

Soft Magnetic Wires for Sensor Applications

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Studies of amorphous magnetic wires have attracted great attention owing to excellent magnetic, mechanical and corrosion properties. Excellent 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.

Excellent soft magnetic properties and GMI effect have been reported for properly prepared and processed 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].

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 changes of hysteresis loops after stress annealing we considered internal stresses relaxation and different mechanisms of stress-induced anisotropy.

Observed versatile properties of stress annealed glass-coated microwires with enhanced and tuneable soft magnetic properties make them suitable for magnetic sensors applications.

References:

[1] A. Zhukov, M. Ipatov and V. Zhukova, Advances in Giant Magnetoimpedance of Materials, Handbook of Magnetic Materials, ed. K.H.J. Buschow, 24: 2015 ch.2, pp.139-236.

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