

Accepted Manuscript

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PII: S0925-8388(17)31063-0

DOI: [10.1016/j.jallcom.2017.03.261](https://doi.org/10.1016/j.jallcom.2017.03.261)

Reference: JALCOM 41299

To appear in: *Journal of Alloys and Compounds*

Received Date: 15 February 2017

Revised Date: 21 March 2017

Accepted Date: 22 March 2017

Please cite this article as: H. Yang, F. Yan, Y. Lin, T. Wang, L. He, F. Wang, A lead free relaxation and high energy storage efficiency ceramics for energy storage applications, *Journal of Alloys and Compounds* (2017), doi: 10.1016/j.jallcom.2017.03.261.

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A lead free relaxation and high energy storage efficiency ceramics for energy storage applications

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Abstract

In the present work, ternary solid solution ceramics of the $(1-x)\text{SrTiO}_3-x(0.65\text{BaTiO}_3-0.35\text{Bi}_{0.5}\text{Na}_{0.5}\text{TiO}_3)$ (STB100x) were designed and fabricated using a conventional solid-state sintering method. The phase structure, microstructure, dielectric property, relaxation property, ferroelectric property and energy storage property were systematically investigated. The addition of $0.65\text{BaTiO}_3-0.35\text{Bi}_{0.5}\text{Na}_{0.5}\text{TiO}_3$ (BT-BNT) could enhance the saturated polarization of the ceramics obviously. All the samples show a slim P - E hysteresis loop, and the sample with $x = 0.3$ exhibits a high energy storage density of 1.40 J/cm^3 and an energy storage efficiency more than 90 %. These results indicate that the STB100x ceramics may be a promising lead free materials for high energy storage density capacitors.

Keywords: Energy storage; Dielectric properties; Lead free ceramics; Relaxation.

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