Synthesis, Properties and Applications of Functionalized Carbon Nanoforms

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Our group has been involved in the organic functionalization of various types of nanocarbons, including carbon nanotubes, fullerenes and, more recently, graphene and carbon nanodots. The chemical functionalization represents an important and versatile tool for tuning the chemical and physical properties of carbon nanostructures (CNS). For example, chemical functionalization can render CNS more easily dispersible in different solvents.
We have recently described a simple, scalable, reliable and cost-effective synthetic process for producing high-quality nitrogen-doped carbon nanodots (NCNDs), by employing arginine and ethylenediamine as precursors. The new material displays among the smallest size and the highest fluorescence quantum yields reported so far for CNDs. Moreover, they can be easily post-functionalized, due to the abundant presence of amino groups.
We have also presented a rational synthetic design for mastering CND properties, showing the importance in the choice of the precursors. By using properly designed functional units, the desired properties can be modulated, from the molecular to the nanoscale level in a controlled fashion. CNDs with customized emission can therefore be approached. Green, red and finally white-emitting CNDs were synthesized.
We are also involved in the interaction of CNS with cells, tissues (as the immune system, nervous system and biological barriers) in order to identify and prevent any possible hazard of graphene and CNS in relation to their physico-chemical properties, with a special focus on the most important exposure routes.
During this talk, we will communicate our latest results in these fast developing fields.

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