Fullerenes Nanostructures and Soluble Nanotubes

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In recent years, the fullerenes have generated great excitement inside the scientific community, mainly because of their interesting physical and chemical properties. In this field, one of the fast moving disciplines is the ?functionalization chemistry?. New opportunities arise from the combination of the fullerene properties with those of other classes of materials, such as polymers, electro- or photoactive units, liquid crystals, etc. In most cases, the new derivatives retain the main properties of the original fullerene, and many functionalized fullerenes may find useful applications in the field of materials science and technology. Our contribution to this field has been the preparation of a variety of fullerene derivatives, mainly generated through the 1,3-dipolar cycloaddition of azomethine ylides to C60. This reaction leads to a class of stable and characterizable compounds, colloquially termed ?fulleropyrrolidines?. Applications of the functionalized fullerenes to different fields have included long-range electron-transfer processes in fulleropyrrolidine-containing donor-acceptor dyads for the development of devices employable for electron/energy storage and nonlinear optical properties. In some cases, when appropriate functionalization is provided, fullerenes self-organize in superstructures such as vesicles and nanorods. Within this contribution, we will review our most recent achievements in the field of fullerene synthesis and applications, including our preliminary efforts in the functionalization of carbon nanotubes, which results in very soluble materials.