In situ Real-time Monitoring and Simulation of Metabolic Activity in Biofilm of Sulfate-reducing Bacteria

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Abstract Content:

Sulfate-reducing bacteria (SRB) are a typical, well-studied, and highly corrosive microorganism that is closely associated with the formation of biofilms on metal surfaces. Traditional methods for measuring SRB activity in biofilms are unable to distinguish between the metabolic activity of sessile SRB in the biofilm and planktonic SRB in bulk solution, making it difficult to apply in the field. To address these issues, this thesis presents two types of all-solid ion selective electrochemical microprobes that were used to construct metabolic activity detection platforms for continuous, in situ detection of SRB metabolic activity in biofilms by selectively recognizing characteristic metabolic substances. Additionally, the feasibility of the SRB metabolic activity detection performances was verified by two organic fluorescent probes. The metabolic activity of sessile SRB in biofilm on the surface of inert material and planktonic SRB in bulk solution were continuously measured, and the test results preliminarily revealed the changes and differences of metabolic activity between SRB cells in the biofilm and free SRB cells. Subsequently, the metabolic activity of sessile SRB in biofilm on the surface of metal material and

planktonic SRB in bulk solution were continuously measured, and the results were discussed in this thesis. This study was of great significance for revealing the variation regulation and difference characteristics of SRB metabolic activity inside and outside the biofilm, and held significant meaning for the research of SRB biofilm corrosive mechanism.

Keywords：Biofilm; bacteria; metabolic activity; in-situ; simulation