"Nanocarbon-inorganic hybrid materials as next-generation photocatalysts"

Abstract:
Carbon nanotube (CNT) and graphene–inorganic hybrids are an exiting new class of functional materials (D. Eder, Chem. Rev. 2010). In contrast to the classical nano-composites, where CNTs are mechanically dispersed in an inorganic matrix, hybrids, in which CNTs are coated by a thin inorganic layer, combine their properties in a way that creates new properties distinct from those of either building block. A considerable synergistic effect originates from the close coexistence of the two phases in the form of interfacial charge and heat transfer processes. As a consequence, CNT-inorganic hybrids have shown increased sensitivities in gas sensors, improved efficiencies in photovoltaics, superior activities in photocatalysts, and enhanced capacities in supercapacitors.

I will present a simple and versatile synthesis route for hybrid materials, and also introduce the first complex hybrids, using a zeolite (i.e. TS-1) as the inorganic compound. I will show that due to their high thermal conductivity, CNTs and graphene can act as heat sinks in stabilising small inorganic particles during calcination treatments. Finally, I will demonstrate the greatly enhanced performance of hybrids over nanocomposites, as well as the superiority of graphene over CNTs in hybrids, for the photocatalytic degradation of organic dyes.

All students and members of the department are cordially invited!

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