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BIODEGRADATION KINETICS OF MIXED MICROBIAL CULTURE UTILIZING 1,1-DCE AS THE SOLE CARBON SOURCE

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Abstract

The mixed microbial culture, isolated from the aerobic sludge was used to study biodegradation of 1,1-DCE as the sole carbon source in batch flasks. 1,1-DCE initial concentration in the medium was varied from 100μg/L to 1000μg/L. The maximum removal rate of 1,1-DCE was 89.2% obtained at 400μg/L 1,1-DCE concentration in the medium. The biodegradation kinetics of 1,1-DCE was found to follow three-half-order model at all initial 1,1-DCE concentrations with regression values greater than 0.95. The maximum specific degradation rate of 1.1×10^{-2} (μg DCE/(mg.VSS.h)) was observed at 400μg/L 1,1-DCE concentration in the medium. In the range of 1,1-DCE concentrations used in the experiment, the specific degradation rates were observed to follow substrate inhibition kinetics. The specific degradation rate was fitted to kinetic model of Haldane, Luong, Edward and Han-levenspiel that are used to explain substrate inhibition on degradation of 1,1-DCE. Out of these models Luong and Han-Levenspiel model fitted the experimental data better with lower root mean square error values. In addition, the degradation pathway of 1,1-DCE by the mixed microbial culture was discussed in this study.

Key words: 1,1-DCE, biodegradation kinetics, mixed microbial culture, specific substrate degradation rate, substrate inhibition

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