Electrical and Bubbly Flow Modeling of a Molten Salt Electrolysis Cell

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Abstract

A laboratory-scale electrolysis cell for the recovery of metals is simulated with COMSOL Multiphysics® software. Two models are implemented: an electrical model simulating the current density (reaction rate) distribution at the electrodes and a laminar bubbly flow model which solves for the electrolyte velocity induced by gas bubble production at the anode. A parametric study on the mesh refinement, the anode-cathode distance (ACD) as well as the bubble diameter (Db) is carried out. Quite heterogeneous current distributions are simulated at the electrodes' surface, with strong edge effect at the cathode. At the anode, a more uniform current is however obtained when increasing ACD. The bubbly flow model suggests that significant electrolyte convective motions between the electrodes are favoured for small values of both ACD and Db.