Magnetic and magnetoresistive properties of CoFe/Au/Co/Au multilayered structures

B. Szymański, M. Urbaniak, and F. Stobiecki

Institute of Molecular Physics, Polish Academy of Sciences
M. Smoluchowskiego 17, 60-179Poznań, Poland

In our previous papers [1, 2] we have demonstrated that $(NiFe/Au/Co/Au)_N$ multilayers (Mls), characterized by in-plane and out-of-plane anisotropy for Ni-Fe and Co layers, respectively, can by applied as magnetoresistive sensors for quantitative measurements of magnetic field. To extend the range of magnetic field corresponding to the linear R(H) dependence we have replaced Ni-Fe layers by $Co_{90}Fe_{10}$, *i.e.*, by layers with a larger value of saturation magnetization.

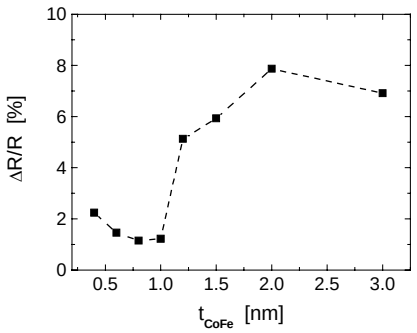

Fig. 1. Amplitue of the GMR effect as a function of t_{CoFe}.

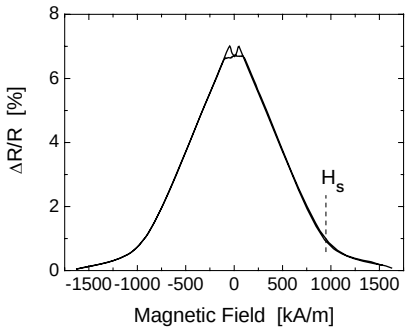

Fig. 2. Magnetoresistance curve for sample with t_{CoFe}=3.0 nm.

The $(CoFe\text{-}t_{CoFe}/Au\text{-}2.7/Co\text{-}0.6/Au\text{-}2.7)_{10}$ Mls, with t_{CoFe} in the range from 0.4 to 3.0 nm, were deposited by UHV magnetron sputtering. Periodic structure of sample was confirmed by X-ray reflectivity and diffraction. Magnetic reversal and magnetoresitance curves were measured by applying magnetic field both perpendicularly and parallel to the sample plane. For $t_{CoFe} \geq 1.2$ nm the R(H) characteristics are similar to that of the prototype system [1]. However, for smaller t_{CoFe} the effective anisotropy of CoFe layers switches from the in-plane anisotropy to the perpendicular one. This transition explains a strong increase of the GMR amplitude between $t_{CoFe} = 1$ nm and 1.2 nm (Fig. 1). The relatively large values of GMR amplitude (≈7%) and saturation field (900 kA/m) were obtained for sample with $t_{CoFe} = 3$ nm, measured in perpendicular field configuration (Fig. 2). The above result indicates a distinct improvement of parameters important for application of studied films as magnetoresistive sensors.

[1] F. Stobiecki *et al*., J. Magn. Magn. Mater. **282** (2004) 32
[2] B. Szymański *et at*., J. Alloys Compd. **423** (2006) 236

Name of the presenting author (poster session II): Bogdan Szymański
e-mail address: szyman@ifmpan.poznan.pl
http://www.ifmpan.poznan.pl