Effect of Fe$^{3+}$ cations substitution on structural and magnetic properties of Bi$_{0.5}$Y$_{2.5-x}$Fe$_{5+x}$O$_{12}$ particles Prepared by Sol-Gel Method

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Abstract: In this work, Fe$^{3+}$ substituted bismuth yttrium iron garnet particles Bi$_{0.5}$Y$_{2.5-x}$Fe$_{5+x}$O$_{12}$ ($x$=0.0, 0.1, 0.2) were synthesized by the sol-gel method. X-ray diffraction (XRD) patterns confirmed the pure garnet structure for 0.0 and 0.1 samples and formation of YIP and Fe$^{2+}$O$_3$ phases in $x$ = 0.2 sample. The results of vibrating sample magnetometer (VSM) measurements represent that saturation magnetization increases with increasing Fe$^{3+}$ cation concentration. These increases assigned to the effects of the bismuth ions in garnet structure, orientation of substituted Fe$^{3+}$ cations magnetic moments and presence of Fe$^{3+}$ cations.

Keywords: Yttrium iron garnet; bismuth; sol-gel; vibrating sample magnetometer.