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研究论文

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TiO_2-石墨烯（Gn）复合材料光催化降解O_3研究

Preparation of TiO_2/graphene composites materials for photocatalytic degradation of O_3

关键词：石墨烯 TiO_2-石墨烯 溶胶凝胶法 光催化降解 O_3

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摘要：通过改性Hummer法及溶胶凝胶法，制备出TiO_2-石墨烯光催化复合材料.经吸附-光催化活性实验选出光催化活性最高的含C量为1.5%（质量分数）的TiO_2-石墨烯复合材料，并在自行设计的模拟大型客机环境的气相光催化反应器中，进行O_3光催化降解实验研究.结果表明，TiO_2-石墨烯复合光催化材料在较短时间内对O_3有较高的降解效率，且其光催化活性显著优于纯TiO_2材料.初始O_3浓度为（0.150~0.200）×10^{-6}时，复合光催化剂受紫外光激发60 min的光催化降解率为66.12%，初始O_3浓度为（0.950~1.000）×10^{-6}时，其光催化降解率约为77%，较低浓度时（（0.100~0.150）×10^{-6}），O_3去除率也能达到45.45%.此外，通过探讨光催化材料的重复使用性能，表明复合光催化剂重复使用4次以内，其对O_3的光催化降解率保持基本稳定.

Abstract: The TiO_2-graphene composite photocatalytic were synthesized by modified Hummers' method and the sol-gel method. The highest photocatalytic activity of TiO_2-graphene was selected by adsorption-photocatalytic activity experiments, and confirmed that the 1.5wt% of C content is the material. The O_3 photocatalytic degradation experiments were conducted in the self-designed gas-phase photocatalytic reactor, which was modeled on the large passenger aircraft. Experimental results showed that O_3 can be more efficiently removed by TiO_2-graphene composite photocatalyst materials and its photocatalytic degradation activity was significantly higher than pure TiO_2 material. The initial O_3 concentration was (0.150~0.200)×10^{-6}, the composite photocatalyst was excited under UV for 60 min and the photocatalytic degradation rate could be 66.12%. Besides, the degradation rate would rise to about 77%, when the initial O_3 concentration was (0.950~1.000)×10^{-6}. While under the lower concentrations ((0.100~0.150)×10^{-6}), the O_3 removal rate dropped to 45.45%. In addition, the photocatalytic materials could be stable to photocatalytic degradation of O_3, if the composite was reused less than 4 times.

Key words: graphene TiO_2-graphene sol-gel method photocatalytic degradation ozone