濃度極化現象對NF薄膜之分離成效的影響

童士庭、柯雅雯

E-mail: 9221185@mail.dyu.edu.tw

摘 要

本研究探討在不同濃度極化現象時，對於NaCl、Na2SO4、PEG200與PEG600溶液的分離成效與傳輸、去除機制的情形。在本研究的操作條件(固定進流濃度為5 10-4 molar fraction，操作壓力在60~140 psi)下，薄膜對於NaCl、Na2SO4、PEG200和PEG600的去除率為20~40%、89~96%、46~54%與93%；且有無濃度極化現象對去除率的影響趨勢並不明顯。且在本研究的實驗條件下，Hydrosep薄膜並不具帶電性，因此主要的溶質去除機制為篩除效應和表面作用力。 將本研究以Kimura與Sourirajun的模式來定量去除率與穩態清水通量之間的關係，在固定掃流速度為0.15 m/s時，NaCl的平均溶質輸送參數為5.57×10-6 m/s，平均Aid值為4.78 10-15 (m)；而在固定掃流速度為0.50 m/s時，Na2SO4的平均溶質輸送參數為2.29 10-7 m/s，平均Aid值為3.56 10-1 (m)。

關鍵詞 : NF ; 薄膜 ; 濃度極化

目錄

參考文獻

參考文獻？杜亮明，「薄膜程序應用於淨水之探討」，碩士論文，國立台灣大學環境工程學研究所，台北，民國88年6月。？國科會專題研究計畫，「前處理對NF薄膜程序影響之研究」，計畫主持人:葉宣顯教授，成功大學環境工程學系，計畫編號:NSC 88-2211-E-006-023，民國88年7月。？台灣省自來水公司專案計畫，「澄清湖高級淨水處理模型廠試驗研究」(第一年)，計畫主持人:葉宣顯教授，成功大學環境工程學系，民國88年8月。？高山鎮，「薄膜阻塞控制之研究」，碩士論文，國立成功大學環 境工程學研所，民國89年6月。？國科會專題研究計畫，「NF薄膜程序應用於淨水處理時的阻塞行為與分離成效之研究」，計畫主持人:柯雅雯教授，大葉大學環境工程學系，計畫編號:NSC，民國90年8月。？Alborzfar, M., Jonsson, G., and Gron, C.,“ Removal of Natural Organic Matter from Two Types of Humic Ground Waters by Nanofiltration ”, Water Research, Vol.32, pp. 2983-2994, 1998.？Amy, G., et al.,“ Removal of Dissolved Organic Matter by Nanofiltration ”, Journal of Environmental Engineering- ASCE, Vol.116, pp.1200, 1990.？AWWA Membrane Technology Research Committee,“ Committee Report: Membrane Processes ”, Journal of American Water Works Association, 1998.？Bowen, W.R., Mohammad, A.W. and Hilal, N.,“ Characterisation of Nanofiltration Membranes for Predictive Purposes -Use of Salts, Uncharged Solutes and Atomic Force Microscopy ”, Jour. of Membrane Science, Vol.126, pp.91-105, 1997.？Bowen, W.R. and Mohammad, A.W.,“ A Theoretical Basis for Specifying Nanofiltration Membranes — Dye/Salt/Water Streams ”, Desalination, Vol.117, pp.257-264, 1998.？Cheryan, Munir,“ Ultrafiltration and Microfiltration Handbook ” Technomic, pp.46, 1998.？Cho, J., Amy, G., and Pellefrino, J.,“ Membrane Filtration of Natural Organic Matter: Initial Comparison of Rejection and Flux Decline Characteristics with Ultrafiltration and Nanofiltration Membranes ”, Water Research, Vol.33, pp. 2517-2526, 1999.？Clark, S., et al.,“ Low-Cost Membrane Filtration in Offing ”, Waterworld News, Jan/Feb, pp.17-18, 1992.？Conlon, W., et al.,“ Membrane Softening Comes of Age ”, Journal of American Water Works Association, Vol.81, pp.47, 1989.？Dard P., Cote P., Seberac P. and Ortiz R.S.“ Drinking water Production from High Sulfate Mine Water by Nanofiltration ”, In Proceedings of the 1995 Membrane Technology Conference, Reno, Nevada. 1995.？DiGiano, F.A., Arweiler, S., and Riddick Jr., J.A.,“ Alternative Tests for Evaluating NF Fouling ”, Journal of American Water Works Association, Vol.92, pp.103-115, 2000.？Dykes, G. and Conlon, W.,“ Use of Membrane Technology in Florida ”, Journal of American Water Works Association, Vol.81, pp.43, 1989.？Gaid A. et al.,“ Performance of 3 years ’ Operation of Nanofiltration ”, Desalination, pp117-149, 1998.？Garba, Y., Taha, S., Gondrexon, N., and Dorange, G.,“ Cadmium Salts Transport through A Nanofiltration Membrane: Experimental Results and Model Predictions ”, Water Science & Technology, Vol.38, pp.529-535, 1998.？Garba, Y., Taha, S., Gondrexon, N., and Dorange, G.,“ Mechanisms Involved in Cadmium Salts Transport through A Nanofiltration Membrane: Characterization and Distribution ”, Jour. of Membrane Science, Vol.168, pp.135-141, 2000.？Jacangelo, J., et al.,“ Assessing Hollow-Fiber Ultrafiltration for Particulate Removal ”, Journal of American Water Works Association, Vol.81, pp.68, 1989.？Lee, S. and Lee, C.-H.,“ Effect of Operating Conditions on CaSO4 Scale Formation Mechanism in Nanofiltration for Water Softening ”, Water Research, Vol.34, pp.3854-3866, 2000.？Lee, S.H., Kim, J.H., and Lee, C.H.,“ Analysis of CaSO4 Scale Formation Mechanism in Various Nanofiltration Modules ”, Jour. of Membrane Science, Vol.163, pp.63-74, 1999.？Marianne N., Lena, K., and Susana, L.,“ Fouling and Retention of Nanofiltration Membranes ”, Jour. of Membrane Science, Vol.98, pp.249-262, 1995.？van der Meer, W.G.J., Aeijelts Averink, C.W., and van Dijk, J.C.,“ Mathematical Model of Nanofiltration Systems ”, Desalination, Vol.105, pp.25-31, 1996.？van der Meer, W.G.J. and van Dijk, J.C.,“ Theoretical Optimization of Spiral-Wound and Capillary Nanofiltration Modules ”, Desalination, Vol.113, pp.129-146, 1997.？Mehiguene, K., Garba, Y., Taha, S., Gondrexon, N., and Dorange, G.,“ Influence of Operating Conditions on the Retention of Copper and Cadmium in Aqueous Solutions by Nanofiltration: Experimental Results and Modelling ”, Separation and Purification Technology, Vol.15, pp.181-187, 1999.？No?l, I.M., Lebrun, R., and Bouchard, C.R.,“ Electro-nanofiltration of A Textile Direct Dye Solution ”, Desalination, Vol.129, pp.125-136, 2000.？Poti? M. et al. :Nanofiltration: A New Technique for the Defluoridation of Drinkable Waters inFrance and inSenegal ”, presented at International Conference on Membrane Science and Technology,June 9-12, Beijing,China,1998.？Pontius, F.W. and Diamond, W.R.,“ Complying with Stage 1 D/DBP Rule ”, Journal of American Water Works Association, Vol.91, pp.16, 1999.？Reiss, C.R., Taylor, J.S., and Robert, C.,“ Surface Water Treatment Using Nanofiltration -Pilot Testing Results and Design Considerations ”, Desalination, Vol.125, pp.97-112, 1999.？Siddiqui, M., Amy, G., Ryan, J., and Odem, W.,“ Membranes for the Control of Natural Organic Matter from Surface Waters ”, Water Research, Vol.34, pp.3355-3370, 2000.？Tan, L. and Amy, G.,“ Comparing Ozonation and Membrane Separation for Color Removal and Disinfection By-Product Control ”, Journal of American Water Works Association, Vol.83, pp.74, 1991.？Tan, L. and Sudak, R.,“ Color Removal from Groundwater by Membrane Processes ”, Journal of American Water Works Association, Vol.84, pp.79, 1992.？Taylor, J., et al.,“ Applying Membrane Processes to Groundwater Sources for Trihalomethane Precursor Control ”, Journal of American Water Works Association, Vol.79, pp.72, 1987.？Visvanathan, C., Marsono, B.D., and Basu, B.,“ Removal of THMFP by Nanofiltration: Effects of Interference Parameters ”, Journal of American Water Works Association, Vol.32, pp.3527-3538, 1998.？Waypa J.J., Elimelech M. and Hering J.G.“ Arsenic Removal by RO and NF Membranes ”, Journal of American Water Works Association, Vol.89, pp102, 1997.