Temperature dependance of high frequency giant magnetoimpedance in glass coated $Co_{67}Fe_{3.8}Ni_{1.4}B_{11.5}Si_{14.6}Mo_{1.7}$ Microwires

Yong-Seok Kim[1], Seong-Cho Yu[1], and Heebok Lee[2]

[1]Chungbuk National Univ., Dept. of Physics, Cheongju 360-763, Korea
[2]Kongju National Univ., Dept. of Physics, Kongju 314-701, Korea

*Corresponding author: e-mail: heebok@kongju.ac.kr, Phone: +82 41 850 8276, Fax: +82 41 850 8270

The investigation of low temperature dependence of the high frequency magnetoimpedance effect is very important for scientific interests, technical applications for a temperature sensor, and the thermal stability of magnetic sensors. And also using high frequency may be more profitable for microwire due to very short penetration depth. In this study, the giant magnetoimpedance(MI) effect in high frequency range from 100MHz to 1GHz was investigated in a glass coated amorphous $Co_{67}Fe_{3.8}Ni_{1.4}B_{11.5}Si_{14.6}Mo_{1.7}$ microwire measured at various temperatures from 10k to 300k. The wires were fabricated by a glass-coated melt spinning technique. A new magneto-resonance technique was used for high frequency MI measurement by forming a LC-resonator circuit consisted of a glass-coated microwire and capacitive electrodes. The measurement was carried out along the wire and at varying axial dc-magnetic field in its range of ±4000 Oe. The shape of the impedance curves plotted vs. a dc-field is changing dramatically at near the resonance frequency. The sudden change of the phase angle, as large as 180°, evidenced the occurrence of the resonance at a given intensity of the external dc-field. This extraordinary sharp change of magneto-impedance effect can be explained in terms of a ferromagnetic resonance in an ultra-soft magnetic microwire. The magnetoimpedance ratio shows extremely stable for magnetic sensors at low temperature.

References

[1] Heebok Lee, Yong-Seok Kim, and Seong-Cho Yu, J. Magnetics, 7(4), pp.160-164 (2002).