

Optimization and application of an existing model for the solubility of alumina in Hall-Héroult cells

Background

A key point of making large consumers of electricity more flexible to meet the future demands of more fluctuations in the electric grid is to adapt large industrial processes to new demands. The Hall Héroult process for gaining primary aluminum is a big consumer of electricity and needs some optimizations to be prepared for the power modulation. The process includes a variety of different physical phenomena. One important aspect is the thermal balance of the electrolytic cells and the dissolution of alumina powder in the molten bath.

Your task will be to implement various modifications in an existing solver in the open source code OpenFOAM. After some benchmarking the improved solver will be applied to study cells under conditions of industrial circumstances and investigate different opportunities for the modification.

Key Points

- Literature research
- Solver optimization using C++
- Performance of a parameter studies for the evaluation of Hall-Héroult process in industrial cells
- Implementation of the simulations and evaluation of the results

Requirements

- high self-motivation
- Understanding of fluid mechanics
- Interest in numerical work
- Structured, independent work
- Practiced handling with CAD software (Catia, Inventor etc.)
- Experience with OpenFOAM or other CFD-Tools desirable
- First experiences with mesh generation (Hypermesh, Pointwise, BlockMesh etc.)