Oral Contributions

[MS20-04] A Neutron Diffraction Study of the Ergodic Transition in Sodium Bismuth Titanate.

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In the global quest for a lead-free piezoelectric material to replace Pb(Zr,Ti)O3 (PZT), a large number of candidate materials subject to intense research are based on the perovskite $Na_{½}Bi_{½}TiO_3$ (NBT). NBT is a relaxor ferroelectric[1] and exhibits some peculiar electrical characteristics, something that has been attributed to it being a non-ergodic relaxor ferroelectric at room temperature [2]. As well as being of interest from a pure materials science perspective, the transition from non-ergodic to ergodic behaviour (at around 430 K) is critical in that it imposes a maximum temperature on devices that utilise non-ergodic behaviour that is well below the usual metric for high temperature use: the curie point. In the presented study, we will show neutron diffraction data and Rietveld refinements of poled and unpoled NBT as a function of temperature. We will show how the average structure of NBT changes as it is driven through this non-ergodicergodic transition, both from the as-cooled unpoled non-ergodic, and poled non-ergodic states. In order to explain the evolution of the poled structure with increased temperature through the ergodic transition, we must also utilise measurements of the spontaneous polarisation. Finally, in light of the well-documented complex nano-scale attributes of NBT, we will relate these spatially averaged observations and results to the nano-scale phenomena that have previously been observed.

[1] C.-S. Tu, I. G. Siny, and V. H. Schmidt, Phys. Rev. B 49, 11550 (1994).

[2] D. Viehland, S. J. Jang, L. E. Cross, and M. Wuttig, J. Appl. Phys. 68, 2916 (1990).