

The Serbian Society for Ceramic Materials  
Institute for Multidisciplinary Research (IMSI), University of Belgrade  
Institute of Physics, University of Belgrade  
Center of Excellence for the Synthesis, Processing and Characterization of  
Materials for use in Extreme Conditions "CEXTREME LAB" - Institute of  
Nuclear Sciences "Vinča", University of Belgrade  
Faculty of Mechanical Engineering, University of Belgrade  
Center for Green Technologies, Institute for Multidisciplinary Research,  
University of Belgrade  
Faculty of Technology and Metallurgy, University of Belgrade  
Faculty of Technology, University of Novi Sad

A microscopic image of ceramic particles, showing a transition from white to red. The particles are spherical and densely packed. The top half is white, and the bottom half is red, with a horizontal boundary line.

# PROGRAMME and the BOOK of ABSTRACTS

## 5CSCS-2019

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**Branko Matović**  
**Zorica Branković**  
**Aleksandra Dapčević**  
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## INFLUENCE OF Ho DOPING ON STRUCTURAL AND MAGNETIC BEHAVIOUR OF MULTIFERROIC BiFeO<sub>3</sub>

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Magnetolectric multiferroics, showing simultaneous ferroelectric and ferromagnetic ordering, have aroused wide attention in recent years, because they offer a wide range of potential applications in data storage media, spintronics and multi-state memories. The influence of Ho doping on the crystal structure and magnetic properties of bismuth ferrite (BFO) nanopowders was investigated. BiFeO<sub>3</sub> and Bi<sub>1-x</sub>Ho<sub>x</sub>FeO<sub>3</sub> ultrafine nanopowders were synthesized by the hydrothermal method. Here we use simple, low-cost and energy-saving hydrothermal method, which has advantages over the conventional methods. The diffraction pattern was recorded at room temperature and atmospheric pressure in the absence of any re-heating of the sample. A fitting refinement procedure using the Rietveld method was performed which showed the incorporation of Ho<sup>3+</sup> ions in the BiFeO<sub>3</sub> crystal lattice, where they substitute Bi<sup>3+</sup> ions. All the samples belong to *R3c* space group. In addition, theoretical investigation using bond valence calculations have been performed in order to mimic pure and Ho doped BiFeO<sub>3</sub> compounds produced in the experiment. Various BFO polymorphs were investigated as function of holmium concentration and final optimization of crystal structures has been performed on *ab initio* level using Density Functional Theory (DFT). Magnetic behaviour of synthesized materials was investigated by SQUID magnetometer in wide temperature interval (2–800 K). Splitting between the zero-field-cooled and field-cooled magnetization curves becomes more pronounced as the Ho concentration is increased, pointing to the development of weak ferromagnetic moment, which is usually connected with uncompensated spins or spin canting. Hysteresis loops show the same fact, attaining higher magnetization with more Ho included, and becoming wider, i.e. magnetically harder.