

Performances of protease and amylase cleaning for microporous membranes used in wastewater applications

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ABSTRACT

Enzymes have been successfully applied to clean fouled membranes, especially those affected by the deposition of protein- and lipid-based compounds. In the water and wastewater industries, enzymatic cleaners are increasingly considered as potential alternatives from conventional chemical agents. Their very specific targeted actions and environmental impact are indeed some of the drivers for using enzymes in microporous membrane processes. This paper aims to assess the cleaning performance of two types of enzyme (protease and amylase) to remove typical fouling materials found in wastewater treatment (protein and carbohydrate modeled in this study by bovine serum albumin and sodium alginate, respectively). Under the experimental conditions used in this study, results showed relatively low cleaning efficiencies, with optimum efficiencies of 68% and 73% for protease and amylase, respectively. Although enzymes are not known to cause membrane ageing/deterioration, this type of cleaners was expected to potentially foul the membrane, as residual enzyme may attach to the membrane during the cleaning process. To assess this potential, cyclical cleanings were performed in addition to single cycle cleaning. Results showed that fouling occurred four times faster after membrane was re-used for 16 cycles. The sequential use of the two enzymatic cleaners in series did not provide any improvement in efficiency compared to the use of single enzyme. However, analysis of residual foulants indicated the lower amount of material found on the membrane.

Keywords: Enzyme; Protease; Amylase; Cleaning; Membrane bioreactor

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