



The Impact of Sulphide Concentration on Microbial Activity in a Biological Sulphate Reduction Process

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Abstract

Mine impacted water includes all water impacted by mining activities, from process effluents to polluted water courses due to mining activities. In South Africa, mine impacted water has caused severe and long term degradation of the environment. As a result, much research is focused on treating mine impacted water, specifically increasing or neutralising the pH of the water and decreasing the sulphate and metals concentrations. South African mine impacted water generally contains high levels of sulphate, often in excess of 3g/L, and stringent regulations enforce low sulphate discharge limits of 200 600 mg/L. Biological sulphate reduction has been demonstrated as a feasible treatment technology for removal of sulphate and precipitation of metals from mine impacted water. Sulphate is biologically converted to sulphide in this process, which is either released as hydrogen sulphide gas, or remains in solution. There is much discrepancy in the literature regarding the nature of sulphide inhibition and its impact on microbial communities and sulphate reduction activity. This study aims to quantify the impact of increasing sulphide concentrations on an established biological sulphate reducing system.

Most of the available data on sulphide inhibition in anaerobic systems was obtained from studies where sulphide was added to a system, and excluded sulphate, thereby neglecting the interactions of sulphate reducers with other microbial communities. This study used a continuously operated reactor at steady state, with a neutralised mine water feed, consisting of high sulphate concentrations and low levels of metals. Sulphide, in the form of sodium sulphide, was added to the feed in increasing concentrations over the study period. Microbial activity was determined measuring the changes in sulphate reduction rates with increased sulphide concentrations. Variations in the microbial communities in response to the changing feed conditions, were determined using metagenomics techniques.

This study is ongoing, and the results concerning the impact of increasing sulphide concentrations on microbial activity, community dynamics and sulphate reduction rates will be analysed and presented in a full paper.

The results from the study will provide a clearer understanding of the effect of sulphide concentration on microbial activity and community dynamics. This would inform the development and optimisation of active and passive processes for treatment of mine impacted water, resulting in higher sulphate reduction rates.

Keywords: Biological Sulphate Reduction, Sulphide Inhibition

