

## Modeling of the kinetics of pervaporative recovery of ethanol from fermented broth with the use of the solution–diffusion theory

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### ABSTRACT

The aim of this study was a mathematical description of the kinetics of ethanol separation from fermentation broth of *Saccharomyces cerevisiae* yeast by the vacuum pervaporation technique. Model equations were developed on basis of the solution–diffusion theory. The finite differences method has been used to calculate the concentration profiles of permeants within the membrane. The optimal number of grid points and their distances were found by numerical tests. The formulated model describes the transport of feed components under the non-stationary conditions. Model equations were solved with the use of the backward differentiation method. Model parameters were estimated by fitting of experimental data with the use of the Nelder–Mead method. Calculations were performed for separation experiments with broths containing 3–6 wt% of ethanol. Very good agreement with the experimental data was obtained.

*Keywords:* Solution–diffusion model; Pervaporation; Kinetics of separation; Ethanol; Broth

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