Stoichiometry influence on short range order in melt-spun $Fe_{81\text{-}x\text{-}y}Ni_xCo_yZr_7B_{12}$ alloys

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A series of amorphous melt-spun ribbons of NANOPERM- and HITPERM-type alloys [1] with the stoichiometry $Fe_{81\text{-}x\text{-}y}Ni_xCo_yZr_7B_{12}$ (x = 0, 10, 20, 30, 40, 50, 60, 70, 81, y = 0 and x = 0, y=20, 40, 60, 81) alloys has been studied by means of X-ray diffractometry and differential scanning calorimetry (DSC).

We present analysis of the short range atomic order of the investigated amorphous alloys in terms of the average interatomic distance performed using the Ehrenfest formula [2], which relates the angle position of the maxima of amorphous halo θ with the average interatomic distance. In our previous investigation [3] it has been shown that for Ni doped glasses with x = 0-30 the primary phase is the α-(Fe,Ni) one, while in the glasses with the x values ranged between 40-60 crystallization begins with the γ-(Fe,Ni) particles formation. The changes in the primary phase nature with stoichiometry (it means with increasing Ni content) correlate with the minimal value of 2θ for x = 30 at.%, which is shown in Fig. 1. In the range of higher Ni content ($x \geq 64$) the primary crystallization product is a metastable $Cr_{23}C_6$-type phase. Increase in 2θ corresponds to a decrease in the mean interatomic distances (see Fig. 1). Fe-Co-Zr-B glasses demonstrate similar behaviour to that observed in Fe-Ni-Zr-B alloys, *i.e.* the mean interatomic distances in highly alloyed amorphous phases decrease with partial replacement of Fe by elements with larger atomic radii.

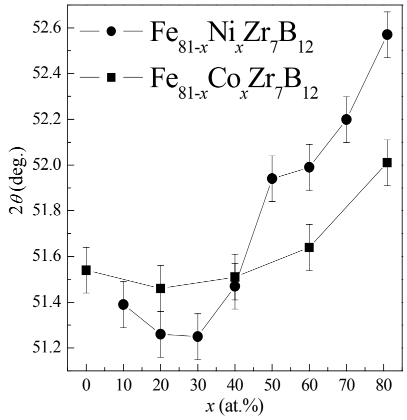

Fig. 1. Dependence of location of amorphous halo maxima on stoichiometry for series of $Fe_{81\text{-}x\text{-}y}Ni_xCo_yZr_7B_{12}$ as-quenched alloys.

The thermal stability characteristics (both glass transition and crystallization temperatures as well as apparent activation energies of primary crystallization) of the amorphous alloys determined from the DSC data have non-monotonic dependencies on the Ni and Co content. The behaviour of the apparent activation energy of crystallization correlates with the changes in the primary crystallized phase structure of the alloys examined.

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