



The ninth Nanodays Workshop on Advanced Materials
Munich (Germany), Sept. 13-15, 2017

Preparation and Characterization of Poly(3-Hexyl Thiophene) Nanoparticles and Graphene Oxide Composites in Water

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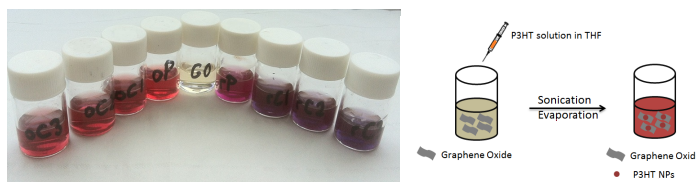
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Nanoparticles derived from conjugated polymers have propagated researches due to its potential application in sensors, optoelectronic devices and photovoltaic devices.¹ Preparing composites by using conjugated polymers and carbon nanomaterials significantly enhances the polymer performance.²

Poly-3-hexyl thiophene (P3HT) is one the most studied conjugated polymer because of its high charge mobility, highly crystalline conformation, and solubility in various solvents. Besides, P3HT shows a unique behavior, which exhibits a tendency to aggregate into crystalline domains in thin film or in solutions as nanofibers or nanoparticles. The properties such as charge transport and vibronic transitions depend on the nature of aggregation.³

In this work, we focused on the preparation of P3HT Nanoparticles (P3HT NPs) composite in presence of graphene oxide (GO) by using re-precipitation technique for the first time. We have worked with both regio-regular and regio-irregular P3HT to compare the effects of different polymer regio-regularities on the properties of composites.

TEM studies show a spherical morphology of P3HT-NPs supported on GO. UV-Vis absorption spectra indicate the vibronic peaks of the P3HT and excitonic coupling was estimated. It reveals that GO leads to an increase in the conjugation of the polymer. Beside, photoluminescence and electrochemical properties consistently prove the formation of a novel GO-P3TH composite, easily to process from water solutions. This provides a base for the development of further functional nanomaterials for variety of applications.



References

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Funding by EU (Project H2020-ITN 2014 642742), Spanish MINECO (ENE2013-48816-C5-5-R) and Government of Aragon (DGA-ESF-T66), is gratefully acknowledged.