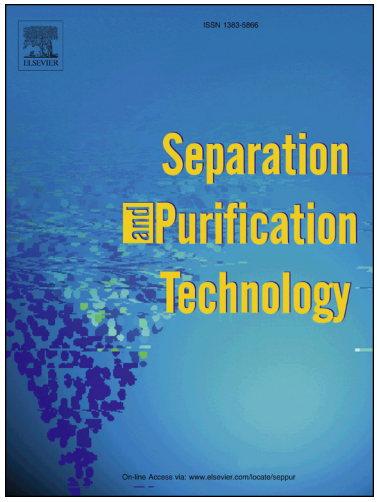

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Separation of methanol-dimethyl carbonate vapour mixtures with PDMS and PTMSP membranes

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Abstract

In this work, we report on the permeation of methanol and dimethyl carbonate (DMC) vapour mixtures through dense membranes made from cross-linked polydimethylsiloxane (PDMS) and from poly[(trimethylsilyl)propyne] (PTMSP). Since methanol forms a methanol-rich pressure-maximum azeotrope with dimethyl carbonate, vapour permeation through hydrophobic (DMC selective) membranes is presumably a favourable method of azeotrope breaking. Permeation of vapours of pure compounds and of binary vapour mixtures was measured at 40 °C for a series of feed mixture compositions. Both membranes showed practically constant permeabilities of both studied compounds, thus indicating that no significant coupling of fluxes occurred. The membrane prepared from PTMSP was *ca*. 2-5 times more permeable and showed higher separation factors ($\alpha_{DMC} \leq 4.2$) than the one prepared from PDMS ($\alpha_{DMC} \leq 2.8$). In the case of the PDMS, the separation factors decreased with the increasing dilution of the feed mixtures with inert gas (hydrogen). Conversely, the separation factors increased with increasing feed mixture dilution in the case of PTMSP. The highest separation factors were observed near the azeotrope composition for both polymers (*ca*. 82 mol.% of methanol), thus enabling the development of effective hybrid processes combining rectification columns and vapour permeation units.

Keywords: vapour permeation; dimethyl carbonate; mass spectroscopy; PDMS; PTMSP

1. Introduction

Dimethyl carbonate (DMC) is an ecologically and toxicologically advantageous solvent, reagent and octane enhancer, the production of which is complicated by the necessity to separate azeotropes [1,2]. This compound is mainly produced from methanol [2,3] and forms

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