Efficient Simulation of Fiber-Fluid Interactions based on Asymptotic Cosserat Models and Homogenization Techniques

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Abstract: Glass wool manufacturing is a multiphysics problem which requires the understanding of the rotational melt-spinning of ten thousands of viscous thermal slender jets by fast air streams. Due to its high complexity an uniform numerical treatment is impossible. In this talk we present a multimethods approach that is based on an asymptotic modeling framework of slender-body theory, homogenization and surrogate models. The algorithm weakly couples melting and spinning phases via iterations. The possibility of combining commercial software and self-implemented code yields satisfying efficiency off-the-shelf. The simulation results are very promising and demonstrate the applicability and practical relevance of our approach for ongoing optimization strategies of the production processes.

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