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Application of osmotic backwashing in forward osmosis: mechanisms and factors involved

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ABSTRACT

Feasibility of osmotic backwashing for cleaning fouled membranes during forward osmosis (FO) process was investigated focusing on the mechanisms and factors involved. Alginate and humic acids were used as model organic foulants; and colloidal silica particles with different sizes were used as model inorganic particulate foulants. Results showed that noticeable flux recovery was achieved by osmotic backwashing through the instantaneous replacement of the draw solution with the dilute solution that has much less osmotic pressure than that of the feed solution. The switch of water flow direction through the membrane from feed-to-draw to draw-to-feed allows the effective detachment of foulants from the membrane surface. It was found that the efficiency of osmotic backwashing was affected by several factors including foulant type, membrane orientation and backwashing conditions (i.e. initial flux and duration). In addition, concentration polarization was found to play an important role in determining fouling behaviour, and thus, the osmotic backwashing efficiency.

Keywords: Forward osmosis (FO); Osmotic backwashing; Organic fouling; Particle fouling; Concentration polarization

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