. Such scattering arises from deviations away from the repetitive structure in materials and can thus provide short-range structural information that many conventional scattering techniques do not have access to. This presentation provides an overview of the structural features giving rise to the diffuse scattering signals in the NBT- $x\%$ BT system and how these affect the macroscopic functional properties of the material.