Nanocomposites and nanomaterials

Qurie-switch

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Qurie-switch is a tri-layers of two strong ferromagnets separated by a weakly ferromagnetic spacer, $F_1/f(P)/F_2$ (in the bulk, f becomes paramagnetic P above T_C), demonstrated sharp thermally-controlled magnetic switching in the structure just above room temperature [1]. The switching is determined by the interplay of the F_1-F_2 exchange coupling across the weakly-ferromagnetic/paramagnetic spacer f and the Zeeman energy of the soft ferromagnetic layer (F_1) in an external field. The former is a nontrivial function of temperature due to the overlap of the intrinsic Curie-transition and the interface-induced proximity effects in the spacer.

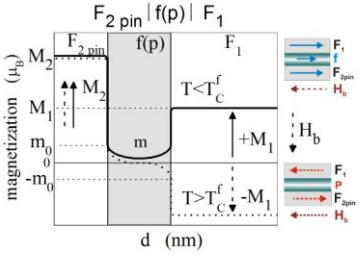

Fig. 1. Magnetization distribution in $F_1/f/F_{2pin}$ Curie-switch at high ($T>T_C$) and low ($T<T_C$) temperatures.

A developed theoretical model of the switch and an obtained analytical expression for the effective switching field and its functional form versus temperature take into account the significantly non-linear profile of the exchange and local magnetization throughout the thickness of the switch. The result is that magnetic switching can be achieved by either a temperature or field sweep, or a combination of the two where the sensitivity of the magnetic transition to external field and temperature are interdependent parameters. An illustration of the field-temperature switching for typical Curie-switch is shown in Fig. 1.

1. *Kravets A.F. et al.* Temperature-controlled interlayer exchange coupling in strong/weak ferromagnetic multilayers: A thermomagnetic Curie switch. // Phys. Rev. B -2012.-**86**, N 21.-P.214413(7).