عنوان مقاله:

Sequential one-pot synthesis of high-quality magnetite@CdS type-II core/shell nanocrystals with improved photocatalytic activity

محل انتشار:

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تعداد صفحات اصل مقاله: 1

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خلاصه مقاله:

High-efficiency photocatalytic materials entail the generation and preservation of high-energy charge carriers with suitable solvent access to initiate redox chemistry. This further requires the prohibition of competing mechanisms (i.e., electron/hole recombination, photo-corrosion and charge trapping) that decrease catalytic activity. One approach to reducing the impact of these competing mechanisms is to design and develop new multicomponent core/shell systems consisting of two (or more) semiconductors [1]. In this regard, the core/shell type composites can be classified into three categories, namely type-I (both electron and hole wave functions are localized in the core), inverted type-I (both electron and hole wave functions are localized in the shell), quasi-type-II (one charge carrier is confined to the core or shell while the other is delocalized over the whole heteronanocrystal), and true type-II (spatially separated photocarriers, i.e., electron and hole wave functions reside mainly on different sides of the heterojunction). The separation of charges in the lowest excited states of type-II heterojunctions should make these nanohybrid composites more suitable for photovoltaic or photocatalytic applications.Herein, the magnetite@CdS core/shell nanocrystals, which are considered as type-II structure, were prepared and then structural, morphological (shape and size) and optical properties of these nanostructures were characterized by X-ray diffraction (XRD), transmission electron microscopy (TEM) and UV-Vis and fluorescence spectroscopy techniques. We thereafter investigated the interfacial photoinduced electron transfer and related secondary photochemical behavior in the system via time-resolved fluorescence spectroscopy. The increased lifetime of magnetite@CdS nanohybrid compared with single CdS QD suggested the charge transfer process between the magnetite core and CdS nanoshell. Finally, the hybrid photocatalytic performance was successfully demonstrated towards photodecomposition of xylenol orange under sunlight irradiation.

کلمات کلیدی: