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Rashba-like spin textures in Graphene promoted by ferromagnet-mediated Electronic-Hybridization with heavy metal.

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Epitaxial Graphene/Ferromagnetic (Gr/FM) structures deposited onto heavy metals (HM) have been proposed for the realization of novel spin-orbitronic devices because of their perpendicular magnetic anisotropy and sizeable Dzyaloshinskii-Moriya interaction, which in turn allow for enhanced thermal stability and stabilization of chiral spin textures [1,2]. In this work we elucidate the nature of the induced Spin-Orbit Coupling (SOC) at Gr/Co interface on Ir by investigating different FM thicknesses [3]. Angular and Spin-Resolved Photoemission Spectroscopy experiments carried out at Cassiopée beamline (Soleil synchrotron), combined with Density Functional Theory calculations show that the interaction of the HM with the C atomic layer via hybridization with the FM is indeed the source of the SOC in the Gr layer. Furthermore, our studies in ultra-thin (2 ML) Co film underneath Gr reveal an energy splitting of $\sim$ 100 meV (negligible) for in-plane (out-of-plane) spin polarized Gr π bands, consistent with a Rashba-SOC at the Gr/Co interface, which is either the fingerprint or the origin of the Dzyaloshinskii Moriya interaction. Interestingly, at larger Co thicknesses ($\sim$ 10 ML), neither in-plane or out-of-plane spin splitting is observed, indicating Gr is almost decoupled from the HM.

1. Ajejas, F. et al. Nano Lett. 18 5364–5372 (2018).
2. Ajejas, F. et al. ACS Appl. Mater. Interfaces 12 4088–4096 (2020).
3. Muñiz Cano, B. et al. arXiv:2206.04351 [cond-mat.mtrl-sci] (2022).

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