Glassy state formation and thermal stability in (Hf,Cr)-Co-B alloys

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Abstract

Research on the new permanent magnet materials is focused on the boost of their magnetic properties, to obtain at least half of the value of energy product of Nd-Fe-B materials. Substitution of Cr atoms is proposed to improve magnetic properties of Hf2Co11B alloys by grain refinement, expected increase of magnetic anisotropy. Results of the Miedema's model calculations for Hf2-xCrxCo11B ($0 <= x <= 2$) were confronted with the experimental results for the melt-spun alloys. Formation enthalpy of Hf2Co11B amorphous alloy = -20.6 kJ/mol and other determined parameters indicate its moderate glass forming ability (GFA). = -0.5 kJ/mol for the Cr2Co11B alloy suggests its very low ability to form amorphous phase, which can be explained by similar atomic radii of Cr and Co and smaller interfacial enthalpy of Cr-Co than Hf-Co pair. This results correspond well with X-ray diffraction experiments, where the presence of fully amorphous structure was confirmed for the alloys with high Hf content ($1 <= x <= 2$). In the ribbons with the lower Hf content ($0.5 <= x <= 0$) crystalline phases were formed at the expense of amorphous one. Thermal stability is usually proportional to GFA and in fact the increase of crystallization temperature and thermal stability with increasing Hf content is reported. **Acknowledgement**
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