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Effect of ion composition on nanofiltration rejection for desalination pretreatment

Jutamas Kaewsuk, Dong Yun Lee, Taek Soon Lee, Gyu Tae Seo*

Department of Environmental Engineering, Changwon National University, 9 Sarim-dong, Changwon, Gyeongnam 641-773, Republic of Korea
Tel. +82 55 213 3749; Fax: +82 55 281 3011; email: gts@changwon.ac.kr

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ABSTRACT

This experiment investigated and explains the rejection of calcium and magnesium ions and conductivity under the influence of the coexisting ions. Nanofiltration (NF) membranes have been used as pressure-driven type of cross-flow system in water treatment. The evolution of flux and rejection was followed in time during 2 h. For analysis and comparison, the values after 1 h of filtration were used. The NF membranes used in this study were thin film composite NF membranes NE90 (Woojing, Korea). The experiment indicated that Donnan exclusion had strong effect with cation when operated at low flux. However, the overall ion rejection, which was conducted by conductivity value, was high due to influence of dielectric phenomenon. For anion, electric repulsion between the NF membrane and chloride was high enough to push calcium and magnesium ions through the membrane by Donnan exclusion phenomenon. Chloride ion had stronger effect on the rejection of magnesium ion than the calcium ion. The results indicate that the electrostatic repulsion between the other anions (nitrate, sulfate, and bicarbonate ions) and the membranes seemed to be strong enough with the low concentration, but vice versa at high concentration.

Keywords: Desalination; Nanofiltration; Pretreatment; Ion composition; Coexistingion

*Corresponding author.

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