

On the Use of the Surface-Renewal Model to Describe Cross-flow Ultrafiltration

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ABSTRACT

A theoretical model using the surface-renewal concept is developed for describing cross-flow ultrafiltration under dynamic and steady-state conditions. The model can predict the local permeate flux and concentration profile of dissolved solute in the filter. The rate of surface renewal (S) at the membrane surface and the diffusion coefficient (D) of the solute in the solvent are the two parameters of the model. The model is able to correlate literature data of the transient flux in the ultrafiltration of skim milk with an average root-mean-square error of 9.9%. The values of S and D , estimated from the correlation, are $0.84\text{--}1.74 \times 10^{-3} \text{ s}^{-1}$ and $0.75\text{--}1.57 \times 10^{-9} \text{ m}^2/\text{s}$, respectively.