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Graphene, the two-dimensional form of carbon atoms existing as a single layer of atoms arranged in a honeycomb lattice, has been named as the material of the future. Graphene has been produced for the first time by the two researchers A. Geim and K. Novoselov. Because of its astounding electrical and thermal properties, combined with its mechanical stiffness, strength and elasticity, as well as its potential applications in various fields of industrial and scientific importance, in the last decade tremandous increase of the cooperation between the public and private sectors around the world can be observed.
While most of the research endeavours nowadays in graphene and other 2D layered materials (2DLMs) are concentrating on device engineering to boost the performances for conventional applications in numerous fields of science and technology, within this project we will exploit the potential of supramolecular chemistry in tuning the properties of 2D materials through their controlled interfacing with functional molecular systems, a strategy that makes it possible also to impart to graphene and other 2DLMs a multifunctional nature, towards logic applications. This multidisciplinary research programme will exploit principles of supramolecular chemistry to develop new chemical methods towards the production of high quality graphene and other 2DLMs with controlled composition, structure and function. The programmed interfacing with functional molecular assemblies via non-covalent, covalent and DCC approaches will enable tuning of the 2DLM’s fundamental physico-chemical properties such as capacity to recognize and host gas molecules, porosity and optical properties.
The innovative supramolecular approach proposed in this project, may be a breakthrough method for finding the use of graphene and other two-dimensional materials in optoelectronics and devices aimed at the energy storage.