ICN2 Institut Català de Nanociència i Nanotecnologia

EXCELENCIA SEVERO OCHOA

PhD Thesis Defence

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Tuning the poly(*p*-phenylene vinylene) derivatives emission properties by phase change materials and sonochemistry

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Abstract

Conjugated polymers (CP) are interesting materials with peculiar optoelectronic properties which make this class of polymers good candidate for several applications such as OLEDs, organic photovoltaics, but also for bioimaging and drug delivery. In the last decades, increasing attention has been directed to the tuning of the emission properties of CP to fully exploite their application in several fields. The aim of this thesis work is to achieve a fine emission tuning of polyphenylene vinylene (PPV) derivatives. Two main strategies have been adopted. **I)** Nanoparticles of PPV oligomers with different conjugation lengths were obtained through sonochemical synthesis. Ultrasound irradiation of PPV polymer heterogenous solution was employed to induce the activation of radical species which cut the polymer chain forming PPV oligomers. The presence of surfactant led to a simultaneous nanostructuration of such oligomers producing water suspensions of nanoparticles which exhibited a progressive absorption/emission hypsochromic shifts compared to the parental polymer. These nanoparticles that emitted in a wide range of the visible electromagnetic spectrum are promising materials for application such as polymers LEDs and bioimaging. **II)** The PPV polymers and oligomers were mixed with phase change materials with different melting points. Upon heating, solid-to-liquid phase transition is induced in the PCM/PPV system and its fluorescence is blue shifted. Once the system is cooled down the initial emission is recovered, demonstrating the reversibility of the system. In order to prepare solid materials with these fluorescent properties, the PCM/PPV mixtures were microstructurated and embedded in polymeric matrices, in which both the reversibility and the spectral features of the bulk solutions were preserved. Such system could be applied as multicolour emitting temperature sensor, or for thermoregulated white organic light emitting diode, thanks to the red, green and blue emission of the PPV derivatives obtained in this work.

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CSIC Consejo Superior de Investigaciones Científicas

UAB Universitat Autònoma de Barcelona