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固定化*Burkholderia vietnamiensis* C09V的生物材料同时去除结晶紫和Cr(VI) Simultaneously removal of crystal violet and Cr(VI) by biomaterial immobilized *Burkholderia vietnamiensis* C09V

关键词: [Burkholderia vietnamiensis C09V](#) [固定化](#) [结晶紫](#) [Cr\(VI\)](#) [还原](#)

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作者 单位

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

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

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

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

摘要: 利用生物材料固定化游离菌*Burkholderia vietnamiensis* C09V同时去除结晶紫(CV)和Cr(VI),并以游离菌和无菌小球作为对照.实验结果表明,固定化C09V菌小球能够同时吸附CV和Cr(VI),在42 h对CV($60.0 \text{ mg} \cdot \text{L}^{-1}$)和Cr(VI)($50.0 \text{ mg} \cdot \text{L}^{-1}$)的去除率分别为92.7%和25.9%,明显高于游离菌的75.6%和13.9%;而无菌小球在6 h时的去除率分别为83.9%和16.4%,且42 h后的去除率没有显著变化,说明固定化小球本身具有很好的吸附性能且能提高对结晶紫的去除效果.将无菌小球同时吸附CV和Cr(VI)试验进行伪二级动力学拟合,结果显示,无菌小球在10 h时达到吸附平衡,饱和吸附量分别为 $0.288 \text{ mg} \cdot \text{g}^{-1}$ 和 $0.082 \text{ mg} \cdot \text{g}^{-1}$,且 R^2 均高于0.99.此外,通过EDS、SEM、FTIR、XPS分析,证明生物材料可同时吸附CV和Cr(VI),固定菌C09V可降解CV,并将Cr(VI)还原为Cr(III).

Abstract: The removal efficiencies of crystal violet (CV) and Cr(VI) by the biomaterial based on the beads with immobilized *Burkholderia vietnamiensis* C09V, were compared with those of free cells and those on the beads without immobilized cells. The results showed that CV and Cr(VI) were removed simultaneously by the biomaterial, with the removal efficiencies of 92.7% and 25.9% on $60.0 \text{ mg} \cdot \text{L}^{-1}$ CV and $50.0 \text{ mg} \cdot \text{L}^{-1}$ Cr(VI), respectively, after 42 h. The efficiencies were higher than those of free cells at 75.6% and 13.9% and than those without immobilized cells at 83.9% and 16.4%, respectively. The efficiencies displayed little change after 42 h. This indicated that the removal of CV and Cr(VI) was enhanced by the biomaterial due to its good adsorption of CV and Cr(VI), which was further confirmed by the adsorption of CV and Cr(VI) onto beads without beads without immobilized cells. This fit well to the pseudo-second order model ($R^2 > 0.99$) and the equilibrium of CV and Cr(VI) were $0.288 \text{ mg} \cdot \text{g}^{-1}$, $0.082 \text{ mg} \cdot \text{g}^{-1}$ at 10 h, respectively. In addition, CV and Cr(VI) adsorbed simultaneously by the biomaterial, where CV was degraded and the adsorbed Cr(VI) was reduced to Cr(III) by *Burkholderia vietnamiensis* C09V, as confirmed by EDS, SEM, FTIR and XPS analysis.

Key words: [Burkholderia vietnamiensis C09V](#) [immobilization](#) [crystal violet](#) [Cr\(VI\)](#) [reduction](#)

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单位地址: 北京市海淀区双清路18号 邮编: 100085

服务热线: 010-62941073 传真: 010-62941073 Email: hjxxb@rcees.ac.cn

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