

Polymer Science & Engineering

August 22-24, 2016 New Orleans, USA

Photocatalytic properties of TiO₂-Graphene nanocomposite as a 2D polymer photosensitized with porphyrin

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To use the visible light in photodegradation reactions efficiently, graphene-TiO₂ nanocomposite (TG-3%) was photosensitized using tetrakis (4-carboxyphenyl) porphyrin. To investigate the effect of graphene as well as dye sensitization on the photoactivity of the synthesized photocatalyst, photocatalytic properties and photocurrent responses of the prepared samples were examined under visible light irradiation. Defect-free graphene has an infinite number of repetitive elements, with the smallest being any of its sp²-hybridized carbon atoms, whose one p orbital and three sp² orbitals are filled with one electron each. These carbon atoms correspond to the smallest repetitive chain segments representing the repeating units of common linear polymers. The 1.6-fold increase of the photocurrent response in the graphene-TiO₂ nanocomposite photosensitized using porphyrin (TGP) compared to the graphene-TiO₂ nanocomposite provides an evidence for the effective influence of the porphyrin photosensitizer in the enhancement of the visible light photoactivity. The porphyrin photosensitizer in the TGP photocatalyst can enhance visible light absorption due to its ability to capture a broad range of the solar spectrum. Thus, porphyrin acts as a light-harvesting agent and is capable of producing photoinduced electrons and holes. Therefore, the largest shift in the visible light range was observed for the TG-3% nanocomposite photosensitized with porphyrin.

Biography

Rahmatollah Rahimi has completed his PhD from Howard University in Inorganic Chemistry. He was the Dean of Chemistry department at Iran University of Science and Technology from 2010 to 2014. He was Supervisor of Iranian Chemistry Olympiad team in Italy with Commission of Education Ministry in 1992. He has published more than 120 papers in reputed journals and more than 200 article in several conferences.

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