PREPARATION AND CHARACTERIZATION OF BISMUTH FERRITE - BARIUM TITANATE SOLID SOLUTION CERAMICS

Andrius Pakalniškis[1], Aivaras Kareiva[1], Gediminas Niaura[2], Dmitry Karpinsky[3], Siarhei Latushka[3], Ramūnas Skaudžius[1]

[1]Institute of Chemistry, Vilnius University, Naugarduko 24, LT-03225 Vilnius, Lithuania
[2]Institute of Chemical Physics, Faculty of Physics, Vilnius University, Sauletekio Ave. 9, LT-10222, Vilnius Lithuania
[3]Scientific-Practical Materials Research Centre of NAS of Belarus, 220072 Minsk, Belarus
andrius.pakalniskis@chgf.vu.lt

Piezoelectricity is the ability of a material to generate a charge when mechanical stress is applied or to experience internal mechanical strain resulting from electric fields. This phenomenon was discovered in 1880 by French physicists Pierre and Jacques Currie in single-crystal quartz. Even so, the first practical applications of piezoelectric ceramics began in around world war I and have been widely used in the industries ever since. Nowadays piezoelectric materials are used in actuators, transducers for energy harvesting and so on [1, 2]. Most of these materials are lead-based and have dominated the field of application and research because of their superior properties, their tunability, and formation of the phase boundary. The main lead-based material is lead zirconate titanate $Pb(Zr_xTi_{1-x})O_3$. However due to rising environmental concerns from lead in current materials and fast mechanical decay accompanied by its ability to be only applied in relatively low temperature the alternatives are needed [3]. For these reasons, new lead-free piezoelectric ceramics are being developed. In lead- free piezoelectric compounds construction of phase boundaries is a very effective way of increasing piezoelectrical properties. However, phase boundaries of lead-free materials often sensitive to temperature and composition. Recently $BiFeO_3$ solid solutions have shown to have high piezoelectricity due to the formation of the phase boundary [4]. Because of their high Currie temperature bismuth ferrite, solid solutions could also be used at elevated temperatures. But due to the leakage of current and not clearly defined phase boundaries, further research is needed.

In this work bismuth ferrite – barium titanate ($XBiFeO_3 – (1-X)BaTiO_3$) solid solutions with different ratios are prepared by ethylene glycol and citric acid assisted sol–gel method. Obtained samples were characterized by X-ray diffraction, scanning electron microscopy, Raman spectroscopy. Electrical and magnetic properties were also measured.

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