Interfacing functional molecules with 2D materials

E. Coronado

Instituto Ciencia Molecular, Univ. Valencia, C/ Catedrático José Beltrán 2, Paterna, Spain
Eugenio.coronado@uv.es

Graphene and other 2D materials have been a hot focus of interest in physics, chemistry and materials science. The emergence of van der Waals heterostructures formed by assembling two different monolayers of these materials through Van der Waals forces have opened new opportunities in this field. This concept can be further expanded by interfacing a layered 2D material with materials of other dimensionalities including 0D materials (molecules, nanoparticles,…), 1D materials (nanotubes, nanowires,…) and 3D materials, which can interact non only through VdW forces but also through covalent or ionic interactions [1].

Here I propose to create heterostructures based on functional molecules and 2D materials with the aim of tuning the properties of the "all surface" 2D material *via* an active control of the hybrid interface. This concept will provide an entire new class of stimuli-responsive molecular/2D heterostructures, which may be at the origin of a novel generation of hybrid materials and devices of direct application in highly topical fields like electronics, spintronics, molecular sensing and energy storage. I will focus in particular in heterostructures in which both or at least one of the two components are magnetic. This concept will be illustrated with two examples i) Chemically functionalized 2D magnetic metal-organic frameworks [2], and ii) Hybrid heterostructures based on spin crossover nanoparticles and 2D materials [3].

References

[1] D. Jariwala et al., Nature Mater., 16 (2017) 170
[2] J. Lopez-Cabrelles et al., Nature Chem. 10 (2018) 1001
[3] J. Dugay et al., Nano Lett., 17 (2017) 186