Physico-Chemical nanomaterials science

Neutron investigation of crystal and magnetic structures of $BaFe_{11.9}(Al,In)_{0.1}O_{19}$ in a wide temperature range

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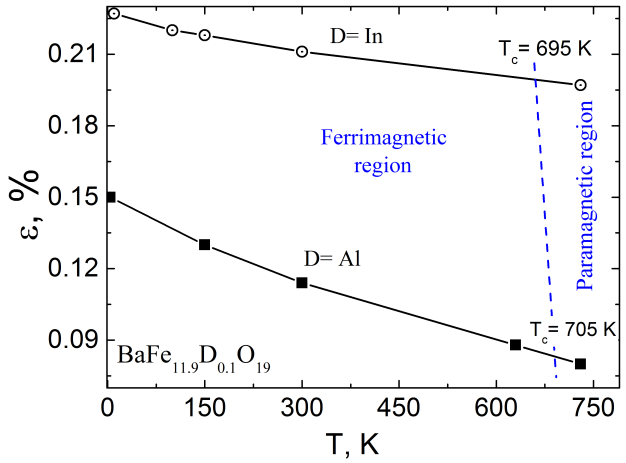
Barium ferrites with hexagonal structure ($BaFe_{12}O_{19}$) and solid solutions at their base were attracted attention during several decades due to their functional properties: high values of electrical resistance and of the Curie temperature, large magnetization and excellent corrosion resistivity [1]. The discovery of considerable ferroelectric polarization in ceramic $BaFe_{12}O_{19}$ [2] and $PbFe_{12}O_{19}$ [3] with hexagonal structure and collinear ferrimagnetic alignment renew the scientific interest for this materials.



The present work is devoted to research of influence of diamagnetic ions Al and In onto crystal and magnetic structures of $BaFe_{11.9}(Al,In)_{0.1}O_{19}$ in a wide temperature range. Polycrystalline patterns fabricated by conventional solid reaction method. Pressured pellets annealed at 1300°C (6 h) in air. The crystal and magnetic structures were researched by neutron diffraction method. Neutron data were gathered at high resolution Fourier diffractometer (HRFD) at pulsed nuclear reactor IBR-2. The changes of hexagonal type of crystal structure were not observed in all temperature range (from 10 to 750 K). The Invar effect was observed in both samples of hexoferrites $BaFe_{11.9}(Al,In)_{0.1}O_{19}$ in the field of low temperatures, similarly to [4]. The increase of microstress with forming of long-range magnetic order in ferrimagnetic crystal could have linked with the fact that individual sublattices make different contributions in general deformation. The financial supports by the 04-4-1121-2015/2017 and F15D-003 project are acknowledged.

Reference.

1. *Robert C. Pullar* // Progress in Materials Science 2012. V. 57. P.1191.
2. *Xiuna Chen*, *Guolong Tan* // J. Magn. Magn. Mater. 2013. V. 327. P. 87.
3. *Tan, G. L., Wang, M.* // J. Electroceramics. 2011. V. 26. P. 170.
4. *Turchenko V.O., Trukhanov A.V., Bobrikov I.A. et al.* // Synchrotron and Neutron Techniques. 2015. V. 9. P. 17–23.