

An investigation on structural and magnetic properties of praseodymium substituted yttrium iron garnet nanoparticles

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Abstract: Praseodymium ion (Pr^{3+}) substituted yttrium iron garnet nanoparticles $\text{Pr}_x\text{Y}_{3-x}\text{Fe}_5\text{O}_{12}$ ($x = 0.0, 0.1, 0.2, 0.3, 0.4$) were fabricated by the sol-gel method. X-ray diffraction (XRD) patterns confirmed the pure garnet structure for all samples. The chemical bonds and the garnet phase were studied by using Far-FTIR. The magnetic hyperfine parameters were obtained by Mössbauer spectroscopy and confirmed the VSM results. The results of vibrating sample magnetometer (VSM) represents that saturation magnetization increases with increasing praseodymium ion concentration for the samples with $x = 0.0$ to $x = 0.2$ and then decreases up to $x = 0.4$. These changes assigned to the Neel theory, Pr^{3+} substituted at c site and the spin canting due to the sublattice splitting.

Keywords: Sol-gel; Yttrium Iron Garnet; Praseodymium; Mössbauer Spectroscopy; Vibrating Sample Magnetometer.

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