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ASPECTS ON POLYMER-SOLVENT EQUILIBRIUM AND DIFFUSION IN POLYMERIC MEMBRANES

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Abstract

The transport of gases and solvents in polymeric membranes is an important phenomenon with many technical applications, such as the mixture separation using polymeric membranes, the polymeric membrane preparation, the polymer devolatilization and the selection of appropriate polymeric membranes for a certain process. In most membrane separation operations and manufacturing, equilibrium and diffusion data are required.
Useful information on equilibrium and diffusion can be obtained from the solvent sorption study. The phase equilibrium for polymer solvent systems can be successfully described using the correlative model or the predictive model based on the UNIFAC group contribution such as the UNIFAC-FV. The diffusion coefficients in polymers depend strongly on temperature and their composition. First researches concerning the diffusion in polymers were reported by different studies. The free-volume theory is the most widely used theory for correlating and predicting the diffusion in polymer-solvent systems. It has been extended to predict the diffusion in ternary polymer-solvent-solvent systems using the pure component viscosity and density data and the binary polymer-solvent diffusion data.
The aim of this work is to present some literature models used to calculate the solvent-polymer equilibrium and the diffusion behaviors, including Fickian and non-Fickian diffusion. These models will be used to correlate equilibrium and diffusion data in solvent polymer systems, such as: methanol - polyvinyl acetate, toluene - polyvinyl acetate, toluene - polystyrene, dichlormethane - cellulose triacetate, water-polyvinyl alcohol and water – Nafion membranes, at different temperatures.

Key words: diffusion, polymeric membranes, solvent-polymer equilibrium

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