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Conjugated Polymer Nanostructures for Photocatalysis under Visible-Light

Visible-light responsive photocatalysts can directly harvest energy from solar light offering a desirable way to solve energy and environment issues. We have shown that conjugated polymers (in particular Polydiphenylbutadiyne, (PDPB) Poly(3,4-ethylenedioxythiophene (PEDOT) Poly(3-hexylthiophene) nanostructures, (P3HT)) and poly(pyrrole) (PPy) emerge as a new class of photocatalysts very active under visible light without the assistance of sacrificial reagents or precious metal co-catalysts.[1,2,3] These polymer nanostructures are synthesized in soft templates provided by hexagonal mesophases. These stable and cheap polymer nanofibers are easy to process and can be reused without appreciable loss of activity.

Addition of scavengers and mechanistic studies show that O_2•- is the main radical responsible for degradation of phenol taken as a model pollutant. P3HT nanostructures can easily be deposited on flat supports such as quartz for photocatalytic applications avoiding a separation step by centrifugation. The photocatalytic activity of these P3HT nanostructures is highly enhanced when they are supported on a solid surface opening new perspectives in photocatalytic reactors and self-cleaning surfaces.3

PDPB nanostructured conjugated polymers when dispersed in water, and in the absence of sacrificial agents or co-catalysts can perform photocatalytic water oxidation under visible light excitation.

Our results demonstrate that conducting polymer nanostructures offer the perspective of development of a new generation of efficient and cheap visible light driven photocatalysts for environmental protection. These polymer nanostructures can also find applications in self-cleaning surfaces and water splitting.

Biography

Hynd Remita is Director of Research at the CNRS. She is working at the Laboratoire de Chimie Physique, Université Paris-Sud, Université Paris-Saclay. After a PhD in Physical Chemistry at Université Paris-Sud (France), she did her post-doc. at University of Medecine of Sherbrooke, Canada. Her current research includes synthesis of Composite Nanomaterials by Radiolysis, development of nanomaterials for Solar Energy Conversion, Plasmonic Photocatalysis, Conjugated Polymer Nanostructures for Photocatalysis, Water Treatment by Photocatalysis, Fuel Cells and Nanomedecine. The goal is not only to enable the development of practical devices but ultimately, to find out the guiding principles by which the performance of a particular material is achieved. She is also devoted to dissemination of Science.

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