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Mechanism of Dual Ferroic Properties Formation in Substituted M-Type Hexaferrites

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Abstract : It has been shown that BaFe₁₂O₁₉ is a perspective room-temperature multiferroic material. A large spontaneous polarization was observed for the BaFe₁₂O₁₉ ceramics revealing a clear ferroelectric hysteresis loop. The maximum polarization was estimated to be approximately 11.8 μC/cm². The FeO₆ octahedron in its perovskite-like hexagonal unit cell and the shift of Fe³⁺ off the center of octahedron are suggested to be the origin of the polarization in BaFe₁₂O₁₉. The magnetic field induced electric polarization has been also observed in the doped BaFe_{12-x-δ}Sc_xM_δO₁₉ (δ=0.05) at 10 K and in the BaSc_xFe_{12−x}O₁₉ and SrSc_xFe_{12−x}O₁₉ (x = 1.3–1.7) M-type hexaferrites. The investigated BaFe_{12-x}D_xO₁₉ (x=0.1, D-Al³⁺, In³⁺) samples have been obtained by two-step “topotactic” reactions. The powder neutron investigations of the samples were performed by neutron time of flight method at High Resolution Fourier Diffractometer.

Keywords : substituted hexaferrites, ferrimagnetics, ferroelectrics, neutron powder diffraction, crystal and magnetic structures

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