Conjugated Polymer Nanoparticle-Graphene Oxide Charge-Transfer Complexes

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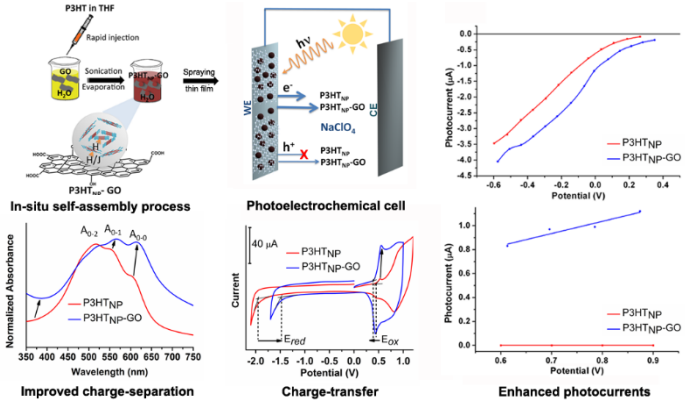
Conjugated polymers (CPs) constitute the base of organic thin film optoelectronic devices, such as organic photovoltaic solar cells (OSCs) and organic light emitting devices (OLEDs). Deposited onto large areas of any shape they critically contribute to the development of self-powered, smart and ubiquitous communication platforms. Operational performance and fabrication from "green" solutions compatible with large-area coating or printing technologies, are key requirements for their commercial implementation. Applying self-assembly strategies, CPs can be prepared in the form of water dispersible nanoparticles [1] being of actual interest for achieving improved device performance [2,3].

In this work we provide novel pathways for the design of improved organic thin film optoelectronic devices by marrying nanoparticles of CPs (CP_{NPs}) with 2D sheets of graphene oxide (GO) [4]. Using poly(3-hexylthiophene) (P3HT) as benchmark CP, we demonstrate the game-changing role of GO in tuning the excitonic aggregate behavior of $P3HT_{NPs}$ and the efficient formation $P3HT_{NPs}$-GO charge-transfer complexes Thin films thereof reveal improved separation of photo-generated charge carriers. Their performance only depends on the optoelectronic properties established in the liquid phase. The possibility to overcome external performance limitations and to employ "green" processing technologies offers exciting possibilities for further progress in the field of organic thin film optoelectronic devices.



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