

Author's Accepted Manuscript

Application of a Lyotropic Liquid Crystal Nanofiltration Membrane for Hydraulic Fracturing Flowback Water: Selectivity and Implications for Treatment

Sarah M. Dischinger, James Rosenblum, Richard D. Noble, Douglas L. Gin, Karl G. Linden



PII: S0376-7388(17)31525-9
DOI: <http://dx.doi.org/10.1016/j.memsci.2017.08.028>
Reference: MEMSCI15494

To appear in: *Journal of Membrane Science*

Received date: 30 May 2017
Revised date: 8 August 2017
Accepted date: 9 August 2017

Cite this article as: Sarah M. Dischinger, James Rosenblum, Richard D. Noble, Douglas L. Gin and Karl G. Linden, Application of a Lyotropic Liquid Crystal Nanofiltration Membrane for Hydraulic Fracturing Flowback Water: Selectivity and Implications for Treatment, *Journal of Membrane Science*, <http://dx.doi.org/10.1016/j.memsci.2017.08.028>

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.

Application of a Lyotropic Liquid Crystal Nanofiltration Membrane for Hydraulic Fracturing Flowback Water: Selectivity and Implications for Treatment

Sarah M. Dischinger^{a1}, James Rosenblum^{b1}, Richard D. Noble^a, Douglas L. Gin^{a,c}, Karl G. Linden^{b}*

^aDepartment of Chemical and Biological Engineering

^bDepartment of Civil, Environmental, and Architectural Engineering, and

^cDepartment of Chemistry and Biochemistry, University of Colorado, Boulder, CO 80309, USA

sarah.dischinger@colorado.edu

james.rosenblum@colorado.edu

richard.noble@colorado.edu

douglas.gin@colorado.edu

karl.linden@colorado.edu

*Corresponding Author

Abstract

A thin-film composite, bicontinuous cubic lyotropic liquid crystal polymer (TFC Q₁) membrane with uniform-size ionic nanopores was studied for the treatment of hydraulic fracturing flowback water. The TFC Q₁ membrane performance was compared to those of a commercial nanofiltration (NF) membrane (NF270) and a commercial reverse osmosis (RO) membrane (SW30HR) for the filtration of flowback water from the Denver-Julesburg Basin. The permeability, salt rejection, and organic solute rejection for each membrane was evaluated. The results obtained illustrate that the TFC Q₁ membrane maintained its performance to a similar degree as the commercial NF and RO membranes while demonstrating a unique selectivity not observed in the commercial membranes. Specifically, the TFC Q₁ membrane rejected 75% of the salt while recovering 9.6% of the dissolved organic carbon (DOC) and 50% of the water. Of particular interest was the recovery of labile DOC, which was assessed through biodegradation experiments. Analysis following biodegradation of the TFC Q₁ membrane permeate demonstrates the membrane's ability to recover labile DOC in a reduced-saline permeate. Improved recovery of labile DOC (increased to 22%) was demonstrated by reducing the pH of the flowback water. Therefore, the selectivity of the TFC Q₁ membrane provides an opportunity to recover resources from hydraulic fracturing flowback.

Graphical abstract

¹ Both S. Dischinger and J. Rosenblum are first authors and contributed equally to this work.

Download English Version:

<https://daneshyari.com/en/article/4988554>

Download Persian Version:

<https://daneshyari.com/article/4988554>

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