

Thick Film Texturing to Enhance the Properties of Lead-Free Ferroelectric Materials

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Increasing concern surrounding the use of lead in consumer products has stimulated research to identify candidates to replace the material of choice for many applications, lead zirconate titanate. PZT-based materials have excellent ferroelectric properties for many applications; however the family of layer-structured perovskites offers a rich variety of potential alternatives, particularly the bismuth layered and alkali niobate-based solid solution ferroelectrics. The dielectric and piezoelectric properties of these materials can be greatly enhanced by texturing, orienting the material to select the optimum response. This work explores the use of thick film screen printing to create textured bulk materials, with the benefit of using accepted and common industrial techniques requiring standard manufacturing equipment. By using these techniques, potential replacements have the advantage of scaling to industrial production without costly development and modification of specialized production equipment. Texturing achieved during the screen printing process was evaluated through microstructure, electron diffraction and x-ray diffraction analysis. The dielectric and piezoelectric properties of these textured materials were determined, using PZT as a benchmark comparison.

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