Tuning the Magnetic Anisotropy at a Molecule-Metal Interface

We demonstrate that a C₆₀ overlayer enhances the perpendicular magnetic anisotropy of a Co thin film, inducing an inverse spin reorientation transition from in plane to out of plane. The driving force is the C₆₀/Co interfacial magnetic anisotropy that we have measured quantitatively in situ as a function of the C₆₀ coverage. Comparison with state-of-the-art ab initio calculations show that this interfacial anisotropy mainly arises from the local hybridization between C₆₀ p₂ and Co d₂₂ orbitals. By generalizing these arguments, we also demonstrate that the hybridization of C₆₀ with a Fe(110) surface decreases the perpendicular magnetic anisotropy. These results open the way to tailor the interfacial magnetic anisotropy in organic-material-ferromagnet systems.