



Phenomenological modeling of orthophosphates transfer through a nanofiltration membrane

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ABSTRACT

The present work involves the study of the potential of selective retention of orthophosphate anions H_2PO_4^- , HPO_4^{2-} and PO_4^{3-} in a synthetic solution and aims to a better understanding of the transport mechanisms of phosphates through a charged Nanomax-type membrane. The study deals with the Spiegler–Kedem model and its derivatives based on the thermodynamics of irreversible processes on the results of nanofiltration of model solutions depending on the charge, concentration and ionic strength. The modeling results were confirmed by the experimental values. The transport parameters namely reflection coefficient σ and solute permeability P_s could be then determined. In fact, this model established the transport parameters and predicted the intrinsic characteristics of the Nanomax-50 membrane. It was further observed that these parameters are true indicators of membrane–solute interaction reflecting the state of transport of species in a phenomenological way. The Spiegler–Kedem model seems well suited with nanofiltration of orthophosphate solutions on a Nanomax-50 type membrane.

Keywords: Nanofiltration; Orthophosphates; Nanomax-50 membrane; Transfer mechanisms; Spiegler–Kedem model

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