Desalination and Water Treatment
www.deswater.com
1944-3994/1944-3986 © 2012 Desalination Publications. All rights reserved
doi: 10.1080/19443994.2012.672212

43 (2012) 308–313
April

Taylor & Francis
Taylor & Francis Group

Influence of solution chemistry on the surface heterogeneity of reverse osmosis membrane

Youngjin Kim, Sangyoup Lee, Seungkwan Hong*

School of Civil, Environmental & Architectural Engineering, Korea University, 1, 5-ka, Anam-Dong, Sungbuk-Gu, Seoul 136-713, Republic of Korea
Tel. +82 2 3290 3322; Fax: +82 2 928 7656; email: skhong21@korea.ac.kr

Received 25 December 2011; Accepted 10 February 2012

ABSTRACT

The chemical heterogeneity of reverse osmosis membrane surface and its impacts on membrane fouling were investigated using dynamic hysteresis, which is a newly developed surface analytical technique. Based on dynamic hysteresis measurements, it has been demonstrated that the chemical heterogeneity of membrane surface was greatly influenced by solution—pH and ionic strength. Significant variation of dynamic hysteresis was observed as solution pH changed, implying the alteration of membrane surface heterogeneity. Interestingly, there existed the interplay between chemical and physical surface heterogeneity with respect to solution ionic strength. At low ionic strength, dynamic hysteresis mostly reflected chemical surface heterogeneity, while physical surface heterogeneity played more dominant role in the change of dynamic hysteresis with increasing ionic strength. This implies that membrane fouling due to chemical surface heterogeneity of the membrane is less remarkable in seawater desalination compared to wastewater and brackish water treatments. In addition, mechanisms and factors affecting chemical and physical surface heterogeneity and their interplay with respect to solution chemistry including pH, ionic strength and divalent cation concentration are discussed and elucidated.

Keywords: Membrane surface characterization; Dynamic hysteresis; RO membrane; Chemical heterogeneity

*Corresponding author.

The 4th International Desalination Workshop (IDW4), 16–18 November 2011, Jeju Island, South Korea