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A comparative study on Donnan dialysis separation using homogeneous and heterogeneous anion-exchange membranes

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ABSTRACT

Donnan dialysis separations of nitrate, bicarbonate and sulfate ions at different concentrations were studied; aiming to test the anions transport in membrane diffusion-controlled regime, boundary layer diffusion-controlled regime, and the transition region. Differences in the transport rates were correlated to differences between the properties of a homogeneous (Selemion AMV) and a heterogeneous (Ralex AM(H)-PES) anion-exchange membranes. As expected, under boundary layer diffusion control conditions, the separation of the three anions was similar with both membrane types, supporting the potential applicability of heterogeneous membranes for water treatment by Donnan dialysis. The transition region was obtained at a lower concentrations range with the heterogeneous membrane. Under membrane diffusion-controlled conditions, superior transport of all three anions were observed with the homogeneous ion-exchange membrane, suggesting that this membrane type is better for Donnan dialysis separation at higher concentrations.

Keywords: Anion exchange; Membrane properties; Separation mechanism; Nitrate; Bicarbonate; Sulfate

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