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Prediction of membrane fouling rate by neural network modeling

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ABSTRACT

Cross-flow microfiltration is an efficient and energy-saving method for separating fine particles from liquids in many chemical, environmental, biochemical and materials processes. Although this filtration mode has many advantages, the flux decline at a constant pressure, or similarly, the transmembrane pressure increase at constant flux due to membrane fouling is a severe barrier to its further development and wide application. The objective of this research was to identify the seasonal characteristics of the raw water collected from the Han River, and to develop a model that can predict and/or monitor the fouling rate. An MLP (multi-layer perceptron) employing the sigmoid transfer function and the back propagation algorithm for training was constructed with the STATISTICA. The ANN input parameters were carefully selected to include the physically meaningful and easy-to-measure membrane operations. The results of the experiment indicated that the seasonal variations in the raw water quality parameters significantly affected the membrane fouling rate. The comparison of the ANN model calculations with the experiment results revealed that the ANN model is a useful tool for predicting the membrane fouling characteristics.

Keywords: Artificial neural network; Microfiltration; Fouling rate; Cake filtration

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