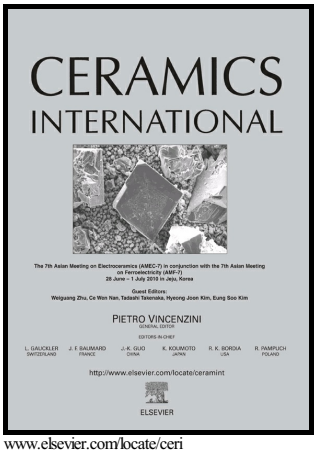
Low dielectric loss of Bi-doped $BaZr_{0.15}Ti_{0.85}O_3$ ceramics for high-voltage capacitor applications

Yan Zhang, Yaoyao Li, Haikui Zhu, Zhenxiao Fu, Qitu Zhang



www.elsevier.com/locate/ceri

PII: S0272-8842(17)31287-7
DOI: http://dx.doi.org/10.1016/j.ceramint.2017.06.077
Reference: CERI15599

To appear in: *Ceramics International*

Received date: 19 May 2017
Revised date: 11 June 2017
Accepted date: 12 June 2017

Cite this article as: Yan Zhang, Yaoyao Li, Haikui Zhu, Zhenxiao Fu and Qitu Zhang, Low dielectric loss of Bi-doped $BaZr_{0.15}Ti_{0.85}O_3$ ceramics for high voltage capacitor applications, *Ceramics International*, http://dx.doi.org/10.1016/j.ceramint.2017.06.077

Low dielectric loss of Bi-doped $BaZr_{0.15}Ti_{0.85}O_3$ ceramics for high-voltage capacitor applications

Yan Zhang[1,2], Yaoyao Li[1,2], Haikui Zhu[1,2], Zhenxiao Fu[3], Qitu Zhang[1,2]*

Abstract

$BaZr_{0.15}Ti_{0.85}O_3$ ceramics are prepared via the conventional solid state reaction method. The effects of $Bi_2O_3{\cdot}3TiO_2$ doped on dielectric properties and breakdown strength of $BaZr_{0.15}Ti_{0.85}O_3$ ceramics are systematically discussed. Doping of $Bi_2O_3{\cdot}3TiO_2$ can obviously improve the breakdown strength and reduce the dielectric loss of the material. It is attributed to the Bi^{3+} substituted Ba^{2+} is an unequal ion substitution, and two Bi^{3+} substitute three Ba^{2+} to produce an A vacancy, thereby increasing the lattice energy and promoting the diffusion and migration of the particles during the sintering process, promoting the sintering and reducing the sintering temperature. However, the dielectric constant of the material is decreased. When the amount of $Bi_2O_3{\cdot}3TiO_2$ is 12 mol%, the minimum dielectric loss tanδ = 0.0009, the maximum breakdown strength is E_b = 15.09 kv/mm, the insulation resistivity is $3.52\times10^{11}\Omega{\cdot}cm$. The energy storage density of the $BaZr_{0.15}Ti_{0.85}O_3$ ceramic samples doped with $Bi_2O_3{\cdot}3TiO_2$ varies from 0.008 J/cm^3 to 0.012 J/cm^3.

Keywords: Dielectric properties; $Bi_2O_3{\cdot}3TiO_2$ doped; Breakdown strength; High-voltage capacitor; Low tanδ

1. Introduction

In recent years, $BaZr_xTi_{1-x}O_3$ (BZT) ceramics have gotten much attention from the

[1] College of Materials Science and Engineering, Nanjing Tech University, Nanjing 210009, China

[2] Jiangsu Collaborative Innovation Center for Advanced Inorganic Function Composites, 210009, Jiangsu, China

[3] Guangdong Fenghua Advanced Technology Company Limited, Zhaoqing 526020, Guangdong, China

* Corresponding author

E-mail address: ngdzqt@163.com