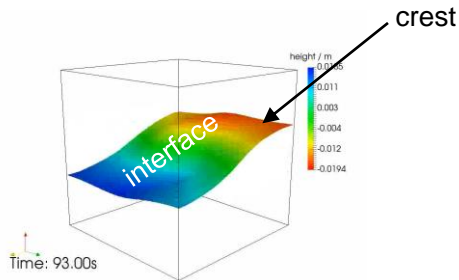


## Investigation and validation of metal pad rolling in a reduced Hall-Héroult cell

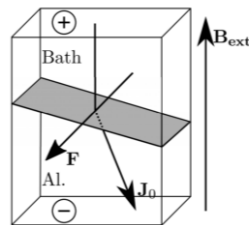
## Background

Due to the high currents in the production of aluminum by Hall-Héroult process in combination with internal and external magnetic fields, strong Lorentz forces are generated. The fluid phase consisting of aluminum and cryolite (electrolyte) is set in motion by the Lorentz forces. Looking from the top at the cell the Lorentz force will rotate anticlockwise, which leads to a rotation of the interface between aluminium and cryolite. Due to the rotation the interface will form a moving crest. Numerous numerical studies have already reconstructed the theoretical rotation frequency in simulations, but so far it has not been possible to reconstruct the height of the crest.

Your task will start by conducting a literature research to determine possible factors influencing the movement (Turbulence, wall contact angle, aspect ratio etc.). After reviewing all parameters, run simulations using OpenFOAM to determine their influence. It might be necessary to extend the existing OpenFOAM solver. Based on an experiment taken from the literature a validation should take place. Due to the complexity of the experiment you might need to perform a model reduction.



Schematic of the cell



## Key Points

- Literature research
- Parameter and Sensitivity Study
- Implementation of new models
- Model reduction
- Validation

## Requirements

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