Synthesis and Mössbauer Effects of $TbFe_{1-x}Mn_xO_3$ Nanoparticles

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Mn^{3+} substituted orthoferrites $TbFe_{1-x}Mn_xO_3$ ($x = 0.00, 0.25, 0.50$, and 0.75) nanoparaticles were prepared by the sol-gel method. The crystallographic and magnetic properties of powders were characterized by using X-ray diffractometer (XRD), Mössbauer spectroscopy, and scanning electron microscopy (SEM). The crystal structure was found to be a single phase of orthorhombic structure (*Pbnm*). For Mössbauer spectra, we have fitted the spectra to a model based on a random distribution of Fe and Mn ions on the octahedral sites. Mössbauer spectroscopy measurement showed that Néel temperature decrease with increasing Mn concentration x. The isomer shift indicate that the valance state of Fe ions is ferric (Fe^{3+}). The result of SEM measurements showed that powders present average particle size of 36.5 nm for $TbFe_{0.25}Mn_{0.75}O_3$.

***Index Terms*—Mössbauer, nanoparticles, orthoferrite, sol-gel.**