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Exchange coupling effects in hybrid Gr-4f RE systems

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Hybrid Ferromagnetic/Graphene (FM/Gr) systems enclose remarkable technological opportunities by bridging spintronics with promised ultra-fast Gr-based electronics and photonics. These are also of fundamental relevance since Gr actively interacts with the neighboring materials determining a modification of the electronic and magnetic properties of the system. In particular, Graphene-spaced magnetic systems with antiferromagnets offer exciting opportunities for the investigation of exchange-coupling phenomena in spintronics.
We have recently shown that ultra–thin graphene/Co films grown on Ir(111) or Pt(111) templates exhibit robust perpendicular magnetic anisotropy (PMA) and antiferromagnetic exchange-coupling when Fe is deposited on top of Gr. These results gather a collection of magnetic properties well-suited for applications. However, one drawback in 3d-FM/Gr systems, is that the FM-Gr hybridization is so strong that impact Graphene´s electronic properties, for example, the presence of Dirac´s cone. Instead, the weak interaction between 4f-FM and Gr preserves Gr unique electronic structure and particularly Dirac´s cone.
Here, by resorting to X-ray absorption and magnetic dichroism (XAS-XMCD) measurements we investigate the magnetic configurations, the nature of the Gr mediated exchange coupling and the magnetic anisotropy in 4f-FM/Gr hybrid systems such as Eu, Dy or Ho as an extension of Gr- synthetic antiferromagnetic (SAF) systems.

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