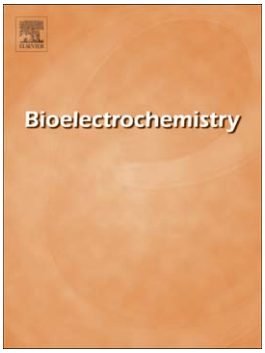


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# Mechanistic modeling of biocorrosion caused by biofilms of sulfate reducing bacteria and acid producing bacteria

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**Abstract:** Biocorrosion is also known as microbiologically influenced corrosion (MIC). Most anaerobic MIC cases can be classified into two major types. Type I MIC involves non-oxygen oxidants such as sulfate and nitrate that require biocatalysis for their reduction in the cytoplasm of microbes such as sulfate reducing bacteria (SRB) and nitrate reducing bacteria (NRB). This means the extracellular electrons from the oxidation of metal such as iron must be transported across cell walls into the cytoplasm. Type II MIC involves oxidants such as protons that are secreted by microbes such as acid producing bacteria (APB). The biofilms in this case supply the locally high concentrations of oxidants that are corrosive without biocatalysis. This work describes a mechanistic model that is based on the biocatalytic cathodic sulfate reduction (BCSR) theory. The model utilizes charge transfer and mass transfer concepts to describe the SRB biocorrosion process. The model also includes a mechanism to describe APB attack based on the local acidic pH at a pit bottom. A pitting prediction software package has been created based on the mechanisms. It predicts long-term pitting rates and worst-case scenarios after calibration using SRB short-term pit depth data. Various parameters can be investigated through computer simulation.

***Key words:*** biocorrosion; microbiologically influenced corrosion; mechanism; model; charge transfer; mass transfer

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