

研究论文

δ -MnO₂对TiO₂光催化降解甲基橙的抑制作用

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摘要 采用动力学方法研究了在水悬浮液中 δ -MnO₂颗粒物对P-25 TiO₂光催化降解甲基橙活性的影响, 并利用紫外-可见漫反射光谱(DRS)和光致发光光谱(PL)对受 δ -MnO₂污染前后的TiO₂样品进行了表征. 动力学研究结果表明, 在3种不同初始pH值条件下, δ -MnO₂对TiO₂光催化剂都具有明显的致毒效应, 共存 δ -MnO₂的浓度越大, 致毒效应越明显. 表征结果表明, 由于 δ -MnO₂与TiO₂之间的界面接触, 使得TiO₂吸收带边蓝移, 紫外光区的吸收强度降低, 光致发光信号(PL)明显减弱. 因此, δ -MnO₂导致TiO₂的禁带宽度增大, 光利用率降低, 并且是光生电子与空穴的复合中心.

关键词 [TiO₂](#)- [\$\delta\$ -MnO₂](#)-[失活](#) [光催化](#) [甲基橙](#)

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Inhibition Effect of δ -MnO₂ on TiO₂ Photocatalytic Degradation of Methyl Orange

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Abstract The influences of δ -MnO₂ particles on the photocatalytic activity of P-25 TiO₂ were investigated with kinetical method through the photocatalytic degradation of methyl orange. The TiO₂ photocatalyst, before and after being contaminated by δ -MnO₂, was characterized with UV-visible diffuse reflectance spectroscopy(UV-Vis DRS) and photoluminescence(PL). The dynamics results show the distinct existence of poisoning effect of δ -MnO₂ on TiO₂ photocatalysis at different initial pH values. The higher the concentration of the δ -MnO₂, the more evident the poisoning effect. The characterizations indicate that the absorption band edge of TiO₂ is blue-shifted and the intensity is decreased, and the intensity of PL signals of TiO₂ is suppressed due to the contact between δ -MnO₂ and TiO₂. Therefore, the presence of δ -MnO₂ increases the band gap and causes the decrease of UV absorption of TiO₂, and δ -MnO₂ can also act as a recombination centers of photoinduced electron-hole. The effects of δ -MnO₂ particles in environment on the stability of TiO₂ photocatalyst were revealed.

Key words [TiO₂](#); [\$\delta\$ -MnO₂](#); [Deactivation](#); [Photocatalysis](#); [Methyl orange](#)

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