Poster

SOFT MAGNETIC PROPERTIES OF NANOCRYSTALLINE $(Co_{77}Si_{13.5}B_{9.5})_{90}Fe_7Nb_3$ ALLOY

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Nanocrystalline soft magnetic alloys with very fine microstructure, combine high-saturation magnetization with very small coercive force and very low effective saturation magnetostriction and are, therefore, especially interesting from the standpoint of their use as soft magnetic materials. These materials are characterized by a microstructure consisting basically of two phases, i.e., crystalline grains (with sizes of the order of the tens of nm and random orientation of their easy axes) embedded in a residual amorphous matrix. Such a microstructure is usually produced by partial crystallization of an amorphous precursor. Such as has been evidenced by different studies, the basic mechanism leading to the achievement of such a good soft magnetic behaviour is that the magneto-crystalline anisotropy of the randomly oriented nanocrystalline grains is averaged out by the exchange interactions.

In the present work we analyse the experimental results of magnetic properties deduced from the hysteresis loop (saturation magnetization and coercive field) of a current annealed (current density 56 A/mm^2 and duration 2 minutes) in the amorphous $(Co_{77}Si_{13.5}B_{9.5})_{90}Fe_7Nb_3$ alloy exhibiting two-phases (nanograins embedded in a residual amorphous matrix). Temperature dependence of the coercivity in this nanocrystalline alloy allows us to dilucidate on the intergranular exchange coupling leading to a deeper knowledge of the soft magnetic character of this nanocrystalline material. The explanation offered is in agreement with actual paradigm of the outstanding soft magnetic behaviour of suc kind of nanomaterial.

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