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METASTABLE PEROVSKITE PHASES - MULTIFERROICS IN THE $BiFeO_3$ - $BiScO_3$ - $LaFeO_3$ - $LaScO_3$ SYSTEM

Abstract

Perovskite bismuth ferrite is one of the most studied multiferroics since this compound can be obtained using the conventional preparation methods. BiFeO3 is ferroelectric until TC=1083 K, while the antiferromagnetic phase transition occurs at TN=643 K. The temperatures of both transitions are too high and far from each other which makes difficult a beneficial use of the lattice-magnetic coupling effect.
Recently, we initiated a systematic study of the quasi-quadruple BiFeO3–BiScO3–LaFeO3–LaScO3 perovskite system. Three end members of this system, BiFeO3, LaFeO3 and LaScO3, can be obtained using the conventional methods, while a bulk perovskite BiScO3 phase can be synthesized under the high-pressure conditions only. One of the ideas of exploration of the Bi1-xLaxFe1-yScyO3 system is to control the temperatures of the magnetic and the polar transitions. In this system, all the constituent cations are trivalent that makes possible to vary the parameters x and y independently. Hence, one can decrease the temperature of polar transition by means of a replacement of bismuth by lanthanum and decrease the temperature of magnetic transition through an iron-to-scandium substitution. Such substitutions were found to result in formation of new structural phases in both the as-prepared and the annealed compositions with unique combinations of polar, magnetic and elastic order parameters.