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Concentration performance and cleaning strategy for controlling membrane fouling during forward osmosis concentration of actual oily wastewater

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Abstract

In this study, two types of forward osmosis (FO) membranes (CTA-HM membranes prepared in this work and commercial CTA membranes from HTI) were used in FO concentration (FOC) for actual oily wastewater (serving as feed solution, FS) treatment using 2M NaCl as draw solution (DS). Concentration performance, fouling behavior and cleaning efficiency were extensively evaluated. Results demonstrated that the concentration factors of salt and organic matter were lower than that obtained by FS weight, attributing to the salt diffusion from FS to DS and the organic accumulation on the membrane surface. An increasing FS salinity and obvious membrane fouling led to a decreasing permeation flux. Such a membrane fouling, mainly composed of alkane (rather than inorganic or colloid fouling) was not efficiently removed by simple hydraulic washing even at a high-flow-rate. Therefore, five cleaning protocols (osmotic backwash, oxidant, acid, surfactant and complexant cleaning) were performed to improve cleaning efficiency. Results indicated that the osmotic backwash performed best to enhance flux recovery to 95% without an obvious impact on the salt rejection. Furthermore, compared to CTA-HTI membranes, CTA-HM

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