

Investigation of the Frozen Bath Layer under Cold Anodes

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Abstract

Hall-Héroult cell stability is highly affected by anode changing operation. Insertion of a cold anode in a cell will freeze a thick layer of molten cryolite under it. Its thickness, microstructure, and chemical composition vary as a function of time and location in the cell. To better understand the evolution of the frozen layer, mandatory for the validation of numerical models, a measurement campaign was conducted on the anodes having a few hours of operation in the cell. The macrostructure of the selected frozen bath samples has been highlighted using computed tomography while Scanning Electron Microscope (SEM) has been used to qualify its microstructure. An Energy-Dispersive X-Ray Spectroscopy (EDS) coupled to the SEM has allowed the qualification of the chemical content. The investigation showed very different macrostructures between samples but also within them. Nevertheless, for all samples, there is a clear distinction between the frozen cryolite and alumina/dusting phases, the latter ones surrounding the cryolite matrix.

Keywords: Cryolite; anode; Computed Tomography; microstructure; anode changing.