

Abstract

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Project Title : Separation of alcohol-toluene mixtures by polystyrene-based membranes

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Objective : To evaluate performance of the membranes synthesized from polystyrene in the separations of methanol-toluene and ethanol-toluene, which are the mixtures found in pharmaceutical and petrochemical industries.

Methodology : Prepare or synthesize polystyrene membrane, sulfonate polystyrene and sulfonate polystyrene incorporated with Ag^+ ions. Test the membranes for alcohol-toluene separations in perstraction mode of operation.

Results : Polystyrene, a hydrophobic membrane, was unable to separate toluene from alcohol because alcohol was much smaller in size. Alcohol was then transported through the membrane faster although toluene was preferentially absorbed by the membrane. Sulfonate polystyrene and sulfonate polystyrene-poly(vinyl alcohol) blend membranes could separate alcohol from toluene. Selectivity of the membranes was primarily dependent on swelling of the polymer films. High concentration of alcohol in the feed resulted in a great swelling, which was responsible for the low selectivity. The membrane incorporated with Ag^+ ions did not show selectivity towards toluene. This was because permeation of alcohol through solution-diffusion mechanism was dominant.

Conclusion : Polystyrene was unable to separate toluene from alcohol-toluene mixtures. Sulfonate polystyrene showed good selectivity towards alcohols because the membrane absorb alcohols to a larger degree. Selectivity was primarily dependent on swelling of the membrane.

Suggestion : Development of sulfonate polystyrene and sulfonate polystyrene-poly(vinyl alcohol) blend should be done to enhance their performance. Testing the membranes by pervaporation process is also necessary.