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CTAC改性活性炭去除水中砷(V)的柱实验吸附和再生研究

Column studies on the adsorption of arsenate from water by cetyltrimethylammonium chloride-modified activated carbon and its regeneration

关键词： 十六烷基三甲基氯化铵(CTAC) 活性炭 砷 吸附

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作　者　单位

陈维芳　上海理工大学 环境与建筑学院, 上海 200093

程明涛　上海理工大学 环境与建筑学院, 上海 200093

张道方　上海理工大学 环境与建筑学院, 上海 200093

摘要： 为了开发一种能有效去除水中砷的吸附材料, 研究了十六烷基三甲基氯化铵(CTAC)改性活性炭后, 活性炭对水中五价砷As(V)的去除效果.研究中利用动态小柱实验(Rapid small-scale column test, RSSCT)探讨了CTAC改性后活性炭对砷的吸附能力、影响吸附能力的因素和活性炭再生方法.结果表明, CTAC改性能有效提高活性炭对As(V)的吸附.活性炭对As(V)的吸附受溶液pH、空床接触时间、进水中砷浓度及水中其他离子存在的影响.另外, 1 mol·L^{-1}的盐酸能有效对吸附穿透后的活性炭进行再生,再生后的活性炭可以重复使用.同时,柱实验中对出水CTAC的检测结果表明, CTAC和活性炭的结合非常稳定.

Abstract： This study investigated the effect of cetyltrimethylammonium chloride (CTAC)-modified activated carbon on the adsorption of As(V) from water. The purpose was to develop an adsorbent that could be cost-effective for As(V) removal. Rapid small column tests (RSSCTs) were set up to test the adsorption capacity for arsenic of the CTAC- modified carbon. Factors that could affect the adsorption capacity and regeneration method when carbon was exhausted were also investigated. Results indicated that CTAC modification greatly improved activated carbon's adsorption for arsenic. However, arsenic adsorption was dependent on influent pH, empty bed contact time, influent arsenic concentration and presence of interfering ions in water. 1 mol·L^{-1} of hydrochloric acid solution was sufficient to regenerate the activated carbon after arsenic breakthrough. Activated carbon thus regenerated could be reused. In addition, monitoring of effluent CTAC during RSSCT tests revealed that the adsorbed CTAC attached strongly to carbon surface.

Key words： cetyltrimethylammonium chloride activated carbon arsenic adsorption