Ordering phthalocyanine–C_{60} fullerene conjugates on individual carbon nanotubes and its effect on conductivity.

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Resumen

The construction of nanometer–size, multicomponent (supra)molecular architectures possessing well–defined morphology will surely play a fundamental role in the emerging field of nanotechnology.
In this context the possibility of preparing such assemblies through the programmable self–organisation of molecules outside the carbon nanotube's surface is highly attractive and could provide a unique opportunity for the nanoscale engineering of novel one–dimensional, multifunctional materials, displaying unconventional physical properties.
Here we report a remarkable example in this direction, in which a photoactive covalently–linked phthalocyanine (Pc)–C60 fullerene conjugate [1], is able to self–organise by means of no–covalent interactions and with nanometer precision on the outer shell of single–wall carbon nanotubes (SWNTs) grown on silica wafers (Figure 1). We also report a remarkable increase on conductivity of the cited carbon nanotubes.
The preparation of complex but easy–to–ensemble multicomponent supramolecular architectures in which photo– and redox–active units such as Pcs and C60 fullerenes, excellent donor (D) and acceptor (A) moieties respectively, are spatially confined and nanoscopically organised around excellent one-dimensional (1–D) conductors such as SWNTs, is extremely promising and may lead to novel molecular materials with possible applications in the fields of nano–optoelectronics and photovoltaics.

Referencias:

[1] Bottari, G; Olea, D; Gomez-Navarro, C, et al., ANGEWANDTE CHEMIE-INTERNATIONAL EDITION, **11** (2008) 2026.

Figuras:

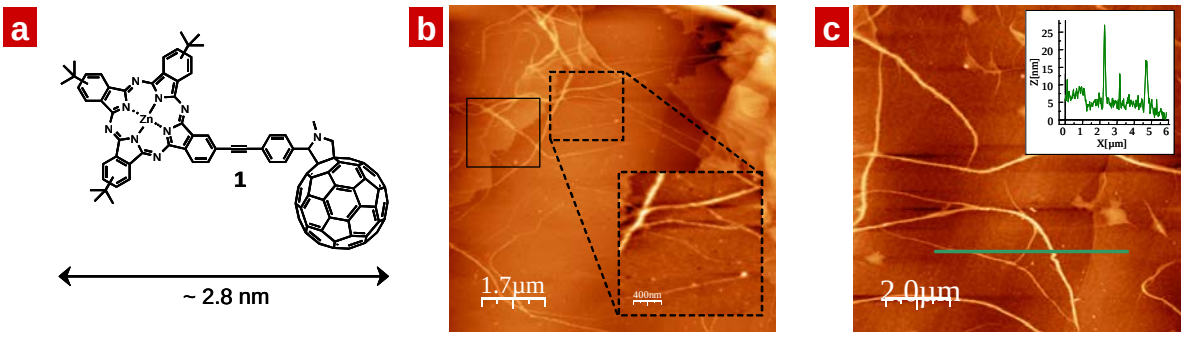

Figure 1. Structure and organisation of the covalently–linked Pc–C60 dyad 1 on HOPG surface. a Schematic molecular structure of the Pc–C60 dyad 1. b and c AFM images of the self–assembled dyad 1 drop–casted on HOPG (concentration of the dyad solutions: b = 10–5 M, c = 10–6 M). The dashed–line box in b evidences the helical structure of the supramolecular filaments. The solid–line box in b shows a region of the substrate where the supramolecular fibers of the Pc–C60 conjugate 1 are sandwiched between the dyad layers. The insets in c represent a topographic profile of the green line in the same figure.