A generic model for prediction of separation performance of olefin/paraffin mixtures by glassy polymer membranes

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Abstract

In this study, separation behavior of olefin/paraffin mixtures through glassy polymer membranes was modeled by three different approaches. The so-called dual transport model, the basic adsorption-diffusion theory and the general Maxwell-Stefan formulation. A critical examination of dual transport mode revealed that this model fails clearly to predict even the proper trend for selectivities. The results obtained from the examination the basic adsorption-diffusion theory show a good agreement with the experimental data. However, in this approach mixed permeability data were used for estimation of diffusion coefficients, which fades out the advantages of prediction of multicomponent separation performance from pure component data. Finally, It was demonstrated by the modeling results that the generic model developed based on Maxwell-Stefan theory is capable to describe effectively the separation behavior of olefin/paraffin mixtures using only pure component sorption and permeation data. The success of this model in prediction of separation performance can be attributed to the proper consideration of thermodynamic and kinetic interactions in multicomponent transport across the membrane.

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