Structure and magnetic properties of Fe(Mn)-Si-B-Nb-Cu alloys

S. Michalik[a], P. Sovak[a], P. Kollar[a], V. Girman[a] and J. Bednarcik[b]

[a]Department of Physics, P.J. Safarik University, Park Angelinum 9, 041 54 Kosice, Slovakia

[b]HASYLAB am DESY, Notkestrasse 85, D-22603 Hamburg, Germany

9.7 cm

The aim of this work was to investigate the role of the partial iron substitution by manganese on structural and magnetic properties of amorphous and nanocrystalline ribbons with nominal composition of $Fe_{73.5-x}Mn_xCu_1Nb_3Si_{13.5}B_9$ ($x = 1, 5, 9, 15$ at. %) prepared by single-roller melt spinning technique. Both, the glassy state of as-quenched samples and nanocrystalline samples after annealing were studied by X-ray diffraction (XRD) measurements using synchrotron radiation performed at HASYLAB/DESY and thus structural factors and atomic pair distribution functions could be calculated. No significant changes were observed in a short range atomic order that could be expected as a result of Mn substitution. Thermal stability of the as-prepared alloys was investigated by differential scanning calorimetry (DSC). The structural evolution of amorphous samples Fe(Mn)-Si-B-Nb-Cu within temperature annealing was studied by in-situ XRD measurements. DSC measurements and in-situ XRD experiments revealed the two-step crystallization process, temperatures T_{x1} and T_{x2} were influenced by Mn content(thermal separation between T_{x1} and T_{x2} completely vanished for $x = 15$ at. %.) The influence of Mn substitution on magnetic properties was confirmed by measurements of coercivity and by thermomagnetic measurements.

13.4 cm

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Corresponding author :

S. Michalik

Address for correspondence :

Department of Physics, P.J. Safarik University, Park Angelinum 9, 041 54 Kosice, Slovakia

Email address :

stefan.michalik@upjs.sk