A numerical study on two-dimensional dynamic model for concentration polarization in spiral wound reverse osmosis membrane modules

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An ordinary differential equation model for spiral wound reverse osmosis memebrane modules is developed for prediction of concentration polarization and other real-time applications by applying the cubic spline collocation method to the associated unsteady state two-dimensional momentum and mass balance equations. To account for the effects of the spacer, a tuning parameter that can adjust the diffusion coefficient is introduced to the model. Process behaviors under dynamic as well as steady states were predicted and compared with those by other existing models and also with experimental results published in the literature.