Low-field magnetoresistance of Fe/Cr multilayers

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Abstract: Sputtered {Fe/Cr} multilayers with a fixed Cr individual layer thickness t_{Cr} = 2nm and variable Fe individual layer thickness (1 nm ?? t_{Fe} ?? 6 nm) are investigated by means of X-ray diffraction, magnetoresistance and magnetisation measurements. At room temperature, the initial magnetoresistive susceptibility of the as-deposited samples is almost constant. However, the saturation field increases with decreasing Fe-layer thickness, therefore, a maximal magnetoresistance ratio ??R/R of 0.7% is reached in the sample with t_{Fe} = 1 nm. After annealing at 350?C, a ??R/R value as large as 2.3% was obtained. Further annealing causes a reduction of magnetoresistance. As the temperature is decreased, the ??R/R ratio measured in $?_0$H = 0.3 T increases linearly. At 77 K, the magnetoresistance ratio is about four times larger than that at 300 K. Results are discussed in terms of the scattering located at interfaces and the formation of a ferromagnetic state at high-temperature heat treatments.

Author Keywords: Giant magnetoresistance; Magnetic coupling; Multilayers

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