Anisometric Grain Growth Kinetics in Textured $SrBi_2Ta_2O_9$ Ceramics by Templated Grain Growth

H. Amorín,[*] A. L. Kholkin and M.E.V. Costa

Department of Ceramics & Glass Engineering, CICECO, University of Aveiro, Aveiro 3810-193, Portugal

Abstract

$SrBi_2Ta_2O_9$ (SBT) is a well-known member of the bismuth oxide layer structured ferroelectrics and a promising material for high-temperature piezoelectric applications. The usefulness of certain piezoelectric ceramics as sensing and actuating devices can be enhanced by texturing, leading to improved device performance. Textured SBT ceramics are fabricated by templated grain growth (TGG), using platelet-like SBT crystals previously grown by high-temperature self-flux solution method. The crystals (5 wt%) are embedded in a fine-grain SBT powder matrix containing 3 wt% of Bi_2O_3 excess and aligned by uniaxial pressing, and then sintered at 1250 ºC, during different times. The microstructure and texture of the obtained ceramics are evaluated by SEM and XRD analysis, which allow correlating the grain growth kinetics to the sintering parameters. The ceramics develop a bimodal microstructure that shows a temperature dependent amount of large and aligned grains (larger than 100 μm), with *c*-axis oriented parallel to the pressing direction. The anisotropic growth of the large template particles occurs at the expense of the small nearest randomly arranged grains and induces the alignment of the neighbour matrix grains. Since, TGG is based on standard powder processing and sintering, it yields textured ceramics at significant lower cost than possible by hot forging or hot pressing.

Keywords: Bi-layered perovskites, $SrBi_2Ta_2O_9$ textured ceramics, Templated grain growth.

Acknowledgments: One of the authors (H. Amorín) acknowledges the Foundation for Science and Technology (FCT, Portugal) for the financial support through a Ph.D. grant.

[*] Corresponding author. *Fax*: (351) 234 425300. *E-mail address*: hamorin@cv.ua.pt