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(Ba_{0.8}Sr_{0.2})Ti_{1-x}(Zn_{1/3}Nb_{2/3})_xO₃ ceramics

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PII: S0272-8842(16)00041-9
DOI: <http://dx.doi.org/10.1016/j.ceramint.2016.01.013>
Reference: CERI11989

To appear in: *Ceramics International*

Received date: 2 October 2015
Revised date: 7 December 2015
Accepted date: 3 January 2016

Cite this article as: Nabil Dhifallah, Olfa Turki, Mimoun El Marssi, Mohamed Dammak and Hamadi Khemakhem, Structural and relaxor behavior in lead-free (Ba_{0.8}Sr_{0.2})Ti_{1-x}(Zn_{1/3}Nb_{2/3})_xO₃ ceramics, *Ceramics International*, <http://dx.doi.org/10.1016/j.ceramint.2016.01.013>

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Structural and relaxor behavior in lead-free

 $(\text{Ba}_{0.8}\text{Sr}_{0.2})\text{Ti}_{1-x}(\text{Zn}_{1/3}\text{Nb}_{2/3})_x\text{O}_3$ ceramicsNabil Dhifallah ^a, Olfa Turki^a, Mimoun El Marssi^b, Mohamed Dammak ^c,Hamadi Khemakhem^{a, *}^a Laboratoire des Matériaux Ferroélectriques (LMF), Unité de Physique Mathématiques, 05UR15-04, Université de Sfax, Faculté des Sciences de Sfax (FSS), Route de Soukra km 3.5, B.P. 1171, 3000 Sfax, Tunisia^b Laboratoire de Physique de la Matière Condensée (LPMC), Université de Picardie, Jules Verne, Pôle Scientifique, 33 rue Saint-Leu, 80039 Amiens Cedex 1, France^c Laboratoire de Chimie Inorganique, Université de Sfax, Faculté des Sciences de Sfax, BP 1171,

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Abstract

The Solid solutions of $(1-x) \text{Ba}_{0.8}\text{Sr}_{0.2}\text{TiO}_3-x \text{Ba}(\text{Zn}_{1/3}\text{Nb}_{2/3})\text{O}_3$ (BST-BZN) with $0.025 \leq x \leq 0.15$ were prepared by a high temperature solid-state reaction technique. The effects of the $\text{Ba}(\text{Zn}_{1/3}\text{Nb}_{2/3})\text{O}_3$ addition on the phase composition in the B site on structural and dielectric properties was investigated. The room temperature X-ray diffraction analyses of all ceramics revealed a perovskite phase with a composition dependent symmetry. The temperature and frequency dependence of the dielectric permittivity and losses have been explored. While ceramics of compositions $x \leq 0.05$ showed normal ferroelectric behavior, while ceramics with $x \geq 0.1$ were of relaxor type. It was found that degree of diffuseness and the relaxor effect increased, whereas the transition temperature (T_C or T_m) decreased when both zinc and niobium were introduced in the $\text{Ba}_{0.8}\text{Sr}_{0.2}\text{TiO}_3$ lattice. For the composition with $x \geq 0.1$, the frequency depend on T_m , satisfying the Vogel-Fulcher formula, which indicates a relaxor behavior.

Keywords: Perovskite structure; Phase transition; Relaxor behavior.

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