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Removal of VOCs from their aqueous solution by pervaporation with PDMS-zeolite composite membrane

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ABSTRACT

VOCs were separated from water–volatile organic compound (VOC) mixtures by pervaporation using poly(dimethylsiloxane) (PDMS)–zeolite composite membranes prepared in our laboratory. Silicalite-1 particles were hydrothermally synthesized for preparation of a composite membrane. PDMS–zeolite composite membranes were prepared with a mixture of synthesized silicalite-1 particles and PDMS–polymer dissolved in a solvent. The effects of a concentration of VOCs and a weight % of zeolite particles in a membrane are presented on the VOCs/water separation. Either a dichloromethane aqueous solution or a 1,2-dichloroethane aqueous solution was used as a feed solution. The fluxes of VOCs increased significantly from 2.8 to 271.8 g/m^2/h as the concentration of VOCs increased from 0.00005 to 0.001 mole fraction of VOCs. As the weight % of zeolite particles was changed from 0% to 8%, the fluxes of VOCs increased almost two times at the typical mole fraction of VOCs such as 0.0001 for dichloromethane and 0.0005 for 1,2-dichloroethane. It was also found that the separation factor of VOCs increased pretty much by adding the zeolite particles in the composite membrane.

Keywords: VOCs; Pervaporation; Zeolite; Composite membrane

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