COST MP 1308 ACTION
TOWARDS OXIDE BASED
ELECTRONICS

COST TO-BE FALL MEETING 2016

City Hotel Ljubljana, Slovenia,
28–30 September 2016

PROGRAMME AND BOOK OF ABSTRACTS

Institut "Jožef Stefan", Ljubljana, Slovenija

COST TO-BE FALL MEETING 2016

City Hotel Ljubljana, Slovenia

28 – 30 September 2016

Organized by

COST MP 1308 ACTION

Jožef Stefan Institute, Ljubljana, Slovenia

COST TO-BE Fall Meeting 2016/Programme and book of abstracts

Organized by: COST MP 1308 ACTION and Jožef Stefan Institute, Ljubljana, Slovenia

Venue: City Hotel Ljubljana, Slovenia, 28–30 September 2016

Committees

Action Chair: Fabio Miletto Granozio (CNR-SPIN, Italy)

Conference Chair: Matjaž Spreitzer (IJS, Slovenia)

Programme Commite Members: Jeroen Van Den Brink (IFW Dresden, Germany)
Manuel Bibes (CNRS-Thales, France)
Gertjan Koster (MESA+/University of Twente, The Netherlands)
Johan Verbeeck (University of Antwerp, Belgium)
Nini Pryds (Technical University of Denmark, Denmark)
Alessia Sambri (University of Naples, CNR-SPIN, Italy)
Matjaž Spreitzer (IJS, Slovenia)
Fabio Miletto Granozio (CNR-SPIN, Italy)

Local Organizing Committee:

Members: Hana Uršič (IJS, Slovenia)
Katarina Vojisavljević (IJS, Slovenia)
Vesna Butinar (IJS, Slovenia)
Urška Gabor (IJS, Slovenia)

Programme and Book of abstract (USB edition)

Editors: Hana Uršič, Marko Vrabelj, Katarina Vojisavljević, Matjaž Spreitzer

Design: Marko Vrabelj, Hana Uršič

Place/Publisher: Ljubljana, Slovenia/Jožef Stefan Institute
Published: 2016

Issue: 130
Under auspices of Slovenian Research Agency, Bleiweisova cesta 30, 1000 Ljubljana
Price: 5 eur

CIP - Kataložni zapis o publikaciji
Narodna in univerzitetna knjižnica, Ljubljana

546.3-31:539.23(082)

COST TO-BE. Fall Meeting (2016 ; Ljubljana)
Programme and book of abstracts [Elektronski vir] / COST TO-BE Fall Meeting, Ljubljana, Slovenia, 28-30 September 2016 ; organized by COST MP 1308 Action [and] Jožef Stefan Institute ; [editors Hana Uršič ... et al.]. - Ljubljana : Jožef Stefan Institute, 2016

ISBN 978-961-264-096-5
1. Uršič, Hana 2. COST MP 1308 Action 3. Institut Jožef Stefan (Ljubljana)
286588416

Microstructure and functional properties of Sr-doped $K_{0.5}Na_{0.5}NbO_3$ thin films

K. Vojisavljević[1]*, T. Pečnik[1,2], H. Uršič[1,2], A. Matavž[1,2], V. Bobnar[1,2], B. Malič[1,2]

[1]Jožef Stefan Institute, Jamova cesta 39, Ljubljana, Slovenia
[2]Jožef Stefan International Postgraduated School, Jamova cesta 39, Ljubljana, Slovenia
*Presenting author: katarina.vojisavljevic@ijs.si

The legislation against the use of lead-based piezoelectric materials in electronics has stimulated an increased research in the field of the lead-free piezoelectric ceramics and thin films after 2003. Among lead-free materials, special attention was paid to some compositions of potassium sodium niobate solid solution, $K_{0.5}Na_{0.5}NbO_3$ (KNN) obtained by a partial replacement of A- and B- site atoms from the perovskite KNN crystal lattice with dopants. Excellent piezoelectric and ferroelectric properties of chemically modified KNN ceramics indicate that they can be used as the efficient lead-free counterparts to lead-based piezoelectrics.

Although A-site doping of KNN ceramics with low amounts of alkaline earths (Ca^{2+}, Sr^{2+}, Ba^{2+}), particularly with Sr^{2+} was reported as an useful way in improvement of their density and electrical properties [1, 2], there is no literature data concerning the microstructure and functional properties of KNN thin films influenced by the same chemical modification.

In this contribution, liquid precursors of $(K_{0.5}Na_{0.5})_{1-y}Sr_yNbO_3$ (KNN-ySr) thin-films, where the Sr- dopant content was set at y = 0, 0.005, 0.01, were prepared from potassium and sodium acetates and niobium ethoxide in 2-methoxyethanol solvent with 5 mole % of potassium acetate excess, and an appropriate amount of strontium acetate dissolved in acetic acid. The approximately 250 nm thick KNN-ySr thin films on $Pt/TiO_x/SiO_2/Si$ substrates were obtained through repeated spin-coating and pyrolysis steps at 300 ^oC for 2 min, followed by the rapid thermal annealing at 650 ^oC in air flow for 5 min with a heating rate of 12 K/s.

According to X-ray diffraction analysis, all of the synthesized KNN thin films crystallize in pure perovskite phase with (100) preferential orientation. The surface and cross-section microstructure analysis, performed by the field emission scanning electron microscopy, reveals that the KNN-ySr films consist of equiaxed grains, the average size of which gradually decreases from about 90 nm to a few tens of nm by increasing the Sr-dopant content. Dielectric properties versus frequency, polarisation – electric field dependence and leakage current were followed in order to get information on how the Sr-dopant content influences the functional properties of the as-prepared films. In addition, the topography and the local piezoelectric response of the KNN-ySr films were analysed by atomic force microscopy coupled with a PFM mode.

References:

[1] B. Malič, J. Bernard, J. Holc, D. Jenko, M. Kosec, Alkaline-earth doping in $(K,Na)NbO_3$ based piezoceramics, *J. Eur. Ceram. Soc.* **25** (2005) 2707-2711.

[2] M. Demartin Maeder, D. Damjanović, N. Setter, Lead free piezoelectric materials, *J. Electroceram.* **13** (2004) 385-392.