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Fe_3O_4硅烷化改性聚合物的制备及可见光光催化性能研究

Degradation of toxic organic pollutants by modified Fe_3O_4 under visible light irradiation

关键词：改性聚合物Fe_3O_4MMPs|光催化|机理

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摘要：利用水热法制备了Fe_3O_4纳米粒子(Fe_3O_4NPs),并对其进行改性制备了改性聚合物Fe_3O_4 MMPs.同时,利用X射线衍射(XRD)、扫描电镜(SEM)和紫外可见漫反射(DRS)等手段对所制备的材料进行表征.通过比表面积(BET)测定发现,Fe_3O_4MMPs的比表面积较Fe_3O_4NPs增大约9倍.在可见光照射下(λ>420 nm),以H_2O_2为氧化剂,比较研究了以Fe_3O_4NPs和Fe_3O_4MMPs为光催化剂降解罗丹明B(Rhodamine,RhB)的催化特性,并探讨了Fe_3O_4改性对催化活性的影响.结果表明,改性聚合物Fe_3O_4MMPs的稳定性增加,对底物RhB的降解活性提高,120 min时对RhB的脱色率在98%以上;此外,Fe_3O_4MMPs对水杨酸(Salicylic Acid,SA)也具有很好的降解效果.利用电子自旋共振技术(ESR)测定氧化物种的结果表明,降解过程涉及羟基自由基(·OH)和超氧自由基($\cdot O_2^-$)氧化机理.

Abstract：Fe_3O_4 nanoparticles (Fe_3O_4NPs) were synthesized by hydrothermal method and modified to prepare polymer Fe_3O_4MMPs.The polymers were characterized by X-ray diffraction (XRD),scanning electron microscopy (SEM) and ultraviolet-visible diffuse reflectance spectroscopy (DRS).According to Brunauer-Emmett-Teller (BET) results,the specific surface area of Fe_3O_4MMPs was 9 times larger than that of Fe_3O_4NPs.The effect of modification on the photocatal-ytic activity of Fe_3O_4MMPs was explored by comparing the removal efficiency of rhodamine B (RhB) by Fe_3O_4NPs and Fe_3O_4 MMPs,respectively,using H_2O_2 as the oxidant and under visible light irradiation (λ>420 nm).The results showed that the stability and photocatalytic activity of Fe_3O_4MMPs were superior to those of Fe_3O_4NPs.The decolorization rate of RhB reached 98% within 120 min.Moreover,salicylic acid (SA) could also be effectively removed by Fe_3O_4MMPs.Electron spin resonance (ESR) technology was employed to detect oxygen species and the results implied that hydroxyl radical (·OH) and superoxide radical ($\cdot O_2^-$) were predominate during the removal process.

Key words：modified polymer Fe_3O_4MMPs|photocatalytic|mechanism

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