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# Asymmetric polybenzimidazole membranes with thin selective skin layer containing ZIF-8 for H<sub>2</sub>/CO<sub>2</sub> separation at pre-combustion capture conditions

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## 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<sup>®</sup> 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<sub>2</sub> capture, much superior to dense membranes, under harsh operating conditions (250 °C and 6 bar feed), performing up to 20.3 GPU of H<sub>2</sub> and a H<sub>2</sub>/CO<sub>2</sub> selectivity of 35.6. Their much thinner selective layer made possible the increase in selectivity because of the saturation of the CO<sub>2</sub> 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

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