

Giant magnetoimpedance effect in $\text{Co}_{70}\text{Fe}_5\text{Si}_{15}\text{B}_{10}$ and $\text{Co}_{70}\text{Fe}_5\text{Si}_{15}\text{Nb}_{2.2}\text{Cu}_{0.8}\text{B}_7$ ribbons

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Abstract: Giant magnetoimpedance (GMI) effect has been observed in $\text{Co}_{70}\text{Fe}_5\text{Si}_{15}\text{B}_{10}$ and $\text{Co}_{70}\text{Fe}_5\text{Si}_{15}\text{Nb}_{2.2}\text{Cu}_{0.8}\text{B}_7$ 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 $\text{Co}_{70}\text{Fe}_5\text{Si}_{15}\text{Nb}_{2.2}\text{Cu}_{0.8}\text{B}_7$ composition around a frequency of 3.1 MHz. Substitution of Cu and Nb for B in an initial $\text{Co}_{70}\text{Fe}_5\text{Si}_{15}\text{B}_{10}$ composition forming the $\text{Co}_{70}\text{Fe}_5\text{Si}_{15}\text{Nb}_{2.2}\text{Cu}_{0.8}\text{B}_7$ 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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