Structural, magnetic, Mossbauer and magnetostrictive studies of amorphous $Tb(Fe_{0.55}Co_{0.45})_{1.5}$ films

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Abstract: Films with a nominal composition of $Tb(Fe_{0.55}Co_{0.45})_{1.5}$ were fabricated by rf-magnetron sputtering from a fixed target configuration at various Ar gas pressures. Samples were investigated by means of x-ray diffraction (XRD), scanning electron microscopy (SEM), vibrating sample magnetometer (VSM), conversion electron Mossbauer spectra (CEMS) and magnetostriction measurements. As the Ar pressure increases, the Tb and Fe content increases slightly, whereas the Co content decreases. In addition, a small amount of Ar is introduced into the films. The as-deposited films are amorphous alloys, but their magnetic behaviour depends strongly on the deposition conditions: a perpendicular magnetic anisotropy is obtained only in film deposited at lowest Ar pressure and a parallel magnetic anisotropy exhibits in remaining films. These samples show an intrinsic magnetostriction (? ?? 10^{-3}) in an applied field of 0.7 T. In this state, it was determined that the hyperfine field reaches the value B_{hf} = 24.5 T. Effects of the heat treatment on the magnetostrictive softness are also reported. The parallel magnetostriction with a huge magnetostrictive susceptibility (??$_?$ = 1.8 ?? 10^{-2} T^{-1}) obtained at (?$_0$H = 10 mT) makes these materials useful for applications.

Index Keywords: Argon; Crystal microstructure; Magnetic anisotropy; Magnetic susceptibility; Magnetometers; Magnetostriction; Magnetron sputtering; Mossbauer spectroscopy; Pressure; Scanning electron microscopy; Terbium alloys; X ray diffraction analysis; Conversion electron Mossbauer spectra; Magnetostriction softness; Vibrating sample magnetometer; Amorphous films

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