

High efficient photodegradation of organic dyes by TiO₂/graphene composite under visible light radiation

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ABSTRACT

An efficient visible light-responsive TiO₂/graphene composite was synthesized easily by grinding. The structure and morphology of the composite were characterized by powder X-ray diffraction, Raman spectroscopy, ultra-high-resolution transmission electron microscopy, and field emission scanning electron microscopy. The photocatalytic characteristics were studied by degrading methylene blue under different conditions such as pH, catalyst dosage, different wt.% ratios of TiO₂/graphene composites, irradiation time, and initial concentration of methylene blue. The results showed that the TiO₂/2.0% graphene possessed much higher photocatalytic activities under visible light than pure TiO₂, displayed high photochemical stability under repeated irradiation, and can also effectively and selectively degraded a mixture of methyl orange and methylene blue. The degradation of methylene blue followed the pseudo-first-order kinetics of Langmuir–HinShelwood model. In addition, the possible mechanism of photocatalytic degradation process was proposed.

Keywords: TiO₂; Graphene; Methylene blue; Photocatalysis; Mechanism

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