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Modeling of lead ions transport through a bulk liquid membrane

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ABSTRACT

The transport of lead ions (Pb^{2+}) through an organic liquid membrane (kerosene) containing (2.5%–12.5% v/v) Tri-n-butyl phosphate (TBP) as a carrier, under various operating conditions were experimentally investigated and modeled. The effect of the strip to feed volume ratio (V_s:V_f), variable membrane volume, and wide range of feed and strip pH on the transport of lead ions (Pb^{2+}) were modeled using a simple kinetic model and experimentally validated. The diffusion boundary layer and steady-state conditions were assumed for the solution of the transport model. The Pb^{2+} ions time-dependent concentrations within feed, membrane, and strip phases were found to be fairly comparable to experimental results. Probable leakage (bleeding between feed and strip phases) and non-leakage conditions were considered in the model. Results have shown that the transport rate is a strong function of pH and partition coefficient. It was also concluded that working at higher V_s:V_f favors the transport of Pb^{2+} and higher removal efficiencies were obtained.

Keywords: Bulk liquid membrane; Lead permeation; Diffusion boundary layer

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