

Thermal and magnetic properties of $\text{Hf}_2(\text{Fe}_x\text{Co}_{1-x})_{11}\text{B}$ alloys in various structural states

A. Musiał,¹ J. Kováč,² and Z. Śniadecki¹

¹*Institute of Molecular Physics, Polish Academy of Sciences,
M. Smoluchowskiego 17, 60-179 Poznań, Poland*

²*Institute of Experimental Physics Slovak Academy of Sciences,
Watsonova 47, 040 01 Košice, Slovakia*

Thermal and magnetic properties of the $\text{Hf}_2(\text{Fe}_x\text{Co}_{1-x})_{11}\text{B}$ alloys were investigated and compared to those of the well-known $\text{Hf}_2\text{Co}_{11}\text{B}$ parent compound [1]. To obtain fully amorphous ribbons, rapid quenching technique was used. The increasing content of Fe resulted in higher thermal stability of the amorphous phase and its higher Curie temperature. The isothermal annealing led to the crystallization of the $\text{Hf}_2\text{Co}_{11}$ (in rhombohedral and orthorhombic structure) and HfCo_2 phases, with the addition of $(\text{FeCo})_3\text{B}$ and $\alpha\text{-Fe}$, instead of the fcc-Co phase reported before for $\text{Hf}_2\text{Co}_{11}\text{B}$ alloy [2]. Moreover, annealing at $T = 665^\circ\text{C}$ resulted in the crystallization of the HfCo_3B_2 phase regardless of composition. Due to the increase of the Fe atoms, the highest value of magnetization saturation was obtained for the $x = 0.4$ sample, while the coercive field and anisotropy constant were higher for $\text{Hf}_2(\text{Fe}_{0.2}\text{Co}_{0.8})_{11}\text{B}$ after heat treatment at $T = 610^\circ\text{C}$. The crystallization of the multiphase alloy causes a nonsymmetric peak of the dM/dH vs. H , suggesting that the soft and hard magnetic phases are not fully exchange coupled.

References:

[1] M. A. McGuire et al., J. Appl. Phys. 117 (2015) 053912

[2] A. Musiał et al., J. Alloys Compd. 665 (2016) 93-99

The project is co-financed by the Polish National Agency for Academic Exchange (agreement no. BPN/BFR/2025/1/00007/U/00001).