

CO<sub>2</sub> permeation through asymmetric thin tubular ceramic-carbonate dual-phase membranes

Xueliang Dong, Han-Chun Wu, Y.S. Lin



PII: S0376-7388(18)30948-7  
DOI: <https://doi.org/10.1016/j.memsci.2018.07.012>  
Reference: MEMSCI16291

To appear in: *Journal of Membrane Science*

Received date: 7 April 2018

Revised date: 5 July 2018

Accepted date: 5 July 2018

Cite this article as: Xueliang Dong, Han-Chun Wu and Y.S. Lin, CO<sub>2</sub> permeation through asymmetric thin tubular ceramic-carbonate dual-phase membranes, *Journal of Membrane Science*, <https://doi.org/10.1016/j.memsci.2018.07.012>

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.

# CO<sub>2</sub> permeation through asymmetric thin tubular ceramic-carbonate dual-phase membranes

Xueliang Dong, Han-Chun Wu and Y. S. Lin\*

School for Engineering of Matter, Transport and Energy,  
Arizona State University, Tempe, Arizona 85287, USA

\*Corresponding author.

Tel.: +1 480 965 7769,

Fax: +1 480 965 0037.

E-mail address: jerry.lin@asu.edu (Y.S. Lin).

Keywords: dual-phase membrane; CO<sub>2</sub> separation; permeation; ionic conduction

## Abstract

Ceramic-carbonate dual-phase dense membrane is a promising high temperature CO<sub>2</sub> separation membrane with remarkable CO<sub>2</sub> permeance and theoretically infinite CO<sub>2</sub> selectivity. This paper reports synthesis and CO<sub>2</sub> permeation properties of asymmetric tubular dual-phase membranes with a thin samarium doped ceria (Ce<sub>0.8</sub>Sm<sub>0.2</sub>O<sub>1.9</sub>, SDC)-carbonate separation layer and a thick porous SDC-Bi<sub>1.5</sub>Y<sub>0.3</sub>Sm<sub>0.2</sub>O<sub>3-δ</sub> (BYS) support. The asymmetric tubular thin (0.12 mm) dual-phase membrane has much higher CO<sub>2</sub> permeance and lower activation energy for permeation than the thick (1.0-1.5 mm) membranes. At 900 °C with 50%CO<sub>2</sub>/N<sub>2</sub> feed at 1 atm, the CO<sub>2</sub> permeation flux and permeance for the thin membrane reach  $1.53 \times 10^{-2} \text{ mol} \cdot \text{m}^{-2} \cdot \text{s}^{-1}$  (or  $2.05 \text{ mL(STP)} \cdot \text{cm}^{-2} \cdot \text{min}^{-1}$ ) and  $3.16 \times 10^{-7} \text{ mol} \cdot \text{m}^{-2} \cdot \text{s}^{-1} \cdot \text{Pa}^{-1}$ , respectively, with activation energy for permeation of 62.5 kJ/mol. These dual-phase membranes exhibit slightly higher CO<sub>2</sub> permeance with essentially same activation energy

Download English Version:

<https://daneshyari.com/en/article/7019579>

Download Persian Version:

<https://daneshyari.com/article/7019579>

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