Giant magnetoimpedance effect in $Co_{70}Fe_5Si_{15}B_{10}$ and $Co_{70}Fe_5Si_{15}Nb_{2.2}Cu_{0.8}B_7$ ribbons

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Abstract: Giant magnetoimpedance (GMI) effect has been observed in $Co_{70}Fe_5Si_{15}B_{10}$ and $Co_{70}Fe_5Si_{15}Nb_{2.2}Cu_{0.8}B_7$ melt-spun amorphous ribbons. The magnetoimpedance (MI) of these samples has been studied up to a frequency of 10 MHz and varying a dc magnetic field (H_{dc}) within 150 Oe. A maximum change of 89% in MI has been observed for $Co_{70}Fe_5Si_{15}Nb_{2.2}Cu_{0.8}B_7$ composition around a frequency of 3.1 MHz. Substitution of Cu and Nb for B in an initial $Co_{70}Fe_5Si_{15}B_{10}$ composition forming the $Co_{70}Fe_5Si_{15}Nb_{2.2}Cu_{0.8}B_7$ composition not only favors the GMI effect but also gives rise to the sensitivity of the magnetic response (18%/Oe), which is very beneficial for magnetic sensors applications. The GMI effect for both samples annealed at 550 K is further enhanced due to the presence of the ultrasoft magnetic materials, compared to their as-quenched samples.

Author Keywords: Co-based amorphous alloys; Magnetic sensing sensors; Magnetoimpedance effect; Proper heat treatments

Index Keywords: Amorphous alloys; Electric conductivity of solids; Giant magnetoresistance; Magnetic fields; Magnetic hysteresis; Magnetometers; Nanostructured materials; Quenching; Soft magnetic materials; X ray diffraction analysis; Giant magnetoimpedance effect; Magnetic sensor; Ultrasoft magnetic material; Cobalt alloys

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References:

- Panina, L.V., Mohri, K., (1994) Appl. Phys. Lett., 65, p. 1189
- Panina, L.V., Mohri, K., (1995) J. Magn. Soc. Jpn., 19, p. 265
- Kim, Y.K., Cho, W.S., Kim, T.K., Kim, C.O., Lee, H.B., (1998) J. Appl. Phys., 83, p. 6575
- Lee, H.B., Lee, K.J., Kim, Y.K., Kim, T.K., Kim, C.O., Yu, S.C., (2000) J. Appl. Phys., 87, p. 5269
- Chiriac, H., Ovari, T.A., Marinescu, C.S., (1999) Nanostruct. Mater., 12, p. 775
- Roy, B., Ghatak, S.K., (2001) J. Alloys Comps., 326, p. 198
- Jiang, B.Z., Ulyanov, A.N., Yu, S.C., Lee, H.B., Park, S.T., (2002) J. Appl. Phys., 91, p. 8444
- Guo, H.Q., Kronmuller, H., Dragon, T., Chen, C., Shen, B.C., (1998) J. Appl. Phys., 84, p. 5673
- Byon, K.S., Yu, S.C., Kim, J.S., Kim, C.G., (2000) IEEE Trans. Magn., 36, p. 3439
- Ryu, G.H., Yu, S.C., Kim, C.G., Lachowicz, H.K., (1999) IEEE Trans. Magn., 35, p. 3391
- Brunetti, L., Tiberto, P., Vinai, F., Chiriac, H., (2001) Mater. Sci. Eng. A, 304-306, p. 961
- Lee, H.B., Lee, K.J., Kim, Y.K., Kim, K.S., Yu, S.C., (2001) J. Alloys Comp., 326, p. 313
- Marin, P., Vazquez, M., Olofinjana, A.O., Davies, H.A., (1998) Nanostruct. Mater., 10, p. 299
- Beach, R.S., Berkowitz, A.E., (1994) Appl. Phys. Lett., 64, p. 3652
- Byon, K.S., Yu, S.C., Kim, C.G., (2001) J. Appl. Phys., 89, p. 7218
- Panina, L.V., Mohri, K., Uchiyama, Noda, M., (1995) IEEE Trans. Magn., 31, p. 1249
- Doyle, W.D., He, X., Tang, P., Jagielinski, T., Smith, N., (1993) J. Appl. Phys., 73, p. 5995