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MAGNETIC PROPERTIES OF $\text{R}_1\text{Y}_2\text{Fe}_5\text{O}_{12}$ (R=Pr, Nd, and Gd) DERIVED BY SOL-GEL METHOD

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Fine particles of $\text{R}_1\text{Y}_2\text{Fe}_5\text{O}_{12}$ (R = Pr, Nd, and Gd) were prepared by a new salts-routed sol-gel process, and their magnetic properties were investigated by using x-ray diffraction (XRD), atomic force microscopy (AFM), vibrating sample magnetometer (VSM), and Mössbauer spectroscopy. The stock solutions were dissolved in absolute 2-Methoxyethanol (2-MOE). Heat treatments were carried out at 600-800 °C for the thin films for 1h in air, and at 800–1000 °C for powders for 6 h in air. Nano-sized fine particles were dispersed on SiO$_2$/Si(100). The microstructure of the films consisted of spherical grains of 500-1000 Å in size and 60-150 Å in surface roughness (rms). The films annealed at other temperatures exhibited almost the same trend, only differing in coercivity ($H_c$) and saturated magnetization ($M_s$) values. The largest coercivity in thin films is 64 Oe for Pr$_1\text{Y}_2\text{Fe}_5\text{O}_{12}$. The $H_c$ increase as doping ionic radius increases from Gd to Pr. Mossbauer spectra for $\text{R}_1\text{Y}_2\text{Fe}_5\text{O}_{12}$ (R = Pr, Nd, and Gd) composed with 2 set of 6-Lorentzians for iron.

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