Asymmetric polybenzimidazole membranes with thin selective skin layer containing ZIF-8 for H_2/CO_2 separation at pre-combustion capture conditions

Javier Sánchez-Laínez, Beatriz Zornoza, Carlos Téllez, Joaquín Coronas

www.elsevier.com/locate/memsci

PII: S0376-7388(18)30310-7
DOI: https://doi.org/10.1016/j.memsci.2018.06.009
Reference: MEMSCI16226

To appear in: *Journal of Membrane Science*

Received date: 1 February 2018
Revised date: 22 May 2018
Accepted date: 5 June 2018

Cite this article as: Javier Sánchez-Laínez, Beatriz Zornoza, Carlos Téllez and Joaquín Coronas, Asymmetric polybenzimidazole membranes with thin selective skin layer containing ZIF-8 for H_2/CO_2 separation at pre-combustion capture conditions, *Journal of Membrane Science,* https://doi.org/10.1016/j.memsci.2018.06.009

Asymmetric polybenzimidazole membranes with thin selective skin layer containing ZIF-8 for H_2/CO_2 separation at pre-combustion capture conditions

Javier Sánchez-Laínez, Beatriz Zornoza, Carlos Téllez and Joaquín Coronas**

Chemical and Environmental Engineering Department, Instituto de Nanociencia de Aragón (INA), Universidad de Zaragoza, 50018 Zaragoza, Spain.

bzornoza@unizar.es, coronas@unizar.es

Abstract:

This work addresses an optimization in the fabrication of flat PBI membranes containing ZIF-8 nanoparticles for gas separation purposes. The PBI membranes were prepared in an asymmetric configuration on P84® supports, representing a new way of preparing flat PBI membranes. An optimization of the conditions for the PBI phase inversion preparation method, including the dope composition (in the 15-26 wt% range), has been carried out to obtain PBI membranes with a 1 μm selective skin layer. The asymmetric membranes showed an unprecedented gas separation capacity in pre-combustion CO_2 capture, much superior to dense membranes, under harsh operating conditions (250 °C and 6 bar feed), performing up to 20.3 GPU of H_2 and a H_2/CO_2 selectivity of 35.6. Their much thinner selective layer made possible the increase in selectivity because of the saturation of the CO_2 flow at high pressures. The reduction in the amount of ZIF-8 for obtaining a membrane with the same filler loading (3.7 vs. 9.3