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Amorphous phases and composition dependence of piezoelectricity in**BaTiO₃-Bi₂O₃ polar amorphous ceramics**

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Abstract

Composite ceramics with the nominal formula BaTiO₃-xBi₂O₃ (x=0.15, 0.2, 0.25, 0.5, 0.667 and 1) were sintered under a small thermal gradient. After sintering, the monoclinic α Bi₂O₃ changed into cubic Bi₁₂TiO₂₀ and a very small amount of rhombohedral Bi_{8.11}Ba_{0.89}O_{13.05} in the x=0.2-1 samples; both direct and converse piezoelectric effects were observed for these samples without undergoing the electrical poling process. Because these composites do not contain obviously oriented grains and their piezoelectricity does not depend on ferroelectricity, temperature gradient-driven plastic flexoelectricity of the grain boundary amorphous phases may be the main poling mechanism. In this study, the largest value of the d_{33} piezoelectric constant of approximately 12 pC/N was found in the x=0.667 sample; this sample also exhibits the highest amorphous content. The depoling temperature of this type of polar material is determined solely by the melting temperature of Bi₁₂TiO₂₀, favoring the potential use of these composites as piezoelectric materials for high temperature applications.

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