386c Mechanisms of Chemical Cleaning of Organic-Fouled Reversed Osmosis Membranes

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Fouling of reverse osmosis (RO) membranes used in advanced water reclamation is inevitable, especially by effluent organic matter (EfOM) found in the feed water. The long-term solution would be to remove the fouling layer on membrane surfaces via chemical cleaning. This study looks into the influence of various chemical cleaning agents on the recovery of water flux of organic-fouled RO membranes. Sodium alginate, bovine serum albumin, and Suwannee River natural organic matter are selected as model organic foulants to represent respectively the polysaccharides, proteins, and humic substances in EfOM. The role of chemical and physical interactions in cleaning of the organic-fouled RO membranes is systematically investigated. The effects of the cleaning agents on membrane surfaces are gauged by analyzing the zeta potential (with a streaming potential analyzer), determining the hydrophobicity (with a contact angle measuring device), and observing the surface morphology (with atomic force microscopy) of the fouled membranes after cleaning. To understand the mechanisms of chemical cleaning, atomic force microscopy (AFM) is used to study the foulant-foulant interactions at the molecular level. It is proposed that an efficient cleaning agent and favorable cleaning conditions could be selected by considering two important mechanisms: chemical reaction between the cleaning agent and foulants in the fouling layer and mass transfer of the chemical agent (from the bulk phase to the fouling layer), and foulants (from the fouling layer to the bulk phase).