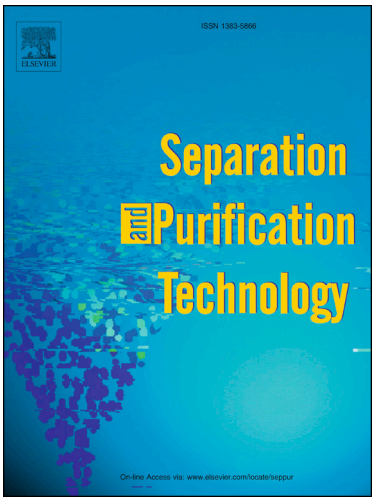

Methanol dehydration with pervaporation: experiments and modelling

Eniko Haaz, Andras Jozsef Toth

PII: S1383-5866(18)30484-2
DOI: https://doi.org/10.1016/j.seppur.2018.04.088
Reference: SEPPUR 14584

To appear in: *Separation and Purification Technology*

Received Date: 7 February 2018
Revised Date: 11 April 2018
Accepted Date: 11 April 2018

Please cite this article as: E. Haaz, A. Jozsef Toth, Methanol dehydration with pervaporation: experiments and modelling, *Separation and Purification Technology* (2018), doi: https://doi.org/10.1016/j.seppur.2018.04.088

Methanol dehydration with pervaporation: experiments and modelling

Eniko Haaz, Andras Jozsef Toth*

Environmental and Process Engineering Research Group, Department of Chemical and Environmental Process Engineering, Budapest University of Technology and Economics, H-1111, Hungary, Budapest, Műegyetem rkp. 3.

* Corresponding author. E-mail address: andras86@kkft.bme.hu Tel: +36 1 463 1490; Fax: +36 1 463 3197

Abstract

The research is motivated by a pharmaceutical industry problem where water should be removed from the aqueous mixture of methanol. To complete this target, pervaporation system is designed using hydrophilic Sulzer PERVAP™ 1510 membranes and examined to obtain information about the separation of methanol–water mixture. The aim of this work is to rigorously model and optimize the dewatering process. Separation factors, total and partial permeation fluxes, permeances and selectivities are experimentally determined. Pervaporation separation index (PSI) data are compared to those of other published membranes in the recent literature and it is found that PERVAP™ 1510 has the highest PSI value. The measured data are evaluated with improved pervaporation model by Valentinyi et al. [1] and it is found that the model can be applied also for this hydrophilic separation case. The separation system is rigorously modelled with ChemCAD and optimized with the dynamic programming optimization method. Such methanol–water separation has not been published in this professional flowsheet environment yet. The objective function of the process is the effective membrane area. The methanol dehydration is also investigated with distillation in flowsheet environment. It can be determined that pervaporation system is capable for the dehydration of methanol and it can become the alternative of distillation based separation, because it has lower heat duties in the case of same product compositions.

Keywords

hydrophilic membrane; pervaporation, methanol dehydration; mathematical modelling; parameter estimation; professional flowsheeting environment