Synthesis of a new GO-C_{60} hybrid by "click" chemistry

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Graphene (GS) and graphene oxide (GO) have attracted great interest for its superior physical, chemical, mechanical, and electrical properties that enable a wide range of applications from electronics to nanoelectromechanical systems.[1] Functionalization of these materials can allow to modulate their electronic, optical and electrical properties, and due to the insolubility and the relatively inert surface of the GS and GO, new methods for functionalization are being explored.[2]

As precedent, hybrid materials of Carbon Nanotubes (CNTs) and fullerenes have generated intense attention, driven by the possibility of combining some of the outstanding properties of the CNTs with those of fullerenes rising new properties of the hybrid. The presence of fullerenes in the SWCNTs environment could improve the mechanical properties of the SWCNTs and tune the electronic and optical properties of both, the CNT and the fullerene cage, a subject of great interest for optoelectronic applications.[3]

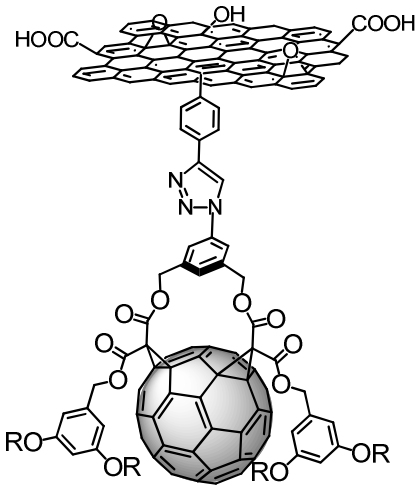
"Click" chemistry is a well-known, versatile and clean reaction and it is extremely efficient to connect discrete molecules, polymers or nanoparticles onto the nanotube sidewalls, through the formation of a triazole ring linker.

In this sense, the preparation of hybrids involving graphene and fullerenes will permit to explore the potentials applications of these materials. Based on this consideration, we present the synthesis and the characterization of a soluble hybrid material, GO-C_{60} that combines fullerene and graphene oxide (GO) into a single structure. The GO was firstly modified by the Tour procedure, affording the alkyne group followed by click chemistry between the modified GO and an azide fullerene derivative yielding the fullerene-triazole-GO (GO-C_{60}) hybrid. This hybrid material has been fully characterized by using a number of complementary techniques, including Raman, X-ray photoelectron spectroscopy (XPS), thermogravimetric analysis (TGA), high resolution transmission electron microscopy (HR-TEM); finally the photophysical properties of the resulting multicomponent system have been investigated in detail.

[1] M.J. Allen, V. C. Tung and R. B. Kaner, *Chem. Rev,***110**, (2010),132.

[2] L. Yan, Y. B. Zheng, F. Zhao, S. Li, X. Gao, B. Xu, P. S. Weiss and Y. Zhao, *Chem. Soc. Rev.*, **41**, (2012), 97.

[3] (a) M. Vizuete, M. J. Gómez-Escalonilla, J. L. G. Fierro, M. Yudasaka, S. Iijima, M. Vartanian, J. Iehl, J.-F Nierengarten and F. Langa, *Chem. Commun.*, **47**, (2011), 12771 (b) M. Vizuete, M. Barrejón, María J. Gómez-Escalonilla and F. Langa, *Nanoscale*, (2012), DOI: 10.1039/c2nr30376.



R = $C_{12}H_{25}$