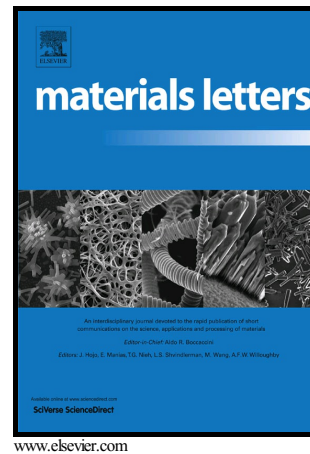


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Improved Energy Storage Properties of Microwave Sintered 0.475BNT-0.525BCTZ- x wt%MgO ceramics

Yongping Pu, Lei Zhang, Mouteng Yao*, Wanyin Ge, Min Chen

School of Materials Science and Engineering, Shaanxi University of Science and Technology, Xuefu-Zhonglu 3, Xi'an 710021, PR China

*Corresponding author. Tel./fax: +86 029 86168133/86168137. *E-mail address*: 229516747@qq.com

Abstract:

0.475BNT-0.525BCTZ- x wt%MgO ceramics were densified by microwave sintering method and their phase compositions and dielectric properties were investigated. The XRD results reveal that all samples possess a perovskite structure and the secondary phase of MgO can be observed in the MgO-doped samples. The maximum polarization of the MgO-doped samples sintered by microwave sintering are higher than that of the samples sintered by traditional sintering, thus a higher energy storage density can be achieved. The dielectric breakdown strength of the samples are greatly improved with the increasing content of MgO. The $x=5$ sample exhibits a high dielectric breakdown strength of 17.91 kV/mm and a high energy storage density of 1.37 J/cm³.

Keywords:

Microwave sintering, Energy storage and conversion, Dielectric breakdown strength, Ferroelectrics

1 Introduction

Capacitors are indispensable components for passive parts in contemporary electronic devices. Compared to batteries, capacitors usually possess higher power density (10^8 W/kg for dielectric capacitor), which are eagerly desired for the potential application in advanced pulsed capacitors [1]. However, the low energy density of capacitor limits its practical application. Interest in high energy storage density dielectric materials has surged recently, which is mainly driven by the ever-increasing demands for the miniaturization of electronic devices [2,3]. Lately, Bi_{0.5}Na_{0.5}TiO₃-based relaxor ferroelectrics were widely investigated for energy storage due to their high maximum polarization. A high a high energy storage density of 0.7 J/cm³, 0.598 J/cm³ and 1.2 J/cm³ were reported in BNT-BT-CZ [4], BNT-BT-KNN [5] and BNT-KNN [6] ceramics, respectively. Furthermore, MgO is generally added

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