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论文

# 焙烧温度对$TiO_2$柱撑膨润土结构、吸附及光催化性能的影响

陈捷, 刘延, 黄磊, 冯威, 熊德琪

大连海事大学环境科学与工程学院, 大连 116026

摘要:

采用酸性溶胶法合成了$TiO_2$柱撑膨润土(Ti-Na-MMT), 采用XRD, FTIR, TG-DTA, BET和DRS等技术, 研究了焙烧温度对Ti-Na-MMT结构和处理偶氮染料废水性能的影响. 结果表明, 所制备的Ti-Na-MMT具有较好的热稳定性, 经773 K热处理后, 其结构仍基本保持不变. 随着焙烧温度的升高, 晶面间距逐渐减少. Ti-Na-MMT的比表面积、孔体积、孔径分布等特征以及$TiO_2$晶粒粒径与煅烧温度有关; 在473 K下, 焙烧制备的Ti-Na-MMT BET的比表面积和最大孔容最大, 平均孔径和$TiO_2$粒径最小; 随着焙烧温度的进一步升高, $TiO_2$粒子发生团聚, 粒径变大, 从而Ti-Na-MMT的比表面积和最大孔容减小, 而其平均孔径呈增大趋势. DRS结果表明, 在473 K下焙烧制备的Ti-Na-MMT对光的吸收能力最强. 焙烧温度对Ti-Na-MMT的吸附性能和光催化活性的影响规律一致, 这表明吸附和光催化过程存在一定的协同作用. 473 K时制备的Ti-Na-MMT表现出的吸附和光催化活性均最强.

关键词: 柱撑膨润土 焙烧温度 孔结构 吸附、光催化性能

# Influence of Calcination Temperature on Structure and Adsorption and Photocatalytic Activity of Titanium Oxide Pillared Bentonite

CHEN Jie, LIU Yan, HUANG Lei, FENG Wei*, XIONG De-Qi

College of Environmental Science and Engineering, Dalian Maritime University, Dalian 116026, China

Abstract:

$TiO_2$-pillared bentonite(Ti-Na-MMT) was synthesized *via* acid-catalyzed sol method and the influence of calcination temperature on the structure of Ti-Na-MMT and the removal of azo dye in aqueous solution were analyzed with XRD, FTIR, TG-DTA, BET and DRS. The results show that all the prepared materials were found thermally stable up to 773 K. The $d_{001}$ basal spacings of Ti-Na-MMT decreased with the increase of the calcination temperature. BET special surface area, median pore diameter, maximum pore volume and the size of titanium of Ti-Na-MMT were related to calcination temperature. BET specific surface area and maximun pore volume of Ti-Na-MMT calcinated at 473 K were the biggest, while median pore diameter and the size of titanium was the smallest. With the increase of calcination temperature, BET surface area and maximun pore volume decreased, while median pore diameter and the size of titanium increased. DRS result shows that Ti-Na-MMT calcinated at 473 K have the strongest absorbency. The regularity of the influence of the calcanating temperature on obsorbtive ability of Ti-Na-MMT was similar with photocatalytic activity, which indicates a synergistic effect on the process of adsorption and photocatalysis. Ti-Na-MMT calcinated at 473 K exhibits the highest adsorptive and photocatalytic activity.

Keywords: $TiO_2$-pillared bentonite Calcination temperature Pore structure Adsorptive and photocatalytic activity

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