В результате проделанной работы было показано, что наличие ударных нагрузок влияет на сохранение значения ОМИ в отличие от температуры эксплуатации.

Работа выполнена в рамках государственного задания МИНОБРНАУКИ России (тема «Диагностика», № АААА-А18-118020690196-3).

1. Новиков В.Ф. Сборник материалов X международной конференции «Механика, ресурс и диагностика материалов и конструкций», Екатеринбург, 280 (2019).

MAGNETIC PROPERTIES AND GIANT MAGNETOIMPEDANCE OF THE FeSiB FERROMAGNETIC ALLOY ELEMENTS

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The magnetostatic and magnetodynamic properties of Fe-based amorphous ribbons were investigated in this work depending on the composition and length of the MI elements.

Amorphous soft magnetic ribbons are widely used materials that applicable for current transformers, electromagnetic interference filters, electromagnetic shields and physical parameter sensors. These materials have an advantage of their very high magnetic softness, low magnetic losses and high stability of the properties. Devices based on amorphous ribbons have high accuracy and reliability. It refers, for example, to such devices as magnetoimpedance sensors. Magnetoimpedance (MI) effect consist in the change in total electrical impedance of a ferromagnetic conductor when an external magnetic field is applied and alternating current flows through it [1]. The magnetostatic and magnetodynamic properties of Fe-based amorphous ribbons were investigated in this work depending on the composition and length of the MI elements.

$(Co_{95}Fe_5)_{80}Si_{10}B_{10}$ ribbon (S1, width 1 mm) and $Fe_{74}Si_{13}B_9Nb_3Cu_1$ (S2 and S3, width 3 mm) ribbons were prepared by rapid quenching technique. The first one has classic composition [2] that was investigated as reference point. The addition of niobium to the second alloy leads to decrease of the the magnetization reversal losses [3]. Magnetic properties of the samples were measured by vibrating sample magnetometer. Magnetoimpedance spectra were obtained for MI sensitive elements using an Agilent E4991A impedance analyzer based installation. It was found that the highest magnetoimpedance ratio has S1 ribbon (Figure 1). Magnetic properties in these alloys can be significantly modified as a result of thermomagnetic treatment, such as an increase of the magnetoimpedance characteristics. Peculiarities of the magnetic anisotropy of the

elongated elements were studied for different lengths of 1.5 and 4.0 cm. Contribution of the demagnetizing fields and the shape anisotropy was evaluated for comparison of the data for S2 and S3 structures. As a result, the magnetoimpedance ratio for the total impedance was increased for longer sample. At the same time, two peaks appeared in the field dependence of the magnetoimpedance ratio, which indicates an increase in the anisotropy field.

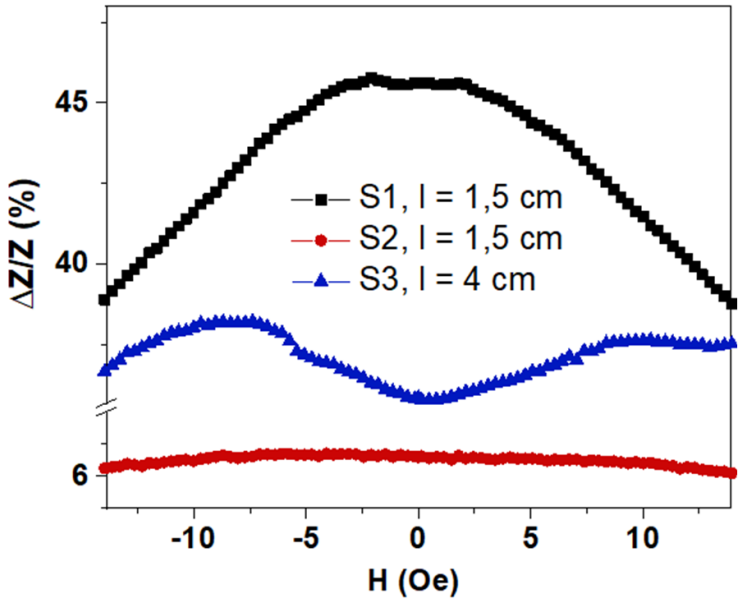

Fig. 1.Field dependence of magnetoimpedance ratio for the total impedance for structures based on different compositions and different length in the case of S1, S2, S3 sensitive elements. Measurements done at 63 MHz frequency.

1. Kurlyandskaya G. V., de Cos D., Volchkov S. O., Russ. J. Nondestr. Test. 45 377 (2009)
2. Machado F.L.A., Da Silva B.L., Rezende S.M., Martins C.S., Journal of Applied Physics Volume 75(10) 6563 (1994)
3. Manna S.K., Srinivas V., JMMM 449 467 (2018)