

SRB regulated the formation of MoS₂/MoO₃ complex for the efficient degradation of dyes by peroxymonosulfate activation

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Abstract Sulfate-reducing bacteria (SRB) is a typical anaerobic corrosive microorganism that can reduce SO₄²⁻ to H₂S. SRB produces nanoscale corrosion products during the corrosion process and has very good application potential in the field of catalysis. This research proposed a novel biosynthesis method for MoS₂ and MoO₃ complexes using cyclic voltammetry (CV) in a sulfate-reducing bacteria (SRB) medium. In this study, a standard three-electrode system was used, with molybdenum mesh as the working electrode, and SRB culture medium as the electrolyte. A linear voltage was applied using an electrochemical workstation. Subsequent structural and surface characterizations were conducted using SEM, EDS, XRD, and XPS, confirming the successful synthesis of MoS₂ and MoO₃. After optimizing the experimental conditions, the most effective degradation of MB was achieved with a voltage range of 0.6-1.2 V, a scanning speed of 30 mV/s, and 10 scanning cycles. The study demonstrated the efficient degradation of methylene blue (MB) through the activation of peroxymonosulfate (PMS). The prepared material was added to 10 mg/L methylene blue solution and PMS solution, and degraded under visible light conditions. The absorbance of degraded MB solution at 665 nm was measured every 2 minutes by UV-VIS DRS spectrophotometer. The optimized conditions for MB degradation were identified as follows: pH=6, PMS concentration of 0.4 g/L, molybdenum mesh dosage of 0.09 cm²/ml, and an incubation period of 8 days. Under these conditions, 99% of MB could be degraded within 10 minutes. Additionally, antibacterial tests confirmed the disinfection capabilities of the synthesized materials. The catalytic mechanism was further elucidated through ESR tests and free radical trapping experiments. This study presents a novel in-situ method for the synthesis of MoS₂/MoO₃, showing good prospect in environmental treatment.

Keywords SRB, MoS₂/MoO₃, PMS activation, cyclic voltammetry

Reference

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