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Structural and magnetic properties of TbNi-substituted calcium strontium M-type nano-structured hexaferrites

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The effect of TbNi substitution on the structural and magnetic properties of $Sr_{0.5}Ba_{0.5-x}Tb_xNi_yFe_{12-y}O_{19}$, (x = 0.00–0.10; y = 0.00–1.00) hexaferrites that are synthesized by sol-gel auto combustion method is investigated. After synthesis of the samples by the sol-gel method they were characterized by (FTIR) Fourier transform infrared spectroscopy, (XRD) x-ray diffraction, (SEM) scanning electron microscopy, (TEM) transmission electron microscopy and (VSM) vibrating sample magnetometry. The single phase of an M-type hexaferrite structure has been confirmed by X-ray diffraction analysis. The lattice parameters were found to increase by increasing TbNi contents, and are thought of due to ionic sizes of the cations implicated. The TbNi has been completely soluble in the lattice. The scanning electron microscopy and transmission electron microscopy results clearly indicate that the grain size decreases with an increase of TbNi substitution. The coercivity values (1640–2170Oe) of all samples exhibit in the M-type hexaferrite range and shows increased anisotropy by the substitution of TbNi, while the size of nanoparticles was drastically reduced between 20 and 30 nm. The fine nanoparticles with increased anisotropy are very attractive in a lot of applications, such as perpendicular recording media, high-frequency applications and for improving the signal to noise ratio.

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