



## Microwave heating-synthesized zeolite membrane for CO<sub>2</sub>/CH<sub>4</sub> separation

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### ABSTRACT

H-SAPO-34 membrane was synthesized using microwave heating at 200°C for 2 h. Ba-SAPO-34 membrane was obtained by ion-exchanging the H-SAPO-34 membrane with Ba<sup>2+</sup> cation. The separation of CO<sub>2</sub> from CO<sub>2</sub>/CH<sub>4</sub> binary gas mixture was studied using design and analysis of experiments. The response surface methodology coupled with central composite design was used for modeling and analysis of the contribution of operating parameters (temperature, pressure difference across the membrane, CO<sub>2</sub> concentration in the feed) to the responses (CO<sub>2</sub> permeance and CO<sub>2</sub>/CH<sub>4</sub> separation selectivity) during Ba-SAPO-34 membrane separation process. The process parameters were varied in the range of 30–180°C of temperature, 100–500 kPa of pressure difference and 5–50% of CO<sub>2</sub> concentration in the feed. The optimum condition for the process parameters was determined by setting the criteria so as to maximize the CO<sub>2</sub> permeance and CO<sub>2</sub>/CH<sub>4</sub> separation selectivity. The optimum CO<sub>2</sub> permeance of  $38.46 \times 10^{-7}$  mol/m<sup>2</sup>sPa and CO<sub>2</sub>/CH<sub>4</sub> separation selectivity of 250.00 were determined at the temperature of 32.68°C, pressure difference of 101.19 kPa and 5.87% CO<sub>2</sub> concentration in the feed.

*Keywords:* Ba-SAPO-34; Membrane; Microwave; Carbon dioxide; Gas separation

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