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Prediction of single salt rejection in nanofiltration membranes

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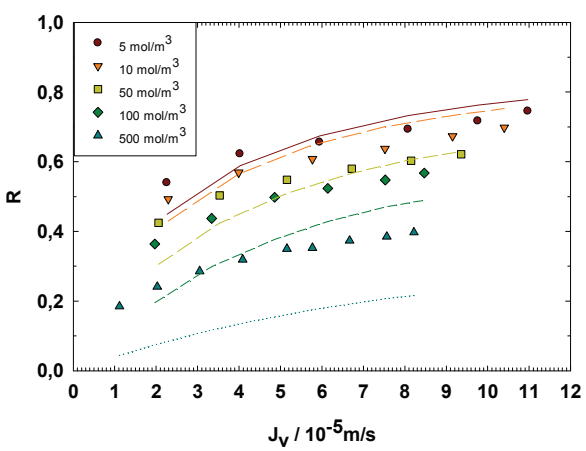
Nanofiltration membranes have shown very interesting characteristics regarding the separation of monovalent and divalent salts. In this work an interesting procedure to predict the salt rejection is introduced.

In order to compare the model predictions with experimental results, the SEDE-VCh model was applied. The model has three parameters: the dielectric constant inside the pores, ε_p, and the *a* and *b* parameter of a Freundlich charge isotherm of the volumetric charge density, X. They were obtained by independent methods or experimental techniques. Consequently, a Desal-HL membrane has been structurally, electrically and functionally characterized. The pore size was obtained from literature using neutral solute rejection method, as well as the support layer thickness was estimated by ESEM technique. The membrane functionality has been accounted by water permeability measurements and salt rejection. And finally, the electric properties inside the membranes have been obtained using Impedance Spectroscopy technique.

Obtaining the model parameters by independent methods, the model can be used in a predictive way. Both theoretical and experimental results are presented in Figure 1 as function of permeate flux per area unit. In these figure it is possible to see how the goodness of the prediction is decreasing with increasing concentrations. One reason for this behavior is that the SEDE-VCh model should be applied to relatively dilute solutions where the assumptions made are still applicable. The results are good enough considering the complexity of the mechanisms involved.



Keywords: Nanofiltration, Impedance Spectroscopy, Membrane Potential, Transport numbers

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