

4、 Microbiological Corrosion

Title Effects of extracellular electron transfer on biomineralization by *Shewanella putrefaciens* in damaged organic coatings

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Abstract In contrast to microbiologically influenced corrosion (MIC), biomineralization can inhibit the corrosion of metal substrates by forming dense and uniform biomineralized films with barrier effects against corrosion. Biofilms as a key role in the biomineralization process, can be improved by extracellular electron transfer (EET) which may introduce corrosion process. This study reports the effect of EET on biomineralization mediated by *Shewanella putrefaciens* in damaged coatings under different carbon sources (100, 75, 50, and 25 wt%) 2216E conditions. The results showed *S. putrefaciens* was able to obtain energy from metal surfaces to support metabolism via EET when the carbon source was insufficient. Under these conditions, although EET can promote the enrichment of bacteria on the coating scratches, the corrosion process was accelerated, and generated Fe₂O₃ and FeOOH corrosion products whereas biomineralization was inhibited. Meanwhile, the decrease in pH value of medium means the microbial metabolic pathways turn from aerobic respiration to other metabolic pathways. When the environment had sufficient carbon sources, aerobic respiration was the main pathway supporting the metabolism of *S. putrefaciens*, and biomineralization dominated and showed corrosion-inhibition effects. The EIS results also revealed that biomineralization was most significant in the 75% carbon source medium after 7 days of incubation.

Keywords Corrosion; Microbiologically induced corrosion inhibition; Biomineralization; Extracellular electron transfer

Reference

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