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## Master Thesis "Grain growth simulation in aluminium casting processes"

In modern metal material processing, the knowledge about and control of the microstructure formation in light metal materials is the key process parameter for determining mechanical properties of the product. The evolution of the microstructure during solidification strongly depends on the chemical composition of the alloy and the local temperature field of the solidification front of the casting process. The temperature itself depends on the process parameters during manufacturing. Numerical integration of small scale phenomena like grain growth into large scale industrial process simulation provides new knowledge about possible interdependencies. Therefore, the commercial Finite Element (FE) tool LS-Dyna should be coupled with a highly parallel in-house Cellular Automata (CA) code to make predictions about microstructure development caused by variables of process parameters.

### Description:

- Literature review concerning solidification and grain growth simulation
- Set up thermo (-mechanical) Finite Element (FE) simulation
- Interpolate and transfer temperature fields from unstructured FE mesh to Cellular Automata (CA) grid (Cartesian grid)
- Simulate grain growth using a coupled CA-FE simulation technique
- Compare parameter study results with literature data or experiments
- Optional: implement a simplified grain growth model into LS-Dyna

### Candidate Profile

- Bachelor degree in Metallurgy, Physics, Mechanical Engineering, Computational Science and Engineering or similar
- Knowledge in Finite Element Modelling, Lattice Boltzmann Modelling or Coding
- Knowledge in stochastic and structural simulation techniques
- High motivation for interdisciplinary applied research
- Strong interest in numerical simulation and software development

Work Place: Ranshofen or Vienna

### What to expect:

At least € 978,00 gross for 20 hours per month based on the collective agreement (Forschungs-KV). There will be additional company benefits. As a research institution, we are familiar with the supervision and execution of Master theses and we are looking forward to accompanying you accordingly.

Please submit your application documents, including certificates, to

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