

Soft Amorphous Magnetic Microwires for Sensor Applications

Keywords: Magnetic microwires, Giant magnetoimpedance, Domain wall propagation, Magnetoelastic anisotropy, Magnetostriction, annealing, internal stresses

Abstract. Studies of amorphous magnetic wires have attracted great attention owing to excellent magnetic, mechanical and corrosion properties. Versatile magnetic properties such as magnetic bistability or Giant Magnetoimpedance (GMI) effect are suitable for magnetic sensors applications [1]. Recent tendency in devices miniaturization stimulated development of thin (few micrometers diameters) microwires.

Superior soft magnetic properties and GMI effect have been reported for Co-rich microwires [1]. However, less expensive Fe-rich microwires are preferable for the applications. But amorphous Fe-rich materials exhibit rather high magnetostriction coefficient and consequently present quite low GMI effect [1]. Magnetic softness and GMI effect of Co-rich microwires can be also further improved. The most common method for magnetic softness optimization is the annealing.

Consequently, the purpose of this paper is to present our recent experimental results on influence of preparation and processing conditions on magnetic properties of Fe- and Fe-Co based glass-coated microwires.

We observed that stress-annealed at appropriate conditions (time and temperature) microwires can present considerable magnetic softening and enhanced GMI effect. For interpretation of observed stress-annealing induced anisotropy we considered internal stresses relaxation and different mechanisms of stress-induced anisotropy. Observed versatile properties of stress annealed glass-coated microwires make them suitable for magnetic sensors applications.

References:

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