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PII: S0376-7388(18)31546-1
DOI: https://doi.org/10.1016/j.memsci.2018.07.023
Reference: MEMSCI16302

To appear in: *Journal of Membrane Science*

Received date: 5 June 2018
Revised date: 10 July 2018
Accepted date: 10 July 2018

Cite this article as: Pasquale F. Zito, Alessio Caravella, Adele Brunetti, Enrico Drioli and Giuseppe Barbieri, Discrimination among gas translation, surface and Knudsen diffusion in permeation through zeolite membranes, *Journal of Membrane Science,* https://doi.org/10.1016/j.memsci.2018.07.023

Discrimination among gas translation, surface and Knudsen diffusion in permeation through zeolite membranes

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ABSTRACT

Gas translation diffusion is proposed to compete with surface diffusion for describing the permeation of light gases (He, H_2, CO_2 and CO) through zeolite membranes. The analysis for both DD3R and NaY zeolite membranes shows some differences in H_2, CO and CO_2 permeation for both binary/ternary gas mixture and single gas.

The permeation description through gas translation of weakly adsorbed species such as, e.g., H_2, specifically at low temperatures, is more accurate than that obtained by Knudsen diffusion in a previous work. Gas translation paired to surface diffusion well reproduces the maximum in H_2 flux, which was missed by the Knudsen diffusion [Caravella et al., Micropor.