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BNT based ceramics with polar nano regions for high power energy storage

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Dielectric capacitors are very attractive for high power energy storage. However, the low energy density of these capacitors, which is mainly limited by the dielectric material, is still the bottleneck for their applications. In this work, lead free single phase perovskite $Sr_x Bi_{1-x} Na_{0.97-x} Li_{0.03} 0.5TiO_3$ ($x=0.30$ and 0.38) bulk ceramics were prepared using solid state reaction method and were carefully studied for the dielectric capacitor application. Polar nano regions (PNRs) were created in this material using co-substitution at A-site to enable relaxor behaviour with low remnant polarization (P_r) and high maximum polarization (P_{max}). Moreover, P_{max} was further increased due to the electric field induced reversible phase transitions in nano regions. Comprehensive structural and electrical studies were performed to confirm the PNRs and reversible phase transitions and finally a high energy density (1.70 J/cm^3) with an excellent efficiency (87.2%) was achieved using the contribution of field-

induced rotations of PNRs and PNR related reversible transitions in this material, making it among the best performing lead free dielectric ceramic bulk material for high energy storage.

Biography

Yan H is a Senior Lecturer in Materials in the School of Engineering and Materials Science at Queen Mary University of London (QMUL). He has completed his PhD in Materials Science and Technology at 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, thermo electrics and ceramic-CNT composites.

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