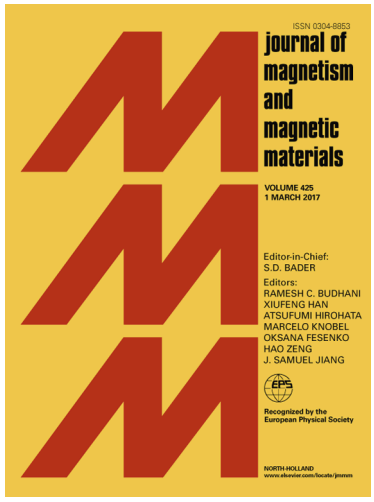

Effect of Process Control Agent on the Structural and Magnetic Properties of Nano/Amorphous $Fe_{0.7}Nb_{0.1}Zr_{0.1}Ti_{0.1}$ Powders Prepared by High Energy Ball Milling

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Abstract

In this study, amorphous $Fe_{0.7}Nb_{0.1}Zr_{0.1}Ti_{0.1}$ alloy without metalloids was produced by mechanical alloying of pure mixture elements. Miedema's semi-empirical model was employed to predict the possibility of amorphous phase formation in proposed alloying system. The effect of Hexane as process control agent (PCA) on the structural, magnetic, morphological and thermal properties of the products was investigated. The results showed that the presence of PCA was necessary for the formation of amorphous phase as well as improved its soft magnetic properties. The PCA addition causes an increase of the saturation magnetization (about 43%) and decrease of the coercivity (about 50%). Moreover, the sample milled without PCA, showed a wide particle size distribution as well as relatively spherical geometry. While, in the presence of PCA the powders were aspherical and Polygon. In addition, the crystallization and Curie temperatures were found to be around 800 ^{o}C and 650 ^{o}C, respectively which are relatively high values for these kinds of alloys.

Keywords: amorphous alloy, crystallinity, soft magnetic properties, milling, thermal stability