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Magnetic anisotropy of isolated Cobalt nanoplatelets TOR OLOF STRANDBERG, Kalmar and Lund university, CARLO M. CANALI, Kalmar university, ALLAN H. MACDONALD, University of Texas, Austin — Motivated by experiments performed by M.H. Pan et al. [1], we have undertaken a theoretical study of the the magnetic properties of two-monolayer-thick Co nanoplatelets with an equilateral triangular shape. We are using a microscopic Slater-Koster tight-binding model with atomic exchange and spin-orbit interactions, that has been designed to realistically capture the salient magnetic features of large magnetic nanoclusters [2]. Two different truncations of the fcc lattice have been studied, in which the nanoplatelet surface is aligned parallel to the [111] and [001] planes respectively. We find that the higher coordination number in the [111] truncation is more likely to reproduce the perpendicular easy direction found in experiment. Qualitatively, the most important model parameter governing the anisotropy is found to be the intra-atomic exchange integral J . If we set the value of J so as to reproduce the experimentally observed magnitude of the magnetic moments, we find both quasi-easy-planes and perpendicular easy directions. Increasing J , we find that, in agreement with experiment, the easy-axis of magnetization is predominantly perpendicular to the surface, and the magnetic anisotropy energy is anomalously large. The possible role of hybridization with substrate surface states in the experimental systems will be discussed. [1] M.H. Pan et al, Nanoletters V5, no 1, 87-90 (2005)
[2] A. Cehovin et al, Phys. Rev. B, 66, 094430 (2002)

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