Functionalization of exfoliated graphene with electron donors

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The rise of graphite exfoliation, pumping up graphene's chemistry, brings significant impact toward the preparation of novel hybrid materials combining the exceptional electronic properties of graphene sheets with those of photoinduced charge transfer phenomena from organic chromophores or semiconducting quantum dots interacting with the carbon nanostructure. Applications based on such charge transfer processes demand both defect-free graphene sheetsand chemical procedures for the covalent grafting or supramolecular decoration of the electron donors onto the sp2-honeycomb lattice of graphene.[1] Covalent chemistry of graphene leads to strong interactions between the electron donor and the graphitic skeleton, however, introduces defects at the anchoring sites, thus acting as insulators.[2, 3] On the other hand, when supramolecular interactions are utilized to integrate the electron donor moieties to graphene, the resulted ensembles although may suffer from weaker - interactions and the subsequent release of the donor units to the solution,[4] the extended aromatic lattice of graphene sheets remains intact and undisrupted, as no bond formation takes place, thus allowing for ballistic transport of charges with negligible loss of energy. Herein, the preparation and the photophysical properties evaluation of graphene-based ensembles, in which graphene sheets supramolecularly interact with porphyrins[4, 5], oligothiophenes[6], perylene diimides[7] and CdS quantum dots[8], will be presented.

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