Interface Engineered Magnetism of Hybrid Organic-Metal Materials

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Organic materials adsorbed on ferromagnetic surfaces offer the possibility to merge the concepts of molecular electronics with spintronics in order to build future nanoscale data storage, sensing and computing multifunctional devices. In this respect, the ability to reliably describe the electronic properties of carbon-based materials adsorbed on magnetic surfaces is essential to understand and assist the engineering of functionalities in hybrid organic spintronic devices. Based on the density functional theory, we performed theoretical studies to understand how to tailor the magnetic properties of hybrid organic-ferromagnetic interfaces by adsorbing organic materials containing π-electrons onto several magnetic substrates. For such hybrid systems, the magnetic properties like molecular magnetic moments and their spatial orientation, spin-polarization and the magnetic exchange coupling can be specifically tuned by an appropriate choice of the organic material. Ultimately, this allows us to precisely engineer the magnetic properties of the hybrid organic-ferromagnetic interfaces, which can be further exploited to design more efficient spintronic devices based on organic materials.

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