环境工程学报
Chinese Journal of Environmental Engineering

$TiO_2/SiO_2/\gamma$-Fe_2O_3的表征及其光催化降解染料废水

Characterization of $TiO_2/SiO_2/\gamma$-Fe_2O_3 and photocatalytic degradation of dye wastewater

投稿时间： 2010-01-01 最后修改时间： 2010-04-12

DOI：

中文关键词： 光催化 染料废水 磁性 降解 亚甲基蓝

英文关键词:photocatalysis dye wastewater magnetic degradation methylene blue

基金项目:江苏省创新基金资助项目（1223000055）

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中文摘要：

以γ-Fe_2O_3为磁性核心，通过溶胶 凝胶法制备出三层结构的复合光催化剂$TiO_2/SiO_2/\gamma$-Fe_2O_3。通过X射线衍射、扫描电镜、透射电镜、振动样品磁强计和紫外-可见分光光谱分析进行表征。SiO_2包覆膜可以减弱内层γ-Fe_2O_3对光催化效果的不利影响，有效地阻隔高温时γ-Fe_2O_3磁核与TiO_2之间的熔结。以亚甲基蓝为目标反应物评价其光催化活性。结果表明：在紫外光照射4 h内对亚甲基蓝(10 mg/L)的降解率达到98.8%。$TiO_2/SiO_2/\gamma$-Fe_2O_3的吸收光强不但在紫外光区有所增加，而且在可见光区的响应范围也大幅增加，提高了光能利用率。催化剂具有的磁性使其易于被分离回收，在紫外光照射4 h时$TiO_2/SiO_2/\gamma$-$Fe_2O_3$3次使用后对亚甲基蓝的降解率仍可达95%。

英文摘要：

The composite photocatalyst $TiO_2/SiO_2/\gamma$-Fe_2O_3 with a three-tier structure was synthesized via sol-gel technology, γ-Fe_2O_3 as the magnetic core. The magnetic core was γ-Fe_2O_3. The catalyst was characterized by X-ray diffraction, scanning electron microscope, trasmission electron microscope, vibrating sample magnetometer and ultraviolet-visible spectroscope (UV-vis). SiO_2 resulted in reducing the adverse effects between the inner layer and the external TiO_2. It also played an important part in preventing sinter of TiO_2 and γ-Fe_2O_3 at high temperature. The photocatalytic activities were evaluated taking methylene blue(MB) as target reactant. The experimental results show that 98.8% of MB (10 mg/L) was photodegradated under UV light irradiation for 4 h. The intensity of light absorption of $TiO_2/SiO_2/\gamma$-Fe_2O_3 increased not only in the UV region, but also in visible light range. This directly leads the improvement of light utilization. The magnetic photocatalyst particles were easily separated and recovered using magnetic separation. The degradation rate of methylene blue remained at 95% after using three times.

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