FABRICATION AND MAGNETIC PROPERTIES OF Cu_{50}-$(Fe_{69}Si_{10}B_{16}C_5)_{50}$ THIN MICROWIRES

A. Zhukov[1,2], C. García[1], V. Zhukova[3], V. Larin[2], J. González[1], J. J. del Val[1], M.Knobel[4], J.M. Blanco[3]

[1]Dpto.Física de Materiales, Fac.Quimicas,UPV/EHU, 20018 San Sebastian, Spain;
[2] TAMAG Ibérica S.L., Parque Tecnológico de Miramón, Paseo Mikeletegi 56, 1ª Planta, 20009 San Sebastián, Spain
[3]Dpto. Física Aplicada I, EUPDS, UPV/EHU, Plaza Europa 1, San Sebastián, 20018, Spain
[4]Instituto de Física "Gleb Wataghin", Univerdsidade Estatal de Campinas, Sao Paolo, Brazil

Glass coated amorphous microwires obtained by Taylor-Ulitovsky technique have been intensively studied in the last years [1]. Although main attention has been paid to studies of amorphous magnetically soft microwires, fee attempts have been made to obtain granular or nanocrystalline microwires with unusual properties [2]. Quite recently, the production of microwires with semi-hard magnetic properties and GMR from Fe-Ni-Cu and Co-Cu alloys was reported, exhibiting coercivities of the order of 700 Oe and GMR up to 18% [2].

In this work, we extend this kind of studies to mixed Cu_{50}-$(Fe_{69}Si_{10}B_{16}C_5)_{50}$ composition where half of alloy composition is commonly used amorphous soft magnetic material and the other half - Cu. Glass covered Cu_{50}-$(Fe_{69}Si_{10}B_{16}C_5)_{50}$ microwires were produced and their magnetic properties were studied at temperatures between 5 and 300 K in function of different annealing temperatures. The evolution of the structure after the annealing was observed using X-ray diffraction with Cu K_α radiation. The magnetic measurements were carried out at room temperature using either a SQUID or a vibration sample magnetometer (VSM). The as-prepared Cu_{50}-$(Fe_{69}Si_{10}B_{16}C_5)_{50}$ microwires present a relatively low coercivity of about 5 Oe and exhibit non-regular hysteresis loop typical behavior for two-phases systems. Annealing resulted in magnetic hardening of the samples with coercivity of about 50 Oe. The variation of the coercivity and remanent magnetization with the temperature at 5-300 K were obtained from those curves. Temperature dependence of magnetization at 5-300 K exhibits significant difference between field-cooled and zero-field cooled behavior.

Observed dependences interpreted in terms of two-phase structure of as-prepared samples and evolution of the structure under annealing.

[1] A. Zhukov, J. Gonzalez, J.M. Blanco, etc., J. Mater. Res. **15**, 2107 (2000)
[2] A. Zhukov, J. Gonzalez and V. Zhukova, J. Magn. and Magn., Mater **294** 165-173 (2005)