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Modeling Reverse Osmosis Crossflow Filtration LAURA CAMPO, BRENT HOUCHENS, Rice University — During the initial stages of crossflow filtration, a concentration polarization layer forms near the membrane surface, causing a decrease in clean water flux over time. Accurate modelling of this flux decline is essential to improving the design of filtration systems in applications including water purification, food processing, and desalination. A continuum model of reverse osmosis crossflow filtration is developed by numerically solving the coupled Navier-Stokes and Convection-Diffusion equations in two dimensions for an incompressible Newtonian fluid. The model treats diffusivity and viscosity as functions of local particle concentration. The dependence of viscosity on concentration is measured experimentally and a curve fit offers an empirical constitutive equation for the generalized Newtonian fluid. The numerical solution is obtained using a Chebyshev spectral collocation method with Gauss-Lobatto grid spacing in both the axial and transverse directions.

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