



Contribution ID: 81

Type: not specified

Stress and electric-field dependence of the induced phase symmetry in BNT-xBT

The solid solution system $\text{Bi}_{1/2}\text{Na}_{1/2}\text{TiO}_3 - x\text{BaTiO}_3$ (BNT-BT) has attracted wide research interest in the scientific community as a potential high-strain lead-free piezoelectric material. The electro-mechanical coupling mechanisms in a series of BNT-BT solid solutions with the BT content ranging from 5 mol% to 8 mol% in 0.25 mol% steps have been studied using in situ high-energy synchrotron x-ray diffraction (XRD). Unipolar stress cycling with a maximum stress ~ 600 MPa, and bipolar electric-field cycling with maximum field of 5 kV/mm were applied in two separate experiments. In the initial state, the BNT-xBT series exhibited a region of pseudo-cubic symmetry between $x \sim 5$ -8. During application of both stress and electric field, lower BT content samples ($x < 5.25$) tended to transform to rhombohedral symmetry, while higher BT content ($x > 7.75$) tended to go tetragonal. Compositions between these tended to transform to mixed phase symmetry. The results show that the stress and electric-field-induced phase transformation mechanisms are highly analogous in this material system within the range studied here.

Keywords: Piezoelectricity, Diffraction, Strain, Ferroelectric

Primary author: Mr HOSSAIN, Mohammad Jahangir (The School of Materials Science and Engineering, UNSW Australia)

Co-authors: DANIELS, John (UNSW); Mr KHANSUR, Neamul (UNSW); Mr TUNG, Patrick (University of New South Wales); Dr WANG, Zhiyang (UNSW Australia)

Presenter: Mr HOSSAIN, Mohammad Jahangir (The School of Materials Science and Engineering, UNSW Australia)