Thermal stability and glass forming ability of (Hf,Cr)-Co-B alloys

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Cr substitution causes the refinement of grains and can increase magnetic anisotropy and hard magnetic properties of $Hf_2Co_{11}B$ alloy. Experimental analysis of $Hf_{2-x}Cr_xCo_{11}B$ ($0 \leq x \leq 2$) melt-spun alloys was performed (x-ray diffraction, differential scanning calorimetry) and compared with the results of semi-empirical calculations (Miedema model). Amorphous ribbons were obtained for high Hf content ($0 \leq x \leq 1$) while for $1.5 \leq x \leq 2$, formation of crystalline phases is reported. Moreover, Hf-rich alloys are characterized by higher thermal stability. Formation enthalpy of $Hf_2Co_{11}B$ amorphous alloy is equal to -20.6 kJ/mol and along with other parameters indicate moderate glass forming ability (GFA). Similar atomic radii of Cr and Co and smaller interfacial enthalpy of Cr-Co than of Hf-Co pair, results in low GFA for the alloys with high Cr content.