

## Conjugated polymers and carbon nanotubes

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Conjugated polymers and carbon nanotubes (CNTs) are important constituents of modern functional hybrid materials. Their utilization as photoactive layers in organic solar cells requires better understanding of the relation between the structure and composition of the hybrids and their photovoltaic efficiency. A major breakthrough in the utilization of conjugated polymers as materials for polymer-based organic photovoltaics (POPV) came with the development of hybrid structures containing conjugated polymers and carbonaceous electron accepting nanostructures (fullerenes and fullerene derivatives), following the discovery of the photoinduced electron transfer between poly(para-phenylenevinylene) (PPV) derivative poly[2-methoxy-5-(2-ethylhexyloxy)-1,4phenylenevinylene] MEH-PPV and the C60 Buckminsterfullerene. Carbon nanotubes (CNTs) were introduced into POPV much later, in 1999. In years to follow, PV-active CNT-conjugated polymers hybrids have aroused considerable interest. Initially, CNTs were presented as candidates for replacing fullerenes as electron acceptors. But the low efficiency of native CNT (below 0.1%) and the higher values obtained in boron-doped CNT( 4.1%) were disappointing. Nowadays, it seems that CNTs may function in a variety of different roles: semiconducting CNTs (s-CNTs) are expected to be directly active in charge separation, while both metallic and s-CNTs should enhance charge collection and charge transport, and indirectly improve the crystallization of the conjugated polymer. Each of these is expected to contribute to improved efficiency in CNT-based POPV. It seems that understanding of the linkage between processing conditions, interfacial interactions, and selfassembled structures to functionality in CNT-conjugated polymers is a precondition for their utilization in POPV. I will review some of the studies carried over the last decade and highlight the challenges in both fundamental understanding and technological manipulation of these materials.

Keywords: conjugated polymers, carbon nanotubes, hybrid structures