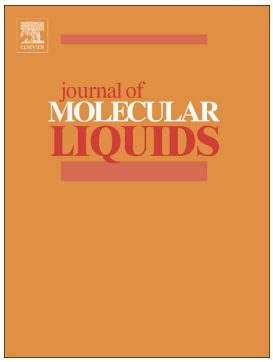

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Morphological Changes in Asymmetric PES Membranes by Addition of Polyurethanes: A Thermodynamic and Experimental Study

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Abstract

The effect of adding two types of polyurethane (PU) namely: polyether urethane (ETPU) and polyester urethane (ESPU), on polyether sulfone (PES) blend membrane is investigated. The morphology of the prepared membranes is studied by phase diagram. For this purpose, Hansen solubility parameters are calculated by Van Krevelen and Hoy methods, and the ternary and quaternary phase diagrams for the prepared membranes are produced using Flory Huggins theory. The membranes are prepared by phase inversion method. Different tests such as permeability, water contact angle, FTIR and SEM images are carried out to determine the membranes' characteristics. The results indicate that porosity and gas permeability of PES blend membranes increase by addition of PU as an additive. The PES/ETPU blend membrane has higher permeability and porosity in comparison with the PES/ESPU due to higher compatibility of the polymers and lower de-mixing rate between solvent and non-solvent in PES/ESPU membrane. It should be mentioned that by increasing the additive concentration, viscosity increases and high viscosity acts as a barrier to mass transfer between the solvent and non-solvent. Therefore, the delayed de-mixing rate reduces pore size and permeability.

Key words: Poly(ether sulfone); Polyurethane; Phase diagram; Morphology; Hansen solubility