

一种可见光响应纳米 TiO<sub>2</sub>粉体的光响应特性表征

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收稿日期 2005-7-16 修回日期 2005-9-22 网络版发布日期 接受日期

摘要

利用有机溶剂水热法制备了一种新型的可见光响应纳米TiO<sub>2</sub>粉体光催化剂. 对其进行光响应特性表征, 研究发现: 固相粉末漫反射吸收谱反映了该TiO<sub>2</sub>粉体具有类似改性TiO<sub>2</sub>的可见光响应的特征; 而在纳米颗粒稀悬浮液的特定条件下, 紫外-可见吸收谱给出了该纳米TiO<sub>2</sub>粉体的类似本征TiO<sub>2</sub>的光响应特征, 观测不到其可见光响应特征; 分析表明, 该现象可能与在稀悬浮液条件下, 声子参与的光致电子跃迁过程的退化有关.

关键词 [二氧化钛](#) [可见光响应](#) [漫反射光谱](#) [紫外-可见吸收光谱](#)

分类号 [0472](#)

## Characterization of Optical Response Properties for a Nanosized TiO<sub>2</sub> with Visible-light Response

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### Abstract

Nanosize-TiO<sub>2</sub> powders with visible-light response and photocatalytic capability were synthesized by hydrothermal process with organics as solvents. Results of diffuse reflectance spectra (DRS) for solid TiO<sub>2</sub> powders show that the visible light response properties of present nanosize-TiO<sub>2</sub> are similar to that of modified TiO<sub>2</sub>, which have strong visible-light response in visible-light region. On the other hand, UV-Vis absorption spectra of TiO<sub>2</sub> suspensions show that the optical properties of present nanosize-TiO<sub>2</sub> are similar to that of intrinsic TiO<sub>2</sub>, and no obvious visible light absorption detected. Such difference in optical properties via DRS and UV-Vis spectra for present nanosize-TiO<sub>2</sub> is attributed to the difference status of nanosize-TiO<sub>2</sub> existing as solid powder or dilute suspensions. Under the conditions of extreme dilute suspensions, photon induced electron transition accompanied by phonon excitation may be degenerated while it is not the case for solid powders. For present photocatalyst with high activity under visible light irradiation, it is necessary to combine two methods to evaluate the accurate information of the absorption edge and optical response properties.

**Key words** [titanium dioxide](#) [visible light photoresponse](#) [diffuse reflectance spectroscopy](#) [UV-Vis absorption spectroscopy](#)

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