

Investigation of the Magnetic Properties of Dy doped Nd-Fe-B Permanent Magnet by Using Mössbauer Spectroscopy

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The crystal and the magnetic properties of $(\text{Nd}_{35.00-x}\text{Dy}_x)\text{Fe}_{bal}\text{Cu}_{0.15}\text{Co}_{1.50}\text{Al}_{0.20}\text{Nb}_{0.35}\text{B}_{1.00}$ (wt.%; $x = 3.50, 6.00, \text{ and } 8.00$) samples are investigated by using x-ray diffractometer (XRD), vibrating sample magnetometer (VSM), and Mössbauer spectrometer. The crystal structure is determined to be tetragonal with the $P4_2/mnm$ space group. The saturation magnetization (M_s) decreases while the coercivity (H_c) increases with increasing Dy ion concentration. Based on the zero-field-cooled (ZFC) curves, all the samples show spin reorientation, and the spin-reorientation temperature T_{SR} decreases with increasing Dy ion concentration. The Mössbauer spectra measured at 295 K show decreasing $\langle H_{hf} \rangle$ with increasing Dy concentration, and the abrupt changes both in the magnetic hyperfine field (H_{hf}) and the electric quadrupole shift (E_Q) at temperatures around T_{SR} .

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