

**Desulfovibrio-induced gauzy FeS for efficient hexavalent chromium removal:
the influence of SRB regulated by carbon source and electron carriers**

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Abstract

Microbiologically influenced corrosion (MIC) is the result of microorganisms' life activities causing corrosion damages to metals or non-metals [1]. SRB had important application value for FeS produced after iron corrosion. It was widely used in catalysis, sensors, electronics, photovoltaics, and other fields [2]. Biosynthetic metal sulfides showed great application prospects on the environmental treatment against high-valence metal pollutants. However, the efficiency of biosynthesis, agglomeration during the reaction process, and the formation of the passivation layer during the reduction process were always the important factors restricting its development.

This study explored the composition of the culture medium to promote the growth of highly corrosive SRB and its metabolism to produce FeS NPs. The results showed that reducing the carbon source and adding electron carriers in the culture medium effectively promoted the production of small, dispersed, and loose FeS NPs in cells. At pH = 7, 24 °C and 10 min reaction time, 0.1 g/L FeS NPs produced by SRB under the conditions of 10% carbon source with 10 ppm cytochrome c medium could achieve 100% removal efficiency of 1 mM Cr(VI). Under this condition, FeS NPs could be produced by intracellular metabolism in SRB cells, and environmental factors such as pH, metal cations, and Cl⁻ had little effect on the removal of Cr(VI) by this FeS NPs. The surface proteins of FeS NPs significantly enhanced its antioxidant properties. After 7 days of natural environment exposure, the Cr(VI) removal efficiency of FeS NPs was only reduced by 16% compared with the initial sample. This work provided an in-depth understanding of Cr(VI) removal by SRB biosynthesis of FeS and contributes to the widespread application of FeS in the future.

Keywords

Sulfate-reducing bacterial, biogenic FeS NPs, Cr(VI) removal, electron carrier

Reference

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