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MAGNETIC PROPERTIES OF TbFeO₃ ORTHOFERRITE BY NEUTRON DIFFRACTION AND MÖSSBAUER SPECTROSCOPY

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The multiferroic orthoferrite TbFeO₃ nanoparticles were prepared by the sol-gal method. The crystallographic and magnetic properties of powders were characterized by using X-ray (XRD) and neutron diffraction, Mössbauer spectroscopy, and vibrating sample magnetometry (VSM). The thermal decomposition characteristic of gel system with temperature was studied by TGA and DTA. Neutron diffraction patterns for the TbFeO₃ compound have been taken at different temperatures, from 4 K to room temperature. We could not find a symptom of a diffused scattering or line broadening in low angle region. It is concluded that long-range interaction is dominant in this sample. The TbFeO₃ had a space group *Pbnm* of orthorhombic structure with lattice constants $a_0 = 5.333 \text{ \AA}$, $b_0 = 5.594 \text{ \AA}$, $c_0 = 7.646 \text{ \AA}$, respectively. Mössbauer spectrum of TbFeO₃ have been taken at various temperatures ranging from 4.2 to 700 K. Isomer shift at room temperature and 4.2 K are in the range 0.25-0.36 mm/s, which mean that the valence state of Fe ions is ferrite (Fe⁺³). The Néel and Debye temperature are determined to be $T_N = 692 \text{ K}$, and $\Theta = 280 \text{ K}$, respectively.

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