Abstract Submitted
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Macro analysis of the electro adsorption process in a capacitive demonization cell during water desalination at developing and fully developed concentration regimes CARLOS RIOS PEREZ, ONUR DEMIRER, REBECCA CLIFTON, RACHEL NAYLOR, CARLOS HIDROVO, The University of Texas at Austin — Capacitive deionization has become a desalination technique of large interest because of its added capability of energy recovery during the regeneration of the adsorbing electrodes. As in any separation practice, adequate modeling of the mass transport mechanisms present in the salt extraction process is crucial for the adequate dimensioning of the desalination cell and selection of the operation parameters. In this regard, this paper presents a simplified one-dimensional model of the concentration variation within a capacitive deionization cell. This model was solved at two distinctive regimes: developing, and fully developed convective diffusion layer. These solutions were used to estimate the net electro-adsorption rates by comparing the predictive variation of the minimum ratio of outlet to inlet solution concentrations with the corresponding measured values at various flow rates. A very good agreement between anticipated and measured outlet solution concentration transients validated the model and methodology to estimate the adsorption rates. This good concurrence between model and experiments evidence the capability of the proposed model to accurately simulate the effects of electrode saturation on the net electro-adsorption rate. Finally, the model and methodology presented were tested with experiments using brackish water concentration solutions.

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