

Membrane fouling in vacuum membrane distillation for ionic liquid recycling: Interaction energy analysis with the XDLVO approach

Huanhuan Wu, Fei Shen, Junfeng Wang, Yinhua Wan



PII: S0376-7388(17)32360-8
DOI: <https://doi.org/10.1016/j.memsci.2018.01.018>
Reference: MEMSCI15872

To appear in: *Journal of Membrane Science*

Received date: 17 August 2017
Revised date: 7 January 2018
Accepted date: 10 January 2018

Cite this article as: Huanhuan Wu, Fei Shen, Junfeng Wang and Yinhua Wan, Membrane fouling in vacuum membrane distillation for ionic liquid recycling: Interaction energy analysis with the XDLVO approach, *Journal of Membrane Science*, <https://doi.org/10.1016/j.memsci.2018.01.018>

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting galley proof before it is published in its final citable form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

Membrane fouling in vacuum membrane distillation for ionic liquid recycling: Interaction energy analysis with the XDLVO approach

Huanhuan Wu^{a,b}, Fei Shen^{a,b*}, Junfeng Wang^a, Yinhua Wan^{a,b*}

^a State Key Laboratory of Biochemical Engineering, Institute of Process Engineering, Chinese Academy of Sciences, Beijing 100190, China

^b University of Chinese Academy of Sciences, Beijing 100049, China
fshen@ipe.ac.cn

yhwan@ipe.ac.cn (Y. Wan)

*Corresponding author. Tel./fax: +86 10 82544991.

Abstract

Membrane fouling, essentially originated from the interactions between foulant and membrane surface, is a big obstacle to use membrane distillation (MD) for ionic liquid recycling from its aqueous solution. By applying the extended Derjaguin-Landau-Verwey-Overbeek (XDLVO) approach and surface element integration method, this study mainly investigated the fouling behavior of three kinds of hydrophobic membranes during the vacuum MD (VMD) separation of 1-butyl-3-methylimidazolium chloride ([Bmim]Cl) solutions. Effects of membrane surface chemical properties (e.g. elemental composition and zeta potential), membrane surface morphology (e.g. roughness), and [Bmim]Cl concentration on the interaction energy between [Bmim]Cl and membrane surface were studied. The results showed that the Lifshitz-van der Waals (LW) and electrostatic interaction (EL) components were positive (repulsion), while the acid-base (AB) interaction component was negative (attraction). Roughening membrane surface significantly decreased the interaction energy barrier, indicating a greater risk of being fouled. Even so, membrane surface chemical properties had more important impact on membrane fouling than surface morphology. Energy barrier would be also reduced when [Bmim]Cl concentration increased, signifying a severer membrane fouling potential in a concentration process. These results were expected to help to understand ILs-fouling mechanism in VMD process and guide the selection and fabrication of promising membrane for ILs recovery.

Download English Version:

<https://daneshyari.com/en/article/7020165>

Download Persian Version:

<https://daneshyari.com/article/7020165>

[Daneshyari.com](https://daneshyari.com)