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Spin interactions in Graphene-Single Molecule Magnets Hybrids CHRISTIAN CERVETTI, Stuttgart University (Germany), ANGELO RETTORI, Firenze University (Italy), MARIA GLORIA PINI, Istituto dei Sistemi Complessi (Italy), ANDREA CORNIA, Modena e Reggio Emilia University (Italy), AÑA REPOLLÉS, FERNANDO LUIS, Zaragoza University (Spain), STEPHAN RAUSCHENBACH, Max Planck Institut fuer Festkoerperforschung, MARTIN DRESSEL, Stuttgart University (Germany), KLAUS KERN, MARKO BURGHARD, Max Planck Institut fuer Festkoerperforschung, LAPO BOGANI, Stuttgart University (Germany) — Graphene is a potential component of novel spintronics devices owing to its long spin diffusion length. Besides its use as spin-transport channel, graphene can be employed for the detection and manipulation of molecular spins. This requires an appropriate coupling between the sheets and the single molecular magnets (SMM). Here, we present a comprehensive characterization of graphene-Fe_4 SMM hybrids. The Fe_4 clusters are anchored non-covalently to the graphene following a diffusion-limited assembly and can reorganize into random networks when subjected to slightly elevated temperature. Molecules anchored on graphene sheets show unaltered static magnetic properties, whilst the quantum dynamics is profoundly modulated. Interaction with Dirac fermions becomes the dominant spin-relaxation channel, with observable effects produced by graphene phonons and reduced dipolar interactions. Coupling to graphene drives the spins over Villain's threshold, allowing the first observation of strongly-perturbative tunneling processes. Preliminary spin-transport experiments at low-temperature are further presented.

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