



Pervaporation through composite membranes with plasma treatment of porous support

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ABSTRACT

Composite membranes were prepared in independent stages. First, a polyethersulfone (PES) support porous membrane was synthesized by the phase inversion technique; a plasma pre-treatment of the substrate surface using argon was followed by activated support coating with a layer of hydrophilic polymeric mixture of poly(vinyl alcohol) (PVA, 75 wt.%) and poly(acrylic acid) (PAA, 25 wt.%). Finally, thermal treatment of the composite membranes to promote crosslinking of the coated polymer was undertaken. Morphology was examined by electronic microscopy (SEM) for both, support membranes and the polymeric blend layer. Contact angles (θ) were measured and surface free energy (γ_s) and adhesion work (W_a) estimated, to evaluate the effect of plasma and hydrophilic polymer coatings. From infrared spectra with horizontal attenuated total reflectance (FT-IR/HATR), surface chemical composition of support membrane and incorporated hydrophilic groups, were analyzed. Composite membranes were investigated with water–ethanol (20/80 wt.%) mixtures performing pervaporation (PV) experiments at several temperatures (30, 40, 50 and 60°C). The membrane showed good performance for separation of water from ethanol. Fluxes, selectivity ($\alpha_{\text{water/Ethanol}}$) and permeation activation energy (E_p) are reported showing that the composite membranes were selective to water. Pervaporation separation index (PSI) ($\text{g m}^{-2} \text{h}^{-1}$) increased continuously with temperature.

Keywords: Composite membranes; Plasma treatment; Hydrophilic modification; Pervaporation

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