The cryogenic treatment effect on the magnetoimpedance properties of the Co- and Fe-based amorphous ribbons.

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The amorphous materials are widely used in sensing applications due to their good magnetic response. The additional thermal treatments usually increase this effect. In $Co_{66}Fe_4B_{15}Si_{15}$ amorphous ribbons was found after annealing in the magnetic field that giant magnetic impedance (GMI) increased more than 100% [1]. It is also known that cryogenic treatment (CT) of amorphous magnetic alloys lead to changes in their magnetic properties also [2]. The purpose of present work was to carry out detailed studies of the GMI effects changes after CT.

The measurements of the samples of the Fe-based ($Fe_{76.8}Ni_{1.2}B_{13.2}Si_{8.8}$, $Fe_{73.5}Cu_1Nb_3Si_{13.5}B_9$) and Co-based ($Co_{66}Fe_4B_{15}Si_{15}$) amorphous ribbons were made with an impedance analyser HP4192A in frequency range 100kHz-10MHz of an AC current (5mA). The magnetic field change was about 40 Oe.

The cryogenic treatment of the amorphous ribbons was produced with liquid nitrogen during 3 hours. After CT the samples of the Co-based alloy were also annealed during 8 hours at the temperature 380° C in air in the external magnetic field of 3 Oe.

The measurements of the GMI response were made before treatment, after CT, and after annealing. It was found that the samples affected CT had a large GMI effect (figure 1). The maximum increase for Fe-based alloys was about 60% (FeNi) and 70% (FeCuNb). For Co-based alloy the increase of GMI effect was about 20%. This increase was kept after annealing of the sample.

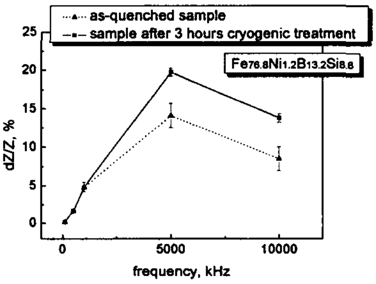

Fig 1. The difference beween the as-quenched sample and the sample after cryogenic treatment. The Fe-based amorphous alloy..

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References

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