SPIN REORIENTATION TRANSITIONS IN ONE-DIMENSIONAL AND TWO-DIMENSIONAL MAGNETIC NANOSTRUCTURES

J. Dorantes-Dávila
Instituto de Física, Universidad Autónoma de San Luis Potosí, San Luis Potosí, México.

The magnetic anisotropy energy (MAE) of 3d transition-metal wires, stripes, and films is calculated self-consistently as a function of stripe width and film thickness.

The magnetization-reorientation transitions in stripes are determined along the crossover from the monoatomic one-dimensional chain to the two-dimensional monolayer. It is shown that the MAE oscillates as a function of stripe width and depends strongly on the considered transition metal. The reorientation transitions in Co films deposited on a highly-polarizable substrate like Pd are discussed. A local analysis of the layer-resolved MAEs provides new insight on the off-plane magnetization observed in Pd capped Co films on Pd(111).

The interfaces responsible for the stability of the off-plane easy axis are characterized microscopically.

An unexpected internal magnetic structure of the Co-Pd interfaces is revealed in which the magnetic moments and spin-orbit interactions at Pd atoms play a crucial role.

The nature reorientation transition from perpendicular to in-plane phases with increasing film thickness is studied by means full-vectorial calculations. The existence of a spin-canted phase at intermediate film thickness is demonstrated.