催化学报 » 2012, Vol. 33 » Issue (8) :1276-1283 DOI: 10.1016/S1872-2067(11)60430-0

Enhanced Sonocatalytic Degradation of Rhodamine B by Graphene-TiO_2 Composites Synthesized by an Ultrasonic-Assisted Method

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摘要 A series of graphene-TiO_2 composites was fabricated from graphene oxide and titanium n-butoxide (TNB) by an ultrasonic-assisted method. The structure and composition of the nanocomposites were characterized by Raman spectroscopy, BET surface area measurements, X-ray diffraction, transmission electron microscopy, and ultraviolet-visible absorption spectroscopy. The average size of the TiO_2 nanoparticles on the graphene nanosheets was controlled at around 10–15 nm without using surfactant, which is attributed to the pyrolysis and condensation of dissolved TNB into TiO_2 by ultrasonic irradiation. The catalytic activity of the composites under ultrasonic irradiation was determined using a rhodamine B (RhB) solution. The graphene-TiO_2 composites possessed a high specific surface area, which increased the decolorization rate for RhB solution. This is because the graphene and TiO_2 nanoparticles in the composites interact strongly, which enhances the photoelectric conversion of TiO_2 by reducing the recombination of photogenerated electron-hole pairs.

关键词： grapheme ultrasonication sonocatalytic degradation adsorption rhodamine B

Abstract： A series of graphene-TiO_2 composites was fabricated from graphene oxide and titanium n-butoxide (TNB) by an ultrasonic-assisted method. The structure and composition of the nanocomposites were characterized by Raman spectroscopy, BET surface area measurements, X-ray diffraction, transmission electron microscopy, and ultraviolet-visible absorption spectroscopy. The average size of the TiO_2 nanoparticles on the graphene nanosheets was controlled at around 10–15 nm without using surfactant, which is attributed to the pyrolysis and condensation of dissolved TNB into TiO_2 by ultrasonic irradiation. The catalytic activity of the composites under ultrasonic irradiation was determined using a rhodamine B (RhB) solution. The graphene-TiO_2 composites possessed a high specific surface area, which increased the decolorization rate for RhB solution. This is because the graphene and TiO_2 nanoparticles in the composites interact strongly, which enhances the photoelectric conversion of TiO_2 by reducing the recombination of photogenerated electron-hole pairs.

Keywords： grapheme, ultrasonication, sonocatalytic degradation, adsorption, rhodamine B

收稿日期: 2012-02-18; 出版日期: 2012-07-31

引用本文:

ZHU Lei, Trisha GHOSH, Chong-Yeon PARK等 .Enhanced Sonocatalytic Degradation of Rhodamine B by Graphene-TiO_2 Composites Synthesized by an Ultrasonic-Assisted Method[J] 催化学报, 2012,V33(8): 1276-1283

ZHU Lei, Trisha GHOSH, Chong-Yeon PARK etc .Enhanced Sonocatalytic Degradation of Rhodamine B by Graphene-TiO_2 Composites Synthesized by an Ultrasonic-Assisted Method[J] Chinese Journal of Catalysis, 2012,V33(8): 1276-1283

链接本文:

http://www.chxb.cn/CN/10.1016/S1872-2067(11)60430-0 或 http://www.chxb.cn/CN/Y2012/V33/I8/1276

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