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Transport and electrochemistry based characterization of porous electrodes for CDI applications and comparison with desalination performance CARLOS RIOS PEREZ, Northeastern University, ELLEN WILKES, LUIS GUITIERREZ, The University of Texas at Austin, CARLOS HIDROVO, Northeastern University — Development of carbon-based materials with high specific surface area at the end of last century has made researchers to look back at capacitive deionization as a potential desalination technique for brackish water. Several publications evaluate the adsorption capacity of electrode materials under different conditions. Many others present the development/characterization of new electrode materials using electrochemical analysis and other techniques. Although some work has been done to model the electro-adsorption process at the macro and micro-scale, there is still a gap to tie the characterization of the electrodes to their performance. Here a simplified one-dimensional model is used to estimate the characteristic net electro-adsorption velocities for fully-developed or developing regimes in a flow-by capacitive deionization system. This methodology is applied to three commercially available materials with very distinct structure topology to estimate electromigration velocities at a specific solution flow rate. The calculated electro-adsorption rates and other characterization parameters obtained using traditional electrochemical techniques were compared against important desalination performance parameters such as amount of salt adsorbed and desalination proficiency (amount of salt adsorbed per unit of energy). The results obtained show interesting correlations and sometimes-unexpected behavior under constant current and constant voltage operation.

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