

Enhancement of CO<sub>2</sub> capture by polyethylene glycol-based polyurethane membranes

Ali Pournaghshband Isfahani, Morteza Sadeghi, Kazuki Wakimoto, Andrew Harold Gibbons, Rouhollah Bagheri, Easan Sivaniah, Behnam Ghalei



PII: S0376-7388(17)31528-4  
DOI: <http://dx.doi.org/10.1016/j.memsci.2017.08.006>  
Reference: MEMSCI15472

To appear in: *Journal of Membrane Science*

Received date: 29 May 2017  
Revised date: 1 August 2017  
Accepted date: 3 August 2017

Cite this article as: Ali Pournaghshband Isfahani, Morteza Sadeghi, Kazuki Wakimoto, Andrew Harold Gibbons, Rouhollah Bagheri, Easan Sivaniah and Behnam Ghalei, Enhancement of CO<sub>2</sub> capture by polyethylene glycol-based polyurethane membranes, *Journal of Membrane Science* <http://dx.doi.org/10.1016/j.memsci.2017.08.006>

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.

# Enhancement of CO<sub>2</sub> capture by polyethylene glycol-based polyurethane membranes

Ali Pournaghshband Isfahani<sup>a,b</sup>, Morteza Sadeghi<sup>a\*</sup>, Kazuki Wakimoto<sup>b</sup>, Andrew Harold Gibbons<sup>b</sup>, Rouhollah Bagheri<sup>a</sup>, Easan Sivaniah<sup>b</sup>, Behnam Ghalei<sup>b\*</sup>

<sup>a</sup>Department of Chemical Engineering, Isfahan University of Technology, Isfahan 84156-83111, Isfahan, Iran

<sup>b</sup>Institute for Integrated Cell-Material Sciences (iCeMS), Kyoto University, 606-8501 Kyoto, Japan  
m-sadeghi@cc.iut.ac.ir  
bghalei@icems.kyoto-u.ac.jp

## Abstract

Poly (ethylene glycol) (PEG)-based polyurethane (PU) membranes are attractive materials for CO<sub>2</sub> separation from various sources such as flue gas and syngas. However, the strong tendency of PEG chains to crystallize can lead to reduced permeability of the membrane. Here, we developed new types of PU chemistries with high PEG content and reduced crystallinity. A series of PUs were synthesized based on mixtures of PEG and poly (propylene glycol) (PPG), and various PEG-PPG triblock copolymers (PEG-b-PPG). The presence of PEG-b-PPG triblock copolymers combines the high selectivity of PEG while the PPG pendant methyl group hinders local crystallization. The resulting membranes showed CO<sub>2</sub> permeability of 144 barrer and high CO<sub>2</sub>/N<sub>2</sub> and CO<sub>2</sub>/H<sub>2</sub> selectivities up to 54 and 8.3, respectively. Due to the absence of a crystalline soft phase, synthesized PUs with PEG-b-PPG triblock copolymers exhibit higher chain flexibility which is reflected by a decrease in the glass transition temperature of the soft segment. In contrast, the mixture of PEG and PPG showed minimal effects on the crystallinity of PEG domains. This resulted in lower membrane gas separation performance where CO<sub>2</sub> permeability and CO<sub>2</sub>/H<sub>2</sub> selectivity decreased to 68 barrer and 4.9, respectively.

**Keywords:** Polyurethane, gas separation, CO<sub>2</sub> capture, poly (ethylene glycol)

Download English Version:

<https://daneshyari.com/en/article/4988627>

Download Persian Version:

<https://daneshyari.com/article/4988627>

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