MAX-PLANCK-INSTITUT
FÜR DIE PHYSIK DES LICHTS

Das Max-Planck-Institut für die Physik des Lichts deckt ein breites Forschungsspektrum ab, darunter nichtlineare Optik, Quantenoptik, Nanophotonik, photonische Kristallfasern, Optomechanik, Quantentechnologien, Biophysik und Verbindungen zwischen Physik und Medizin.

Pflichtpraktikum or Projekt-/ Abschlussarbeit (Master)
Numerical Simulation of Glass Fibre Fabrication Process

When making high-quality glass fibres, the process of drawing them from larger preforms on a drawing tower at high temperatures plays a critical role. This determines the final structure of the fibre, which is typically 100 - 300 µm in diameter. Small changes in the final microstructure can have a big effect on the optical properties of the fibre. This is even more important when it comes to manufacturing optical fibres with complex internal microstructures.
In this project, to better understand and predict the outcome of the drawing process of such fibres, numerical modelling will be employed. By treating the molten glass as a Newtonian fluid, the process can be simulated using well-established finite volume methods (FVM). The thesis aims to develop a validated numerical model and a predictive tool capable of linking initial geometry and process parameters to the resulting shape after a fibre drawing.

Your tasks

- Conduct an extensive literature review on glass flow modelling, drawing processes, and existing numerical approaches.
- Set up and perform CFD simulations of the extrusion process using STAR-CCM+.
- Perform Design of Experiments (DOE) and sensitivity analyses to study the influence of various boundary conditions.
- Generate and analyse a comprehensive dataset for different process and geometric configurations.
- Conduct statistical analysis of simulation results to support the development of an in-house predictive tool for drawing outcomes.
- Perform post-processing, comparison with literature and available experiments, and validation of numerical results.

Requirements

- Background in Fluid Mechanics, Mechanical Engineering, or Computational Engineering.
- Experience with CFD and finite volume methods (knowledge of STAR-CCM+ is advantageous).
- Proficiency in programming and data analysis (Python, C/C++, MATLAB, etc.).
- Strong analytical and communication skills.
- Interest in interdisciplinary research at the interface of materials science and fluid dynamics.
- Ability to work independently and be self-motivated.

Have we sparked your interest? Then apply via email.

The Max Planck Society strives to ensure a workplace that embraces diversity and provides equal opportunities irrespective of gender, nationality or disabilities of the applicants. Furthermore, the Max Planck Society is committed to increasing the number of individuals with disabilities in its workforce and therefore encourages applications from such qualified individuals.

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