



## Gas permeation properties of amine loaded mesoporous silica membranes for CO<sub>2</sub> separation

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Received 3 September 2010; Accepted 3 January 2011

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### ABSTRACT

Gas permeation properties of amine loaded mesoporous silica membranes for CO<sub>2</sub> separation were evaluated using a mixture of CO<sub>2</sub>/N<sub>2</sub> under dry and wet conditions. Although the 3-aminopropyl loaded mesoporous silica membrane was highly CO<sub>2</sub> selective under dry conditions, its selectivity declined in the presence of water. By contrast, 3-trimethoxysilylpropyl-diethylenetriamine (TA) loaded mesoporous silica membranes showed high CO<sub>2</sub> selectivity even under wet conditions. Water condensed within the mesopores inhibited CO<sub>2</sub> permeation of the 3-aminopropyl loaded membrane. However, the subnanometer effective pore size of the TA loaded membrane (because of the long molecular length of TA), meant that CO<sub>2</sub> molecules still preferentially permeated in the presence of water. The size of mesopores and modifying reagents significantly influences CO<sub>2</sub> selectivity. In addition, the affinity between organoamines and polar molecules may also be exploited to increase selectivity.

*Keywords:* Mesoporous silica; Membrane; CO<sub>2</sub> separation; Amine; Wet condition; Gas adsorption

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