IMPROVED SOFT MAGNETIC PROPERTIES IN HITPERM NANOCRYSTALLINE ALLOYS BY HEAT TREATMENT UNDER EXTERNAL MAGNETIC FIELD

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9.7 cm

The nanocrystalline FeCo-based alloys prepared by devitrification of melt-spun amorphous precursors, called also HITPERM, belong to an important group of soft magnetic materials. In this work, the formation of a nanocrystalline structure and its influence on the magnetic properties was investigated in the series of $(Fe_{1-x}Co_x)_{81}Nb_7B_{12}$ (x=0, 0.25, 0.33, 0.5, 0.66, 0.75) alloys. We report on a beneficial effect of the external magnetic field applied during the heat treatment on the magnetic characteristics of these materials. Most remarkable improvement of soft magnetic properties after magnetic annealing is observed for equiatomic (x=0.5) and Co-rich compositions. As an example, the $(Fe_{0.5}Co_{0.5})_{81}Nb_7B_{12}$ alloy can exhibit after the amorphous/crystalline transformation under longitudinal field of 20 kA/m the values of coercive field less than 8 A/m. For the same sample annealed under transverse field of 640 kA/m, the induced anisotropy constant reaches the value $K_u \approx 1400$ J/m^3. These values are superior to those previously reported for HITPERM materials and they remain fairly stable also at elevated temperatures. The differences in the development of induced anisotropy versus Co-content are discussed in the frame of magnetic atoms pair ordering theory.

13.4 cm

Subject category :

3. Transition Metals, Alloys and Compounds

Presentation mode :
oral

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