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Analysis of combined influence of foulant concentration and flux in ultrafiltration membrane process using response surface methodology

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ABSTRACT

Microfiltration (MF) and ultrafiltration (UF) have been extensively adopted as alternatives to conventional filtration. However, one of the main barriers to widespread use of these technologies is membrane fouling that affects both the quality and the quantity of the product water. Accordingly, the operation conditions for MF/UF should be properly adjusted to minimize fouling. The objective of this study is to analyze combined influence of foulant concentration and flux on fouling propensity of hollow fiber UF membrane through response surface methodology and Central Composite Design. Colloidal silica, kaolin and alginate were used as model foulants, and the concentration of foulant and flux were chosen as the operation parameter. In each case, the fouling rate was determined based on the experimental results. Second-order polynomial model equations were derived to predict the fouling rate as a function of foulant concentration and flux. Finally, operating conditions for a given level of fouling were determined using the model equation and the optimization plot.

Keywords: Microfiltration (MF); Ultrafiltration (UF); Fouling; Flux; Response surface methodology (RSM)

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