[MS28-P09] Structural Investigation of the Lead-Free Ferroelectric Solid-Solution (1-*x*) Na0.5Bi0.5TiO3*x*BaTiO3

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In recent years, $Na_{0.5}B_{i0.5}T_iO_3$ (NBT) based solid solutions have emerged as a potential replacement for conventional lead-based piezoelectric materials. However, their application as a piezoceramic are limited by a high coercive field of 5.0-7.3 $kVmm^{-1}$, low depolarization temperature (160–190°C) and low piezoelectric coefficient (75 pCN^{-1}) [1, 2]. As a result, the binary system of (1-*x*)NBT-*x*BT (BaTiO3) has attracted significant research focus because of their superior piezoelectric properties. (1-*x*)NBT-*x*BT exhibits a morphotropic phase boundary near x = 6% where the piezoelectric properties are enhanced [3].

However, the phase diagram is the subject of much debate, with more than 5 having been proposed to date. This controversy is unsurprising given the current uncertainty in the structure of NBT itself. A recent study based on refinements against combined X-ray and neutron diffraction of 0.96NBT-0.04BT attributed a mixture of a monoclinic Cc phase with a minor fraction of a cubic Pm-3m phase to this region [4]. In addition, under ferroelectric poling it exhibits an irreversible electric field induced phase-transition [5].

Rietveld refinements against laboratory-based high-resolution X-ray powder diffraction measurements of unpoled and poled ceramic solid-solution (1*x*)NBT-*x*BT are presented for the region $0.02 \leq x \leq 0.1$. A new phase diagram, as a function of composition, temperature and electric field, is shown using the refinements along with data from complementary techniques such as second harmonic generation.

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