267d Flux Coupling in Pervaporation of Binary Alcohol-Water Mixtures through a Microporous Silica Membrane

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The modelling of the mass transfer in pervaporation is one of the fundamental aspects to understand and therefore improve the process performance. In literature, various models, most of which are based on the adsorption-diffusion-desorption mechanism, have been proposed to describe transport and separation mechanisms of binary liquids (Fickian approach, thermodynamics of irreversible processes, Maxwell-Stefan description). Simple models adopt the equations derived by Lee (1975). The more complex models incorporate coupling effects and other non-idealities. This study explores the applicability of the adsorption-diffusion description for the transport of binary ethanol/water and methanol/water mixtures through a commercial microporous silica membrane. The influence of feed temperature (40°C-90°C) on permeation flux is therefore analysed in terms of activation energy of flux, permeability and diffusion and heat of adsorption and vaporization. Also coupling effects are studied by determining the effect of feed composition (entire composition range) on permeation flux and by comparing the measured selectivity to the ideal selectivity, derived from pure components permeability.