Dimensional effect of terminal electroes on resonance frequencies in glass coated $Co_{67}Fe_{3.8}Ni_{1.4}B_{11.5}Si_{14.6}Mo_{1.7}$ microwires

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A new magneto-resonance effect was found out in *LC*-resonators consisted of a glass-coated microwires with capacitive terminal electrodes. The dimensional effect of terminal electrodes on the resonance frequency is one of serious factors to confront the magnetic sensor application. We examined the changes of resonance frequencies as a function of the electrode dimensions in amorphous $Co_{67}Fe_{3.8}Ni_{1.4}B_{11.5}Si_{14.6}Mo_{1.7}$ microwire. Two capacitive electrodes at the end of microwire can vary from 3mm to 9mm and spaced the electrodes out from 4mm to 8mm. The measurement of resonance frequency was carried out at high frequency range from 100 MHz up to 1 GHz with a network analyzer and an impedance analyzer along the wire direction and at varying axial dc-magnetic field in its range of ±300 Oe. The wires were fabricated by a glass-coated melt spinning technique. The shape of the impedance curves plotted vs. a dc-field is changing dramatically at near the resonance frequency. The phase angle was also strongly dependent on this field. The external dc-magnetic field changes the circumferential permeability as well as the penetration depth, both in turn change the impedance of the sample. A large increase in circumferential permeability collaborates with the capacitance of electrodes to make the magnetic resonance in the *LC* resonator. The resonance frequency can be tuned from 100MHz to 1GHz by changing the length of terminal electrodes. The increasing the length of terminal electrodes and the decreasing the distance between the electrodes help to reduce the resonance frequency.

References

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