

RESEARCH PAPERS

基于固定相二氧化钛薄膜的新型多重石英管分布式光催化反应器及其水处理应用

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摘要 A novel multi-tube photoreactor with 0.0188 m³ valid reaction volume was constructed in pilot-scale. This rectangular reactor consisted of 13 regularly distributed silica glass tubes coating with TiO₂ thin film photo-catalyst. Total active area of TiO₂ thin film is 0.3916m². The ratio of surface area to volume achieves 20.8m⁻¹. Photocatalytic experiment of phenol red demonstrates that the apparent reaction rate constant (k) is 0.074 65 h⁻¹ and 0.165 02 h⁻¹ for reaction system with and without micro-bubbles mixing. The corresponding apparent quantum efficiency (ϕ_a) is 8.1771×10^{-7} g.J⁻¹ and 4.9036×10^{-7} g.J⁻¹, respectively. COD value of reactant could decrease to 17 mg.L⁻¹ and high performance liquid chromatography (HPLC) only shows two absorption peaks in 24 h photo-catalytic process time, so this photoreactor has good photomineralization effect. Experimental results reveal that photocatalytic destruction of organics is possible by using the multi-tube photoreactor.

关键词 [photoreactor](#) [photocatalyst](#) [TiO₂ thin film](#) [apparent quantum efficiency](#)

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A Novel Multi-Tube Photoreactor with UV Light and Immobilized TiO₂ Thin Film for Water Treatment

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Abstract

A novel multi-tube photoreactor with 0.0188 m³ valid reaction volume was constructed in pilot-scale. This rectangular reactor consisted of 13 regularly distributed silica glass tubes coating with TiO₂ thin film photo-catalyst. Total active area of TiO₂ thin film is 0.3916m². The ratio of surface area to volume achieves 20.8m⁻¹. Photocatalytic experiment of phenol red demonstrates that the apparent reaction rate constant (k) is 0.074 65 h⁻¹ and 0.165 02 h⁻¹ for reaction system with and without micro-bubbles mixing. The corresponding apparent quantum efficiency (ϕ_a) is 8.1771×10^{-7} g.J⁻¹ and 4.9036×10^{-7} g.J⁻¹, respectively. COD value of reactant could decrease to 17 mg.L⁻¹ and high performance liquid chromatography (HPLC) only shows two absorption peaks in 24 h photo-catalytic process time, so this photoreactor has good photomineralization effect. Experimental results reveal that photocatalytic destruction of organics is possible by using the multi-tube photoreactor.

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