

研究论文

## 二氧化钛纳米粒子和纳米管的合成、表征及对硝基苯的光催化性能研究

石金娥, 闫吉昌, 尚淑霞, 陈大伟, 王悦宏, 闫福成, 薛静, 初丽伟, 苏丽敏

东北师范大学城市与环境科学学院, 长春 130024

收稿日期 2006-12-22 修回日期 网络版发布日期 2007-7-14 接受日期

**摘要** 采用水热合成法, 通过改变反应条件, 控制反应参数, 成功地合成了粒径可控的球形TiO<sub>2</sub>纳米粒子和长径比、比表面积均比较大的纳米管. 用XRD, TEM, SAED和BET等手段对产物进行了表征. 为了测试产物的光催化性能, 以高浓度的硝基苯(NB)溶液为模拟水样, 进行了一系列提高降解效率的优化实验和光催化降解的对比实验. 通过对硝基苯溶液初始浓度、TiO<sub>2</sub>加入量和降解体系pH值等条件的考察, 得出硝基苯溶液的质量浓度为300 mg/L, TiO<sub>2</sub>的加入量为0.4 g/L, 体系的pH值为6~7时, 降解效果最好; 通过对比实验发现, 由于纳米管的大比表面积, 使得其光催化性能明显优于球形纳米粒子, 3 h后的降解率达到90%以上, 3.5 h左右硝基苯几乎被完全降解.

**关键词** [TiO<sub>2</sub>纳米粒子](#) [TiO<sub>2</sub>纳米管](#) [硝基苯](#) [降解](#)

分类号 [0643](#)

## Synthesis and Characterization of TiO<sub>2</sub> Nanoparticles and Nanotubes and Their Photocatalytic Property for Nitrobenzene Degradation

SHI Jin-E, YAN Ji-Chang\*, SHANG Shu-Xia, CHEN Da-Wei, WANG Yue-Hong, YAN Fu-Cheng, XUE Jing, CHU Li-Wei, SU Li-Min

College of Urban and Environmental Sciences, Northeast Normal University, Changchun 130024, China

**Abstract** By changing the parameters of reaction and controlling the conditions of reaction, the spheres TiO<sub>2</sub> nanoparticles whose particles size can be controlled and nanotubes whose aspect ratio and surface areas are larger were synthesized *via* the hydrothermal method. The products were characterized with XRD, TEM, SAED and BET. For testing the photocatalysis performance of the products, we took the nitrobenzene solution with a high concentration as the water sample, completed a series of optimizing experiments for enhancing efficiency of the degradation and comparable experiments of photocatalysis degradation. By reviewing these parameters: the original concentration of the nitrobenzene solution, TiO<sub>2</sub> loading, pH of the solution, we found that the effect of degradation was the best when the concentration of the nitrobenzene solution was 300 mg/L, TiO<sub>2</sub> loading was 0.4 g/L, the pH of the solution was 6—7. By comparable experiments, we found that the photocatalysis performance of nanotubes is better than spheres titania nanoparticles because of the specific surface areas of nanotubes is larger. After 3 h irradiation by artificial ultraviolet light, the rate of degradation could reach over 90%, About 3.5 h irradiation by artificial ultraviolet light, nitrobenzene almost could be degraded completely.

**Key words** [TiO<sub>2</sub> nanoparticles](#) [TiO<sub>2</sub> nanotubes](#) [Nitrobenzene](#) [Degradation](#)

DOI:

扩展功能

本文信息

▶ [Supporting info](#)

▶ [PDF\(444KB\)](#)

▶ [\[HTML全文\]\(0KB\)](#)

▶ [参考文献](#)

服务与反馈

▶ [把本文推荐给朋友](#)

▶ [加入我的书架](#)

▶ [加入引用管理器](#)

▶ [复制索引](#)

▶ [Email Alert](#)

▶ [文章反馈](#)

▶ [浏览反馈信息](#)

相关信息

▶ 本刊中 包含 [“TiO<sub>2</sub>纳米粒子”](#) 的相关文章

▶ 本文作者相关文章

- [石金娥](#)
- [闫吉昌](#)
- [尚淑霞](#)
- [陈大伟](#)
- [王悦宏](#)
- [闫福成](#)
- [薛静](#)
- [初丽伟](#)
- [苏丽敏](#)