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Thesis Title	*Atomistic Modeling of the exchange bias field in core-shell nanowires*
Supervisor	D. Kechrakos, Assistant Professor
Summary	We study the magnetic properties of exchange biased cylindrical nanowires composed of a ferromagnetic core and an antiferromagnetic shell, using atomistic modeling and the Metropolis Monte Carlo simulation algorithm. Emphasis is given to the impact of exchange biasing on the domain wall propagation mechanism during magnetization reversal. To this end, we compare the properties of FM core – AF shell nanowires to bare FM nanowires of the same size. The magnetic structure is described within a classical Heisenberg Hamiltonian on a simple cubic lattice containing uniaxial anisotropy terms and dipolar interactions. Our main results demonstrate that core-shell FM-AF nanowires exhibit an initial increase of the coercivity (Hc) at small lengths followed by a saturation value (Hc0), which increases with increasing dipolar coupling strength (g). Similarly, the bias field (Heb) decreases at small lengths and reaches a saturation value (Hb0) at large lengths. However, when the FM core of the NW is hard (g<0.1KFM) the saturation value Hb0 increases with dipolar strength, while the opposite trend is observed when the FM core is soft (g~KFM). Magnetization reversal proceeds by nucleation of a pair of domain walls (DW) at the opposite ends of the wire, that propagate towards the centre of the wire with constant and opposite velocities and eventually they merge. However, the coupling to the AF shell, obstructs the DW nucleation, pushing the coherent rotation limit of a nanowire to higher values of the dipolar strength. Finally, an increase in the bias field (Heb) is observed due to interface roughness.
Key words	Magnetic Nanowires, Coercive Field, Exchange- Bias Field, Domain wall propagation, Interface roughness
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