Desalination and Water Treatment
www.deswater.com
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doi: 10.5004/dwt.2011.2363

31 (2011) 291–295
July

Separation characteristics of acetone/water mixtures through sodium alginate/poly(vinyl pyrrolidone) membranes by vapor permeation and vapor permeation with temperature difference methods

Ebru Kondolot Solak[a], Suat Kahya[b], Oya Şanlı[c]*

[a]*Gazi University, Atatürk Vocational High School, Department of Chemistry and Chemical Processing Technology, Teknikokullar, 06500, Ankara, Turkey*
[b]*Aksaray University, Güzelyurt Vocational High School, Department of Food Technology, 68000, Aksaray, Turkey*
[c]*Gazi University, Faculty of Science, Department of Chemistry, Teknikokullar, 06500, Ankara, Turkey*
Tel. +90 (312) 2021107; Fax +90 (312) 2122279; email: osanli@gazi.edu.tr

Received 10 June 2010; Accepted in revised form 14 April 2011

ABSTRACT

In this study the permeation and separation characteristics of acetone/water mixtures were investigated by vapor permeation (VP) and vapor permeation with temperature difference (TDVP) methods using sodium alginate/poly (vinyl pyrrolidone) (NaAlg/PVP) membranes crosslinked with calcium chloride. Membranes were prepared in different ratios (w/w) (100/0, 95/5, 90/10, 85/15, 80/20, 75/25) of NaAlg/PVP. The effects of blend ratio, feed composition, operating temperature and temperature of the membrane surroundings on the separation characteristics (separation factor, permeation rate) were studied for the acetone/water mixtures. The optimum NaAlg/PVP ratio, operating temperature and feed composition were determined as 75/25 (w/w), 40°C, and 20 wt% acetone, respectively. The separation factors decreased whereas permeation rates increased with the increase in permeation temperature for both VP and TDVP methods. In the TDVP method separation factors increased and the permeation rates decreased as the temperature of the membrane surroundings decreased. It was as observed that the permeation rate in TDVP method was lower than in VP; however the highest separation factor was obtained with TDVP method as 73.

Keywords: Membrane; Vapor permeation; Acetone; PVP; NaAlg

* Corresponding author.