Phase transitions in $Bi_{0.5}Na_{0.5}TiO_3$ based Ferroelectrics

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Lead-free $0.94(Bi_{0.5}Na_{0.5}TiO_3)–0.06(BaTiO_3)$ (BNTBT) is a potential piezoelectric candidate to replace lead-based PZT ceramics. The thermal depoling temperature sets the upper limit for the high temperature application of piezoelectric materials. Recently, an interface model was proposed to explain the good resistance to thermal depoling of BNTBT-ZnO composite. However, we found that the presence of ZnO was not limited to the interface but contributed intrinsically to the BNTBT lattice. This played a critical role in the structural changes of BNTBT, confirmed by a unit volume change supported by XRD, which was further proved by Raman, EDS, and dielectric characterization at different temperatures. The previous interface model is not correct because BNTBT shows thermally stable piezoelectric properties, even though there is no interface between BNTBT and ZnO. The thermal depoling behaviour of BNTBT-based materials is directly related to the transition temperature from the rhombohedral phase to the tetragonal phase in our phase transition model, which is consistent with four current peaks in their ferroelectric loops close to the depoling temperature.

Speaker Biography

Yan H is a senior lecturer in materials at the school of engineering and materials science in Queen Mary, University of London. He received his PhD in materials science and technology from Shanghai Institute of Ceramics in 2001. Since that, he joined QMUL as an academic visitor and research assistant. At QMUL, he was appointed as an academic Fellow in 2011 and senior lecturer in 2015. His research area includes: processing and analysis of the microstructures and properties of advanced materials with textured, nano and metastable structures, covering dielectrics, ferroelectrics, thermoelectrics and ceramic-CNT composites. He has over 100 publications that have been cited over 3600 times, and his publication H-index is 35 and has been serving as an editorial board member of Advance in Applied Ceramics and Materials Research Bulletin.

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