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SYNTHESIS OF $(1-x)\text{BaTiO}_3 \cdot x\text{BiMnO}_3$ SOLID SOLUTIONS VIA SOL-GEL METHOD

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Multiferroic materials are special class of solid-state compounds, in which at least two order states such as electric, magnetic, or piezo-elastic coexist [1]. One of the most studied single-phase multiferroic material, which demonstrates coexistence of both ferroelectric and magnetic orders at low temperature, is BiMnO_3 [2, 3]. The main problem for the preparation of this compound is requirement of high temperature and high pressure during synthesis, while at ambient conditions it cannot be synthesized [3, 4]. Solid solutions containing a substantial amount of BiMnO_3 could lead to possible synthesis and demonstration of BiMnO_3 -like properties [5].

In this study, solid solutions of $(1-x)\text{BaTiO}_3 \cdot x\text{BiMnO}_3$ ($x = 0.0-0.6$) were prepared by sol-gel synthesis method. The appropriate amounts of barium, bismuth and manganese nitrates and titanium isopropoxide ($\text{C}_{12}\text{H}_{28}\text{O}_4\text{Ti}$) were mixed with citric acid monohydrate and ethylene glycol under continuous stirring for 1.5 h at 90 °C. The ratio between metal ions, citric acid and ethylene glycol was 1:3:10. Next, the solvent was evaporated at 180 °C temperature until the gel was formed. Gel was dried at 180 °C temperature for 12 h. The obtained gel was carefully ground, placed in a ceramic crucible, covered with a cup and heated for 5 h at 1000 °C temperature with a heating rate of 5 °C/min. For the characterization of obtained samples X-ray diffraction (XRD) analysis, scanning electron microscopy (SEM), Fourier transform infrared spectroscopy (FTIR) and other methods were used. The results obtained showed that the sol-gel synthesis route is suitable for the fabrication of $(1-x)\text{BaTiO}_3 \cdot x\text{BiMnO}_3$ solid solutions.

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