

Neutron diffraction studies of the polycrystalline and nano particle TbMnO_3

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The crystal and magnetic structure of the orthorhombic perovskite TbMnO_3 have been studied on three samples: two nanosize obtained at 800 and 850 °C and one polycrystalline by neutron diffraction measurements in the function of temperature (1.5 - 290 K). With decrease of the temperature first the ordering in Mn-sublattice and next in Tb one is observed. For polycrystalline compound in Mn sublattice the modulated structure with the propagation vector $k = (k_x, 0, 0)$ is observed in the temperature range 5 - 41 K. The ordering is collinear (C_x mode) between 27 - 41 K and noncollinear ($C_x A_z$ mode) below. The magnetic order in Tb-sublattice in 5 K is also modulated and describe by the $F_y A_z$ mode. For nano samples magnetic order in both sublattices: Mn and Tb is modulated and described by propagation vector $k = (k_x, 0, 0)$. The values of k_x components for nano samples are higher that for polycrystalline. The magnetic order in Mn sublattice is described by the C_x mode up to 1.6 K while in Tb by A_z mode. The width Bragg peaks connected with the Tb- sublattitice suggests the cluster character of this order.