



## Pervaporation of aqueous dilute 1-butanol, 2-propanol, ethanol and acetone using a tubular silicalite membrane

Keiji Sakaki\*, Hiroshi Habe, Hideyuki Negishi, Toru Ikegami

*National Institute of Advanced Industrial Science and Technology (AIST), Tsukuba, Ibaraki 305-8565, Japan  
Tel. +81-298-61-4655; Fax: +81-298-61-4674; email: k.sakaki@aist.go.jp*

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### ABSTRACT

Pervaporation is a promising method to recover bio-alcohols from fermentation broths because of its high energy-saving potential. A silicalite membrane was prepared and applied to the pervaporation separation of 1-butanol, 2-propanol, ethanol and acetone from dilute aqueous solutions. In feed solvent concentrations in the range of 0.5–5.0 wt.%, the solvent flux of ethanol, 2-propanol and acetone increased with the increase of feed concentration, whereas 1-butanol flux was not greatly influenced by the feed concentration. In contrast to other solvents, the separation factor for 1-butanol solution decreased with the increase of feed 1-butanol concentration. This is because 1-butanol concentration in the permeate did not increase along with the increase of the feed 1-butanol concentration due to adsorption saturation. The solvent flux increased with the increase of separation temperature for all the solvents. The separation factor of 1-butanol and 2-propanol increased with the increase of separation temperature in the range of 30–60°C, while the separation factor of acetone and ethanol was not greatly influenced by the separation temperature. Silicalite membrane shows higher selectivity toward 1-butanol solutions than silicone membrane when the feed concentration is low and the temperature is high.

*Keywords:* Pervaporation; Silicalite membrane; Separation factor; Bio-butanol; Permeate flux; Silicone membrane

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\*Corresponding author.