Optimization of process parameters in mixed sulfide oxidation bacterial culture using response surface methodology as a tool

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Abstract

The integrated bacterial mixed culture consortium with disproportionate oxygen demand was discovered to mutually cooperate with one single biofilm in oxidizing sulfide at different concentration. The present work was carried out to verify the potential of bacterial mixed culture (BMC) in developing a predictive optimum condition for sulfide oxidation in a laboratory batch mode. A face centered central composite design (FCCCD) under response surface methodology (RSM) was employed to predict the synergistic effects of initial hydrogen sulfide concentration (100-500 ppm), temperature (30-40 degrees C) and aeration rates (50-250 vvm) on BMC sulfide oxidation. A total number of 20 experimental runs with 6 centre points were carried out. The obtained results were analyzed using design expert and statistical validation indices to check the adequacy of the obtained quadratic models. The analysis of variance showed that more than 99% of the variation was explained by the models. There was a good agreement between experimental and predicted data. The optimum sulfide removal of 448.75 ppm was achieved at the temperature of 32.4 degrees C, initial hydrogen sulfide of 500 ppm and aeration rates of 110.06 vvm in 8 h. Therefore, the finding depicts the adequacy of the obtained model in enhancing BMC sulfide oxidation conditions. The model is further affirmed through SEM-EDXS analysis, revealing oxidized sulfide product aggregate of the micrographs coupled with elemental identification and quantitative composition. (C) 2017 The Authors. Production and hosting by Elsevier B.V. on behalf of King Saud University.

Keywords

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