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# WELCOME

The aim of the conference is to overview and share information about the latest achievements in bioceramic nanotechnologies with the scientific community. Over the duration of the conference, scientists from the fields of chemistry, physics, technology, medicine and implantology will be able to acquaint themselves with synthesis methods, unique properties, and applications of bioceramic nanomaterials.

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## Characterization of Sm-Doped BiFeO<sub>3</sub> Ceramics Crystal Structure and Magnetization Across the Phase Boundary Region

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### ABSTRACT

Chemical substitution of bismuth ions by rare-earth elements (La - Sm) causes the structural transition from the polar rhombohedral phase (described by the space group  $R3c$ ,  $R$ -phase) to the non-polar orthorhombic phase (s.g.  $Pnma$ ,  $O_1$ -phase) via stabilization of PbZrO<sub>3</sub>-like anti-polar orthorhombic phase ( $O_2$ -phase) [1,2]. The concentration ranges of the structural stability of the rhombohedral and the anti-polar orthorhombic phases strongly depend on the type of rare-earth element and the reduction in the ionic radius of the dopant ions leads to a shrinkage of the mentioned ranges [3]. The concentration range attributed to the anti-polar orthorhombic phase reduces down to 1% in the system Bi<sub>1-x</sub>Sm<sub>x</sub>FeO<sub>3</sub>, while a chemical doping with rare earth elements having ionic radius smaller than that specific for samarium ions leads to a structural transition directly to the non-polar orthorhombic phase [4,5]. Chemical doping with samarium ions attracts particular attention due to very narrow concentration range ascribed to the single phase anti-polar orthorhombic state. It is known that the concentration ranges attributed to the phase coexistence regions can be modified using different synthesis methods and preparation conditions thus allowing a stabilization of relaxor -type ferroelectric behavior and/or diluted magnetic structure [3,6]. In the case of Sm-doping the concentration range ascribed to structural stability of the antipolar orthorhombic phase becomes extremely dependent on the preparation conditions and post synthesis treatment of the samples [1].

It should be noted that a formation of the metastable structural state in the compounds having frustrated ferroic orders opens up new possibilities for applications of the BiFeO<sub>3</sub>-based multiferroic materials. In the present study, we report on the correlation between the type of structural distortion, morphology of crystallites and an onset of remanent magnetization for Sm-doped BiFeO<sub>3</sub> compounds prepared by different methods. In contrast to the structural results obtained for the solid-state ceramics the single-phase state with anti-polar orthorhombic structure is not stabilized in the compounds under study. The compounds having single phase rhombohedral structure are characterized by a notable release of remanent magnetization in contrast to the solid-state compounds having the same chemical compositions.

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