Edited by:
DSL CONFERENCE

ABSTRACT BOOK

25 -29 JUNE / AMSTERDAM, THE NETHERLANDS / MERCURE HOTEL AMSTERDAM CITY

14TH INTERNATIONAL CONFERENCE ON DIFFUSION IN SOLIDS AND LIQUIDS - DSL2018

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Effects of additives on Structure, Microstructure, Dielectric and Piezoelectric Properties of Lead-Free KNN- and NBT-based Ceramics

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Lead-free oxide materials based on (K0.5Na0.5)NbO3 (KNN) and (Na0..5Bi0.5)TiO3 (NBT) perovskites are being intensively studied with aim to replace widely used lead-based materials. In this work we studied influence of cation substitutions and overstoichiometric additives on preparation conditions, structure parameters, microstructure, dielectric, ferroelectric, and piezoelectric properties of KNN- and NBT-based ceramics additionally modified by Li+, Ba2+, Mn3+, Ni3+, and Fe3+ cations and overstoichiometric LiF, NaCl and KCl additives.
The samples were characterized using complex of physico-chemical methods: X-ray Diffraction, Scanning Electron Microscopy, Second Harmonic Generation, Dielectric Spectroscopy, and Atomic Force Microscopy in Piezoresponse Force mode. The samples were prepared by the two-step solid-state reaction method at temperatures 400 – 1400 K.
Changes in the unit cell parameters and microstructure of the samples observed in ceramics prepared correlate well with both preparation conditions and substituting cations. Ferroelectric phase transitions near ~ 400 K and 550 K (in NBT-based) and at ~700 K (in KNN-based) were confirmed. Effects of dielectric relaxation related to the presence of polar nanoregions and due to deficiency in the A-sites were observed.

Acknowledgment. The work was supported by the Russian Foundation for Basic Research (Project 18-03-00372).

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Characterization of Cuprous Oxide Thin Films for Application in Solar Cells

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Cuprous oxide (Cu2O) has a high optical absorption coefficient and favorable electrical properties, which make Cu2O thin films attractive for photovoltaic applications. Using reactive radio-frequency magnetron sputtering, high quality