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Surface Induced Magnetic Switching in Nanoparticles NATHAN HORREL, RENAT SABIRIANOV, University of Nebraska at Omaha — We show that the magnetic structure of nanoparticles with competing exchange interactions, i.e. having ferromagnetic exchange coupling between nearest neighbors, J01, and antiferromagnetic one between second nearest neighbors, J02, is very sensitive to the ratio of these exchanges, R=-J02/J01. The magnetic structurein ground state changes as a function of R from ferromagnetic to non-collinear, and to antiferromagnetic. This change occurs in a very narrow window of R. The moderate modification of the surface exchange parameters of such nanoparticle may lead to a substantial change in the temperature dependence of its total magnetic moment. Using Monte Carlo simulations we show that the "ordering" temperature of nanoparticles of 3-4nm in diameter can be varied by about 25% with the change of nearest neighbor exchange by only 25%. Thus, if the surface exchange is modified by the external stimuli in core shell nanoparticles, the magnetic moment of the nanoparticle can be switched from nearly zero to about half of its maximum value. We discuss the modification of surface exchange in core-shell nanoparticles with core of iron oxide and shell made of photochromic materials as azobenzene.

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