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Sorption, diffusion and pervaporation study of thiophene/n-heptane mixture through self-support PU/PEG blend membrane

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Abstract

The novel polyurethane (PU)/polyethylene glycol (PEG) self-support blend membranes were prepared via solution casting method to investigate their gasoline desulfurization performance. Pervaporation (PV) method was employed to separate thiophene from model gasoline consisting of a binary mixture of thiophene and n-heptane. The membrane sorption (S) and diffusion (D) coefficients were obtained from the sorption test. Characteristics and morphological attributes of the membrane were studied using FTIR and SEM analysis. SEM images exhibited a fine heterogeneous blended phase with a defect-free surface. Blending intensified the properties of individual PU and PEG membranes bringing about satisfactory permeability and desulfurization performance. A normalized flux of 25.5 kg μm/m^2 h and an enrichment factor of 7.1 were obtained at 65 °C. The membranes were constructed and evaluated in self-support form, which indicates their mechanical and chemical strength when operated up to 120 hours. Both the blending method and the selection of the proper PU with appropriate blending ratio resulted in the fabrication of apposite membranes for separation of thiophene from n-heptane and also the development of a membrane material to be utilized in desulfurization industry.

Keywords: Pervaporation; Sorption, Diffusion; Blending; Desulfurization; Thiophene; n-heptane.