

## COMPLEX FLUID FLOWS IN ENGINEERING: MODELING, SIMULATION, AND OPTIMIZATION

*Fabian Key\*<sup>1</sup> and Marek Behr<sup>2</sup> and Stefanie Elgeti<sup>1,2</sup>*

<sup>1</sup>TU Wien

<sup>2</sup>RWTH Aachen University

### MINISYMPOSIUM

#### Abstract

The design process in engineering applications is currently experiencing a change in paradigm, away from experience-based design to numerical design. In many such engineering applications, flows of complex fluids are encountered, posing the challenge of understanding, describing, computing, and controlling these flows. In this spirit, this mini-symposium aims at providing a forum for questions concerning both numerical and optimization methods specific to fluid flow. On the modeling side, it covers the issues related to complex, non-Newtonian flow phenomena, such as the choice of model or appropriate stabilization. Furthermore, in the area of simulation, novel numerical methods, ranging from discretization methods to both free-boundary problems and deforming domain problems, are considered. In all cases, the flow solution may serve as the forward solution of a shape optimization problem. To this end, this mini-symposium will cover novel techniques for shape representation as well as new methods for an efficient evaluation of the design.

Topics of this mini-symposium include, but are not limited to:

- Non-Newtonian fluid models describing shear-thinning or viscoelastic properties.
- Simulation methods, including stabilization schemes, interface capturing, and interface tracking.
- Methods related to shape optimization in fluid flow, in particular geometry representation, reduced order models, and development of objective functions.
- Methods particular to specific applications.

#### Keywords

Non-Newtonian Fluids, Moving Boundaries, Shape Optimization, Model Order Reduction.