

Simulated and Measured Hysteresis Curves for Permalloy Based Thin Films

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A computer micromagnetic simulator was used to obtain the hysteresis curves for thin films of permalloy (NiFe) and NiFe/Cu/NiFe multilayers. The thickness of the permalloy layers was ranged between 10 and 100 nm. The thickness of the Cu interlayer was 4 nm. The magnetic measurements were made with a Vibrating Sample Magnetometer. The agreement between measured and simulated curves is very good when the permalloy layer is thinner than 100 nm. For a 10 nm NiFe layer the simulation gives a coercive field of 15 Oe. For a NiFe(10 nm)/Cu(4 nm)/NiFe(10 nm) we obtained from simulation a coercive field of about 50 Oe and a value for the remnant to saturation magnetisation ratio of about 0.36. The measured values for the same parameters were 60 Oe and 0.32 respectively. To obtain these values we used a grid or two grids of 12x12 single domains, square shape, whose dimensions are inspired from the film structure. For the NiFe/Cu/NiFe multilayer, each single domain is 10 nm thick and 95 nm each side. The distance between the adjacent domains was 5 nm. The thickness of the Cu layer is, in our simulation, the distance between the two grids. Between the top and the bottom layers we introduced coupling fields that have random values from 30 to 60 Oe. The data are very sensitive on the right choice of the parameters used for simulation.

9.7 cm

13.4 cm

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