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Numerical Studies of Cell Stack for Zinc-Nickel Single Flow Battery

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A three-dimensional stationary model is established, based on the universal conservation laws and a kinetic model for reaction involving hydroxide and zinc ions, is applied to describe a zinc-nickel single flow battery cells stack. The model is validated against the experimental data and is used to describe the spatial distribution of flow, concentration, current density and potential. The effects of variations in electrolyte flow rate and concentration are further studied. The model results indicate that the current density and potential distribution of each battery cell have good consistency and the influence of the spatial arrangement of battery cells is more clearly reflected in the distribution of flow and concentration. An increase in flow rate or ions concentration leads to a slighter concentration polarization, a better consistency and a higher cell stack voltage.

Keywords: zinc-nickel single flow battery, cell stack, three-dimensional stationary model, concentration polarization, cell stack voltage

FULL TEXT