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Cover story

(Fernando F. Rivera, Berenice Miranda-Alcántara, Germán Orozco, Carlos Ponce de León, Luis F. Arenas, pp. 399–409)

Redox flow batteries are being developed to contribute to the large-scale energy storage required for the full implementation of renewable energy sources. A grid incorporating energy storage is capable of managing the load-levelling needs set by wind and solar power. Among the proposed chemistries, cerium-based systems are interesting due to their relatively high cell voltage. Our work presents validated CFD simulations of two relevant materials for the positive electrode of this device: a 2D planar electrode (and a polymer mesh spacer) and a 3D expanded metal mesh. Turbulent Reynolds-averaged Navier-Stokes and free flow plus porous media models were applied to compute local fluid velocities within a rectangular channel flow cell for laboratory studies. Calculated pressure drop was compared to experimental data. Pressure drop was described by the RANS approach, whereas the validity of Brinkman equations was dependent on the permeability of the porous media.

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