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Magnetic properties of Nd-Ga-Fe_{bal}-Nb-B alloy

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Here, we have synthesized Nd-Ga-Fe_{bal}-Nb-B alloy by strip casting method. The crystalline and magnetic properties of sample were investigated with x-ray diffractometer (XRD), vibrating sample magnetometer (VSM), and Mössbauer spectrometer. The XRD pattern was analyzed with the Rietveld refinement method, indicating a tetragonal structure and the space group of $P4_2/mnm$. The temperature dependence of zero-field cooled (ZFC) magnetization curve was measured under applied field at temperature ranging from 4.2 to 740 K. From the ZFC curve, Curie temperature and spin reorientation temperature are determined to be 615 K and 130 K, respectively. Also, Mössbauer spectra were measured at various temperatures ranging from 4.2 to 620 K. Each spectrum was fitted with 6-sextets for Fe site ($8j_1$, $8j_2$, $16k_1$, $16k_2$, $4c$, and $4e$), and magnetic hyperfine field, Isomer shift, electric quadrupole shift, and area ratio values were obtained from the fit. We observed the change in slope of magnetic hyperfine field and electric quadrupole shift at 130 K while the Curie temperature was determined to be 615 K from the measurement of zero velocity counter, agreeing with the values obtained from VSM measurements. [http://dx.doi.org/10.1063/1.4868602]