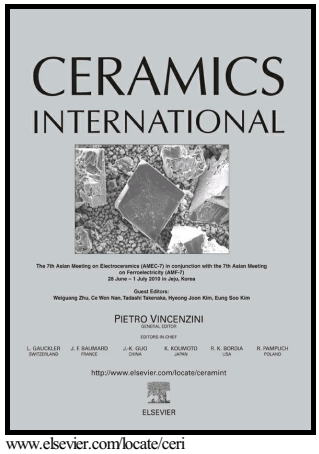

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Qiuxia Li, Wenbin Gao, Zhen Su, Manwen Yao, Xi Yao

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Self-growth of nanocrystalline structures for amorphous $Sr_{0.925}Bi_{0.05}TiO_3$ thin films with high energy density

Qiuxia Li[a], Wenbin Gao[b], Zhen Su[a], Manwen Yao[a,*], Xi Yao[a]

[a]Functional Materials Research Laboratory, School of Materials Science & Engineering, Tongji University, No. 4800, Cao'an Road, Shanghai 201804, China

[b]Electronic Materials Research Laboratory, Key Laboratory of the Ministry of Education & International Center for Dielectric Research, Xi'an Jiaotong University, Xi'an 710049, China

Abstract: Process of self-growth nanocrystalline structure was explored to improve the dielectric properties of amorphous $Sr_{0.925}Bi_{0.05}TiO_3$ (SBT) thin films through controlling the annealing temperature. The crystallinity of the material was only 15% when annealed at 550 °C, and the resulting nanocrystalline particles were 14 nm in size as determined by XRD analysis. Therefore, the proposed process could produce a novel film of an amorphous matrix coating nanocrystalline particles. Finite element analysis results showed that the applied electric field was focused primarily in the amorphous matrix, which could effectively decrease the probability of low voltage breakdown of the nanocrystalline particles. Simultaneously, the nanocrystalline particles supplied more polarization charges, which helped to improve the dielectric constant of the inorganic composite. Combining the merits of amorphous and crystalline phases, the ultimate energy storage density of the modified sample was as high as 21.2 J/cm^3, which represents an improvement of 5.1 J/cm^3 compared with that

* corresponding author
E-mail address: yaomw@tongji.edu.cn (Manwen.Yao).