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

Serbian Ceramic Society
Institute for Testing of Materials
Institute of Chemistry Technology and Metallurgy
Institute for Technology of Nuclear and Other Raw Mineral Materials
School of Electrical Engineering and Computer Science of Applied Studies

PROGRAM AND THE BOOK OF ABSTRACTS

Serbian Academy of Sciences and Arts, Knez Mihailova 35
Serbia, Belgrade, 21-23. September 2015

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nanocellulose in synthesis of various nanocomposites, gain great relevance not only due to its renewable nature and biodegradability, but also due to its unique structure and tendency to form intra- and intermolecular bonding. Our research focus on the use of nanocellulose (NC) functionalized with Fe_3O_4 for the production of novel multiferroic Fe_3O_4-NC-PVDF-$BaTiO_3$ nanocomposites. Functionalized nanocellulose was prepared by co-precipitating Fe(II) and Fe(III) ions in aqueous solution containing NC with ammonia. NC\Fe_3O_4 with different content of NC were sonicated in DMF and subsequently added to PVDF/$BaTiO_3$ mixture, resulting in multi-component mixtures with four different concentrations of NC. XRD and Raman analysis were used to study the phase composition of nanocomposites, while their morphologies were examined by SEM and AFM. It has been shown that the addition of nanocellulose had a positive effect on PVDF β-phase formation, which is responsible for its ferroelectric properties. As a result, the formation of composite multi-component hybrid material with multiferroic properties is enabled.

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Microstructure development and Raman responses of mechanically activated Fe/$BaTiO_3$

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The structure and lattice dynamics of mechanically activated nanocrystalline Fe/$BaTiO_3$ is investigated in this work. The powder mixture of 60%Fe and 40% $BaTiO_3$ was mechanically activated up to 240 min in 500 cm^3 zirconium oxide beakers together with balls of 10 mm in diameter (the ratio of powder and balls was 1:20). The microstructure development has been studied by scanning electron microscope equipped with energy dispersive x-ray analysis spectrometer. Room temperature Raman spectra of the samples were obtained in the spectral range from 100 to 1650 cm^{-1}, in the backscattering geometry, using 633 nm line of a He-Ne laser. Raman spectroscopy was employed to investigate the laser power dependence of the spectra of the activated samples as wells. Microstructural investigations showed that mechanical activation has led to the creation of new surfaces and the comminution of the initial powder particles. Raman spectroscopy analysis pointed out that activation had a pronounced influence on Fe/ $BaTiO_3$ lattice spectra, thus affecting both the stability of the crystal structure and the phase transition phenomena.