Desalination and Water Treatment
www.deswater.com

3 (2009) 11–20
March

1944-3994 / 1944-3986 © 2009 Desalination Publications. All rights reserved.
doi: 10.5004/dwt.2009.434

Hybrid composite membranes of sodium alginate for pervaporation dehydration of 1,4-dioxane and tetrahydrofuran*

M.B. Patil[a], R.S. Veerapur[a], S.D. Bhat[a], C.D. Madhusoodana[b], T.M. Aminabhavi[a]**

[a]*Membrane Separations Division, Center of Excellence in Polymer Science, Karnatak University, Dharwad 580 003, India*
Fax: +91 836 277 1275; email: aminabhavi@yahoo.com; sdbhat123@rediffmail.com
[b]*Ceramic Technological Institute, Bharat Heavy Electricals Limited, Bangalore 560 012 India*

Received 3 December 2006; Accepted 16 February 2009

ABSTRACT

The study reports on the development of hybrid composite membranes of sodium alginate loaded with hydrophilic alumina-containing Mobile Composition Matter-41 i.e., Al-MCM-41 in different compositions from 3 to 10 wt.% that are used for pervaporation (PV) dehydration of 1,4-dioxane and tetrahydrofuran (THF) from aqueous mixtures in compositions of 10–40 wt.% at 30EC. The PV performance of the hybrid composite membranes was much superior to that of plain NaAlg membrane in terms of selectivity and flux due to increased hydrophilicity of NaAlg membrane in the presence of Al-MCM-41 mesoporous zeolite particles that are also hydrophilic. Membranes crosslinked with glutaraldehyde were characterised by ion exchange capacity, Fourier Transform spectroscopy and X-ray diffraction. Morphology of the membranes was assessed by scanning electron microscopy. Sorption studies have been performed to evaluate the extent of interaction and degree of swelling of the membranes with pure and mixed feed aqueous mixtures of 1,4-dioxane and THF. It is observed that flux and selectivity increased systematically with increasing amount of Al-MCM-41 particles in the NaAlg matrix. In case of hybrid composite membrane containing 10 wt.% Al-MCM-41, selectivity for water was infinity, which was attributed to the combined effects of molecular adhesion between particle surfaces and NaAlg matrix as well as higher selectivity of the composite membrane when compared to plain NaAlg membrane.

Keywords: Pervaporation; Dehydration; Sodium alginate; Al-MCM-41; Hybrid membranes

*This article is Center of Excellence in Polymer Science Communication #160.
**Corresponding author.