Modified polydimethylsiloxane/polystyrene blended IPN pervaporation membrane for ethanol/water separation

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ABSTRACT

In this article a modified polydimethylsiloxane (PDMS) blended polystyrene (PS) interpenetrating polymer network (IPN) membranes supported by Teflon (polytetrafluoroethylene) ultrafiltration membrane were prepared for the separation of ethanol in water by pervaporation application. The relationship between the surface characteristics of the surface-modified PDMS membranes and their permselectivity for aqueous ethanol solutions by pervaporation are discussed. The IPN supported membranes were prepared by sequential IPN technique. The IPN supported membrane were tested for the separation performance on 10 wt % ethanol in water and were characterized by evaluating their mechanical properties, swelling behavior, density, and degree of crosslinking. The results indicated that separation performance, mechanical properties, density, and the percentage of swelling of IPN membranes were influenced by degree of crosslink density. Depending on the feed temperature, the supported membranes had separation factors between 2.03 and 6.00 and permeation rates between 81.66 and 144.03 g m^{-2} h^{-1}. For the azeotropic water–ethanol mixture (10 wt % ethanol), the supported membrane had at 30°C a separation factor of 6.00 and a permeation rate of 85 g m^{-2} h^{-1}. Compared to the PDMS supported membranes, the PDMS/PS IPN supported blend membrane ones had a higher selectivity but a somewhat lower permeability. © 2011 Wiley Periodicals, Inc. J Appl Polym Sci, 2011

KEYWORDS:

interpenetrating polymer network; pervaporation; polydimethylsiloxane; polystyrene; water-ethanol mixtures

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