Effects of exchange interactions on magnetic anisotropy and spin-dynamics of adatoms on metallic surfaces

PEDRO RUIZ DIAZ, Max Planck Institute of Microstructure Physics, OLEG STEPANYUK, Physics Department, Moscow State University, VALERI STEPANYUK, Max Planck Institute of Microstructure Physics — A common belief is that magneto-crystalline anisotropy energy (MA) mainly arises from the spin-orbit coupling interaction. Here, throughout an ab initio study we show that direct exchange interactions (Eex) together with substrate-mediated interactions rules the MA nature in Co interacting adatoms supported on Cu(001) and Pt(001) surfaces. MA exhibits a non-trivial behavior and is found to be strongly sensitive to Eex, magnetic order and substrate composition. Oscillatory magnetization switching is also revealed. Further, by means of a stochastic method, for the first time to our knowledge, the spin-dynamics of these single-spin systems assessed in the hysteresis loops is presented. Insights about the interplay between Eex and MA which determines the onset of the magnetization curves and their shape are inquired as well.

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