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孔雀石绿高效脱色菌株的筛选、鉴定与脱色特性研究

Isolation, identification and characterization of the highly efficient Malachite Green-decolorizing strain

关键词: [Enterabacter sp.](#) [孔雀石绿](#) [分离鉴定](#) [脱色特性](#) [响应面设计](#)

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摘要: 孔雀石绿应用广泛, 但难以降解且对许多生物都具有致癌致畸性. 从浙江温州皮革厂污泥中分离筛选到1株孔雀石绿高效脱色菌株DH-9, 16S rRNA基因序列分析表明, 该菌株属于 *Enterabacter sp.* 属. 单因素实验结果表明: 当pH值在3.0~9.0时, 培养24 h以后, 该菌株对孔雀石绿的脱色率均在90%以上; 脱色的最适温度范围为30~40 °C; 多数所测试碳源对脱色没有显著影响, 而多数所测试氮源则对脱色有显著的促进作用; 所测金属离子中, 仅Cu²⁺和Fe³⁺对脱色有显著的抑制效应; 此外, 当接种量达到3% (V: V, 菌体干重约0.23 g · L⁻¹) 以后, 12 h的脱色率即可达到90%以上. 响应面设计实验结果显示, 菌株DH-9对孔雀石绿脱色的最优操作条件为: pH 6.0、1.0 g · L⁻¹的半乳糖、1.0 g · L⁻¹的酵母粉、3.0 mmol · L⁻¹的氯化钙以及培养温度为34.5 °C. 验证实验结果表明: 在最优条件下, 该菌株在8 h内对孔雀石绿的脱色率可达99.4%. 总体而言, 菌株DH-9在孔雀石绿脱色中的实际应用潜能较大.

Abstract. Malachite Green (MG) is widely used in many industry fields. It is however hardly to be degraded and carcinogenic and mutagenic against many organisms. In this study, the strain DH-9 capable of efficiently decolorizing MG was isolated from a tannery sludge collected in Wenzhou, Zhejiang. Results of 16S rRNA gene analysis indicated that the strain was a member of *Enterabacter sp.* The results of one-factor-at-a-time experiments showed that over 90% of decolorization was observed after incubation for 24 h at pH 3.0~9.0, and the optimal temperature for decolorization was between 30~40 °C. Most of the tested carbon resources had no significant effect on decolorization, while most of the tested nitrogen resources could significantly enhance the decolorization. Among the tested metal ions, only Cu²⁺ and Fe³⁺ could significantly inhibit the decolorization. Besides, over 90% MG could be removed after incubation for 12 h when the inoculums size reached 3% (V: V, the cell dry weight was about 0.23 g · L⁻¹). Moreover, the results of response surface design experiment indicated that the optimal conditions for decolorization were as follows: pH 6.0, 1.0 g · L⁻¹ galactose, 1.0 g · L⁻¹ yeast extract, 3.0 mmol · L⁻¹ CaCl₂, and at 34.5 °C. Finally, the results of verification tests showed that the MG decolorization by the strain could reach 99.4% after incubation for 8 h under the optimal conditions. In general, the strain DH-9 could be potentially used for decolorization of MG.

Key words. [Enterabacter sp.](#) [malachite green](#) [isolation and identification](#) [characteristics of decolorization](#) [response surface design](#)

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