

Structural and magnetic properties of $\text{Fe}_{72}\text{Nb}_8\text{B}_{20}$ alloy prepared by mechanical alloying

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Abstract :

$\text{Fe}_{72}\text{Nb}_8\text{B}_{20}$ alloy was prepared by mechanical alloying of mixture of Fe, Nb and B powders for 50 h in a high energy planetary ball mill Retsch PM400, under argon atmosphere, using hardened steel vials and balls. Morphological changes, structural, microstructural and magnetic properties were investigated by scanning electron microscopy (SEM), X-ray diffraction (XRD), transmission Mössbauer spectroscopy (TMS) and vibrating sample magnetometer (VSM). The reaction between Fe, Nb and B powders leads to the formation of bcc Fe (Nb, B) and Nb (B) solids solutions as well as Fe_2B and FeB type borides and amorphous. The coercivity, H_c , and the saturation magnetization, M_s , values are of about 144.516 Oe and 11.51 emu/g respectively.

Keywords: Nanocrystalline materials; Mechanical alloying; FeNbB alloy; X-ray diffraction; transmission Mössbauer spectroscopy; Vibrating sample magnetometer.