"Insight into the non-convalent functionalization mechanism of carbon nanotubes and graphene nanosheets with porphyrin molecules"

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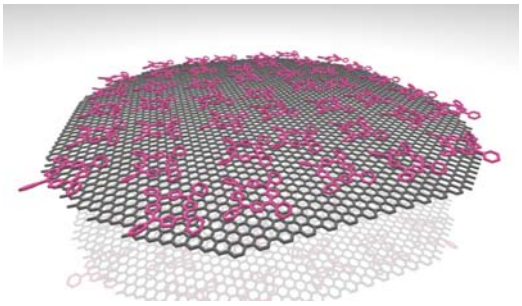
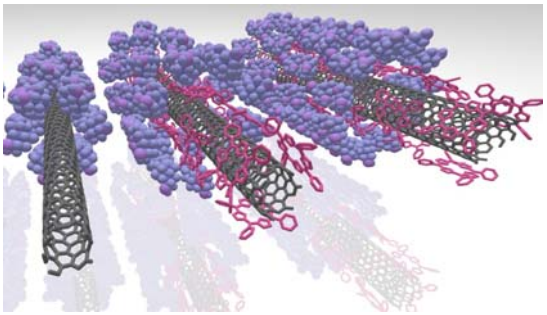
Semiconducting single wall carbon nanotubes (Swcnts) and graphene are of great interest in nanoscience, in particular for optoelectronics applications. Due to their carbon sp^2 surface, these nanocarbon objects can be non-covalently coupled to organic molecules. In this context, we have designed a nondestructive functionalization method to couple porphyrin molecules to nanotubes and graphene nanosheets.

We have evidenced that such porphyrins tightly interact with nanocarbon, leading to stable nano-compounds with efficient energy transfer properties. In the following, we will use optical spectroscopy to provide an insight into the adsorption mechanism of the molecules onto the surface of the nanotubes or graphene nanosheets. While the adsorption process is similar on these two materials, a few differences will be highlighted.

Secondly, we have studied the degree of organization of the porphyrin layer around the carbon surface. We have combined thermodynamic, chemical and spectroscopic approaches, to unveil a cooperative behavior of the porphyrins during the adsorption. In particular, we have evidenced the presence of dipole–dipole coupling between the stacked porphyrin monomers.





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