

金晓英,黄兰兰,陈祖亮:CTAB作用下绿色合成纳米铁的制备及降解孔雀绿[J].环境科学学报,2014,34(3):645-650

CTAB作用下绿色合成纳米铁的制备及降解孔雀绿

Green synthesis of iron nanoparticles in presence of CTAB and its degradation of malachite green

关键词: [绿色合成](#) [绿茶萃取液](#) [纳米铁颗粒](#) [十六烷基三甲基溴化铵](#) [孔雀绿](#)

基金项目: [国家自然科学基金资助项目 \(No.20775013\)](#)

作者 单位

金晓英 1. 福建师范大学环境科学与工程学院, 福州 350007; 2. 福建省污染控制与资源循环利用重点实验室, 福州 350007

黄兰兰 福建师范大学环境科学与工程学院, 福州 350007

陈祖亮 1. 福建师范大学环境科学与工程学院, 福州 350007; 2. 福建省污染控制与资源循环利用重点实验室, 福州 350007

摘要: 化学合成纳米铁存在成本高和二次污染等问题, 探寻低成本、环境友好的合成方法是纳米技术在环境修复中的研究热点之一. 本课题组前期采用绿茶提取液 (GTE) 还原 Fe^{2+} 合成纳米铁颗粒 (Fe NPs), 发现GTE合成的Fe NPs易被氧化和团聚. 本文采用阳离子表面活性剂十六烷基三甲基溴化铵 (CTAB) 对绿色合成纳米铁形貌和粒径进行改善, 提高了纳米铁颗粒的分散性和抗氧化性. 通过SEM、XRD、FT-IR、UV-vis等表征手段对GTE合成的Fe NPs和CTAB作用下合成的Fe NPs的微观结构表征以及对孔雀绿降解效果对比表明: CTAB作用下合成的Fe NPs分散均匀, CTAB的包覆提高了Fe NPs的稳定性, 从而提高了Fe NPs的反应活性. GTE合成的Fe NPs对孔雀绿的去除率为75.66%, 而CTAB作用下绿色合成的Fe NPs的去除率高达91.06%. 最后, 提出了CTAB作用下GTE合成Fe NPs的可能机理.

Abstract: Iron nanoparticles (Fe NPs) synthesized by chemical methods are limited for its high cost and toxicity, and therefore it is urgently needed to develop a low-cost and environmental friendly method to synthesize Fe NPs. Our previous work showed that Fe NPs can be prepared using green tea extract, but the synthesized Fe NPs remained aggregated and oxidized. In this study, green synthesis of Fe NPs in the presence of cationic surfactant such as cetyl trimethyl ammonium bromide (CTAB) was investigated to improve the morphology in terms of the aggregation and oxidation of these Fe NPs, which was confirmed by SEM, XRD, FT-IR and UV-vis. In addition, batch experiment indicated that more than 91.06% of malachite green (MG) was removed by Fe NPs synthesized in presence of CTAB, while only 75.66% was removed by Fe NPs in absence of CTAB. The higher degradation efficiency was due to the coated CTAB on the Fe NPs surface, which improved the dispersion and stability of these nanoparticles, and thus enhanced the reactivity. Finally, the synthesis mechanism of Fe NPs using green tea extract in the presence of CTAB was proposed.

Key words: [green synthesis](#) [GTE](#) [Fe NPs](#) [CTAB](#) [MG](#)

摘要点击次数: 47 全文下载次数: 39