Accepted Manuscript

High energy-storage performance of BNT-BT-NN ferroelectric thin films prepared by RF magnetron sputtering

Yuan Yao, Yong Li, Ningning Sun, Jinhua Du, Xiaowei Li, Liwen Zhang, Qiwei Zhang, Xihong Hao

PII: S0925-8388(18)31260-X

DOI: 10.1016/j.jallcom.2018.03.383

Reference: JALCOM 45613

To appear in: *Journal of Alloys and Compounds*

Received Date: 27 December 2017

Revised Date: 10 March 2018

Accepted Date: 29 March 2018

Please cite this article as: Y. Yao, Y. Li, N. Sun, J. Du, X. Li, L. Zhang, Q. Zhang, X. Hao, High energy-storage performance of BNT-BT-NN ferroelectric thin films prepared by RF magnetron sputtering, *Journal of Alloys and Compounds* (2018), doi: 10.1016/j.jallcom.2018.03.383.

High energy-storage performance of BNT-BT-NN ferroelectric thin films prepared by RF magnetron sputtering

Yuan Yao, Yong Li*, Ningning Sun, Jinhua Du, Xiaowei Li, Liwen Zhang, Qiwei Zhang, and Xihong Hao*

Inner Mongolia Key Laboratory of Ferroelectric-related New Energy Materials and Devices, School of Materials and Metallurgy, Inner Mongolia University of Science and Technology, Baotou 014010, China

Abstract: Dielectric materials with high energy-storage density and efficiency have great potential applications in modern electric and electronic devices. In this work, a series of $0.9(0.94Bi_{0.5}Na_{0.5}TiO_3\text{-}0.06BaTiO_3)\text{-}0.1NaNbO_3$ (BNT-BT-NN) ferroelectric thin films were deposited on $LaNiO_3$ (*LNO*) bottom electrodes by radio-frequency (*RF*) magnetron sputtering technique. The effects of different annealing temperature on microstructure, dielectric property and energy-storage performance of these thin films were studied in detail. Post-deposition annealing of BNT-BT-NN thin films at an appropriate temperature of 650 ^{o}C was found to greatly enhance film structure and electrical characteristics, such as dense structure, smooth surface, low leakage current density, high breakdown strength (*BDS*) and large difference between maximum and remanent polarization. As a result, a huge energy-storage density of 32 J/cm^3 and a large energy-storage efficiency of 90% were achieved under 3170 kV/cm in the thin film which was annealed at 650 ^{o}C. Moreover, the thin film exhibited a stable energy-storage performance under different temperature and frequency. Therefore, BNT-BT-NN thin film with proper annealing temperature is a promising candidate for high energy-storage capacitors.

Keywords: Thin film; *RF* magnetron sputtering; Energy-storage performance

*Corresponding author: liyong3062545@126.com; xhhao@imust.cn; Tel: +86-472-59515721