

# Electroceramics XVII

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### BOOK OF ABSTRACTS



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# Improving of ferroelectric and magnetic properties of Bi<sub>5</sub>Ti<sub>3</sub>FeO<sub>15</sub> multiferroic materials with Y<sup>3+</sup> and Co<sup>2+</sup> partial substitution

Poster

**Dr . Jelena Bobic <sup>1</sup>, Dr . Nikola Ilic <sup>1</sup>, Mr . Vignaswaran Kaliyaperumal Veerapandiyam <sup>2</sup>, Dr . Mirjana Vijatovic Petrovic <sup>3</sup>, Dr . Adis Džunuzović <sup>1</sup>, Dr . Jelena Vukmirovic <sup>4</sup>, Dr . Marco Deluca <sup>2</sup>**

*1. Institute for Multidisciplinary Research, University of Belgrade, Kneza Visislava 1, Belgrade, Serbia , 2. Materials Center Leoben Forschung GmbH, Roseggerstraße 12, A-8700 Leoben, Austria , 3. Institute for Multidisciplinary Research, University of Belgrade , 4. Faculty of Technology Novi Sad, University of Novi Sad*

The search for multiferroic materials combining electric and magnetic properties in a single phase has attracted a lot of attention in the perspective of future magnetoelectronic devices. A handful of single phase multiferroics have been discovered so far, and most of them are not suitable for practical applications at present, either because the room temperature polarization/magnetization is too small or their mutual coupling is too weak. One of the most important single-phase multiferroic material with Aurivillius structure is Bi<sub>5</sub>Ti<sub>3</sub>FeO<sub>15</sub> (BFT) which generally yields a magnetoelectric coupling above room temperature. The main lack of this material is high electrical conductivity and hence the lower ferro-electromagnetic properties. Since BFT has the capability to host ions of different size, multiferroic properties could be improved by using dopants or ionic substitutions on different A and B-sites of the structure.

To this respect, Co<sup>2+</sup> and Y<sup>3+</sup> doped BFT were prepared by the solid state reaction method according to formulas: Bi<sub>1-x</sub>Y<sub>x</sub>Ti<sub>3</sub>FeO<sub>15</sub> (x=0.1, 0.2, 0.3) and BiTi<sub>3</sub>Fe<sub>1-y</sub>Co<sub>y</sub>O<sub>15</sub> (y=0.1, 0.3, 0.5). Slightly improve of ferroelectric properties was noticed with 0.3 mol% of Co while replacement of Bi<sup>3+</sup> with Y<sup>3+</sup> causes a reduction in orbital hybridization between Bi 6s and O 2s/2p orbitals leading to a decrease in electric polarization as a vector sum of all dipole moments. Magnetic measurements confirm the antiferromagnetic nature of pure and Y doped ceramics while Co-doped samples exhibit a typical ferromagnetic loop reveals the existence of FM interactions in these samples. The largest  $M_r$  value appears in samples doped with 3 mol% of Co ( $M_r$  of 0.084 emu/g and  $H_c$  of 287 Oe). Raman spectroscopy confirmed that Y prefer to replace Bi ions in the pseudo-perovskite layers while Co ions enter into the lattice and occupy the Fe site inside of oxygen octahedral.