



Pretreatment strategies for mitigation of membrane fouling by effluent organic matter in ultrafiltration: ozonation and coagulation/flocculation

Geon-Youb Kim^a, Ji-Hoon Kim^{a,*}, Min-Gue Kim^a, Hyung-Soo Kim^a,
Hyung-Sook Kim^b, Won-Seok Chang^c

^aDepartment of Water Resources, Graduate School of Water Resources, Sungkyunkwan University, 2066 Seobu-ro, Jangan-gu, Suwon, Gyeonggi-do 440-746, Korea, Tel. +82-31-290-7647; Fax: +82-31-290-7549; email: jjtt23@skku.edu (J. Kim)

^bDepartment of Food and Nutrition, School of Human Ecology, Suwon University, 17 Wauan-gil, Bongdam-eup, Hwaseong-si, Gyeonggi-do 445-743, Korea

^cResearch Institute, Korea District Heating Corp., 781 Yangjae-daero, Gangnam-gu, Seoul 135-220, Korea

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ABSTRACT

Membrane separation processes are widely used in wastewater reuse systems. However, membrane fouling is a challenging issue because it leads to high energy consumption and decreases separation efficiency. In this study, we investigated measures to control the membrane fouling arising from the deposition of foulants such as particles, colloids, and effluent organic matter onto the membrane surface during secondary wastewater management. Preozonation and coagulation/flocculation pretreatments were tested as measures to reduce membrane fouling. Filtration resistance was notably high in the absence of preozonation and coagulation/flocculation pretreatments; in contrast, both preozonation and coagulation/flocculation facilitated the removal of organic foulants by decreasing the irreversible fouling during filtration. The optimal ozone contact time for preozonation was found to be 120 s, in terms of improving the permeate water flux. In addition, the use of iron(III) chloride (FeCl₃; dosage 25 mg Fe/L) with preozonation was required to depolarize foulants from the membrane surface. These findings suggest that irreversible resistance can be controlled by using preozonation and coagulation/flocculation pretreatments after eliminating the reversible phase. Therefore, the combined application of ozone and coagulant can play a key role in stable operation of the membrane separation process for wastewater reuse.

Keywords: Effluent organic matter; Membrane; Fouling; Ozonation; Coagulation

* Corresponding author.