Amalgamation of N-graphene quantum dots with nanocubic like TiO_2: an insight study of sunlight sensitive photocatalysis

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Abstract

In this work, a sunlight-sensitive photocatalyst of nanocubic-like titanium dioxide (TiO_2) and N-doped graphene quantum dots (N-GQDs) is developed through a simple hydrothermal and physical mixing method. The successful amalgamation composite photocatalyst characteristics were comprehensively scrutinized through various physical and chemical analyses. A complete removal of bisphenol A (BPA) is attained by a synthesized composite after 30 min of sunlight irradiation as compared to pure TiO_2. This clearly proved the unique contribution of N-GQDs that enhanced the ability of light harvesting especially under visible light and near-infrared region. This superior characteristic enables it to maximize the absorbance in the entire solar spectrum. However, the increase of N-GQDs weight percentage has created massive oxygen vacancies that suppress the generation of active radicals. This resulted in a longer duration for a complete removal of BPA as compared to lower weight percentage of N-GQDs. Hence, this finding can offer a new insight in developing effective sunlight-sensitive photocatalysts for various complex organic pollutants degradation.

Keywords N-Graphene quantum dots · Nanocubic-like TiO_2 · Bisphenol A · Sunlight · Visible light · Near Infrared