Serbian Ceramic Society Conference
ADVANCED CERAMICS AND APPLICATION IX
New Frontiers in Multifunctional Material Science and Processing

Serbian Ceramic Society
Institute of Technical Sciences of SASA
Institute for Testing of Materials
Institute of Chemistry Technology and Metallurgy
Institute for Technology of Nuclear and Other Raw Mineral Materials

PROGRAM AND THE BOOK OF ABSTRACTS

Serbian Academy of Sciences and Arts, Knez Mihailova 35
Serbia, Belgrade, 20-21. September 2021.

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(XRD),Induction coupled Plasma Atomic Emission (ICPES), Scanning electron Microscopy with Energy Dispersive Spectroscopy SEM/EDS and magnetic measurements on Superconducting Quantum Interference Device (Squid).DTA revealed phase transition at ≈918ºC.Chemical analysis has been done by ICPES and EDSwhich confirmed that nominal composition has been attained for all samples.XRD data were analysed by Rietveld refinement which showed that orthorhombic perovskite structure, S.G. *Pnma*(62), persisted with the change of Gd content, while unit cell parameters depended on the composition. Magnetic measurements show that electron doping by Gd^{3+} ions substantially changes $CaMnO_3$ antiferromagnetic behavior. After introduction of Gd^{3+} ions, significant ferromagnetic component appears due to an emergence of double exchange interaction between Mn^{3+}-Mn^{4+} ions. This resulted in appearance of a low temperature plateau in field cooled magnetization diagram as well as in hysteresis loop with the relatively high coercivity up to 2300 Oe.

INV

A multidisciplinary approach to multiferroics

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Multiferroics, materials where spontaneous long-range magnetic and dipolar orders coexist,represent an attractive class of compounds, which combine rich and fascinating fundamentalphysics with a technologically appealing potential for applications in the general area ofspintronics.Among the different types of multiferroic compounds, bismuth ferrite ($BiFeO_3$; BFO) stands out because it is perhaps the only one being simultaneously magnetic and strongly ferroelectric at room temperature.$BiFeO_3$ and $Bi_{1-x}Ho_xFeO_3$ 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 influence of Ho doping on the crystal structure and magnetic properties of bismuth ferrite (BFO) nanopowders was investigated. 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^{3+} ions in the $BiFeO_3$ crystal lattice, where they substitute Bi^{3+} ions. All the samples belong to *R*3*c* space group.In addition, theoretical investigation using bond valence calculations have been performed in order to mimic pure and Ho doped $BiFeO_3$ compounds produced in the experiment. Various BFOpolymorphs 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).Furthermore, electronic and magnetic properties of $BiFeO_3$ were investigated using combination of experimental and theoretical methods.Magnetic behavior of synthesized materials was investigated by

SQUIDmagnetometer 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,andbecomingwider, i.e. magnetically harder.

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INV
Dilatometric study of the $ZnTiO_3$ phase transition kinetic influenced by nano powder sintering

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Sintering is often accompanied with phase transition. Phase transition kinetic is thus hard to deconvolute due to the superposition of the sintering and phase transition dimensional change phenomena. Metastabile perovskite phase $ZnTiO_3$ reforms to stabile spinel Zn_2TiO_4 at 950^{o}C with high kinetic rate. Dimensional change during heating of $ZnTiO_3$ nano powder compacts up to 1050^{o}C was monitored using dilatometric thermo mechanical analyzer TMA model SETSYS Evolution. Shrinkage of simultaneous sintering and phase transition were recorded. The obtained non-isothermally sintered specimens were then second run treated with same schedule. Sintering phenomenon of the $ZnTiO_3$ nanopowder compact was also recorded up to 900^{o}C with isothermal holding of 25 minutes. Here phase transition was avoided with lower temperature and isothermal holding. Second run heating, of isothermally obtained specimens at 900^{o}C, was recorded with non-isothermal heating schedule to 1050^{o}C. This has led to the dilatometric curve record of the $ZnTiO_3$ phase transition in polycrystalline bulk specimen, now recorded without sintering. In such a manner when kinetic is complex, the separation of phenomena such as sintering, linear expansion and phase transition are leading to the knowledge of their mutual interconnected relations. Also application of mathematical operations on dilatometric data leads to the established procedure for the sintering and phase transition data treatment.