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研究论文

活性炭纤维电极生成羟基自由基降解酸性红**B**

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摘要 分别采用具有吸附催化性能的活性炭纤维(ACF)作为阳极和阴极对水中偶氮染料酸性红B (ARB)的电化学降解情况进行了系统研究. 研究表明两种体系均可较好降解ARB, 可达到色度完全去除, 但ACF作为阴极电芬顿对有机物的矿化程度远远高于以ACF作为阳极时的矿化程度, 其TOC去除率达到70%, 高于阳极体系的30% TOC去除率. 通过电子自旋捕集技术(ESR)检测两种反应体系中产生的活性中间体, 发现在两种体系中均有高活性的羟基自由基生成, ACF阴极体系中产生的羟基自由基的量远远高于阳极体系产生量, 这是阴极体系有机物矿化效果较好的根本原因. 还对电流强度和初始pH的影响进行了研究, 并对两个体系反应机理进行了讨论.

关键词 活性炭纤维 阴极体系 阳极体系 电芬顿反应 羟基自由基 酸性红B

分类号

Electrochemical Generation of Hydroxyl Radicals for Acid Red B Degradation by Activated Carbon Fiber Electrodes

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Abstract The electrochemical degradation of acid red B (ARB) using high surface area activated carbon fiber (ACF) as an anode or a cathode was investigated separately. In both systems, ARB could be thoroughly degraded and complete decoloration achieved. However, the mineralization rate of ACF cathode system was much higher than the other. 70% TOC removal was achieved in the ACF cathode system, while only 30% TOC was removed in the ACF anode system. The degradation process was analyzed and the reactive radicals were detected with the electron spin resonance technique. The results show that a high concentration of active hydroxyl radicals was produced in both systems, but the hydroxyl radical concentration in the ACF cathode system was much higher than that in the ACF cathode system. In the ACF cathode system, the electro-Fenton reaction occurred to generate a good many of hydroxyl radicals, which oxidized ARB much effectively. The effects of the current intensity and initial pH on both systems were also explored and the possible mechanisms were discussed.

Key words activated carbon fiber cathode system anode system electro-Fenton reaction hydroxyl radical acid red B

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