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Fouling characteristics of microfiltration membranes by organic and inorganic matter and evaluation of flux recovery by chemical cleaning

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ABSTRACT

Characteristics of membrane fouling by organic and inorganic foulants and flux recovery by chemical cleaning were investigated in this study. Three kinds of raw water with organic matter (15 mg/L humic acid), with inorganic matter (1 mg/L Fe and 1 mg/L Mn) and a mixture of organic and inorganic matter (humic acid, Fe and Mn) were tested. The effects of Ca^{2+} and pH on fouling were also investigated as well as efficiency of chemical cleaning. The results showed that raw water with the mixture reduced the final flux by 10%. On the other hand, the final fluxes were reduced by 8% for inorganic matter and by 78% for organic matter. Although, FI decreased with the existence of Ca^{2+} in the mixture of humic acid, Fe and Mn, flux was recovered easily by backwashing because Ca formed a cake layer by chelating with humic substances. However, pre-treatment with sodium hypochlorite reduced the flux severely for raw water containing inorganic matter. Acid (2% nitric acid) and base (1% sodium hydroxide), were used to clean the fouled membranes. Cleaning efficiency was different by changing the cleaning sequence of the two chemicals (acid/base and base/acid). Flux recovery was 20% higher in base/acid sequence. These results showed that both raw water characteristics and cleaning method should be thoroughly investigated for appropriate operation of membrane processes.

Keywords: Chemical cleaning; Cleaning sequence; Flux recovery; Fouling; Microfiltration

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