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Unser Zeichen:
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Master Thesis (theoretical)

Investigations of film instabilities of gravity-driven liquid films over microstructured surfaces

Gravity-driven liquid films overflowing a solid, structured surface appear in numerous technical applications. Examples include falling film evaporators or structured high-performance packing for absorption columns. The packing surfaces are often textured with microstructures with geometrical dimensions in the same order of the magnitude of the film thickness. For improving the performance of these textured packings, and enable the design of new surfaces, knowledge about the stability of the overflowing thin liquid films is crucial.

Therefore, we conduct detailed numerical simulations of a two-phase flow over separated microstructures with sharp corners. The dynamics of the two-phase flow are described by the coupling between the Cahn–Hilliard (CH) and the Navier–Stokes (NS) equations. The resulting model forms a very tightly coupled and nonlinear system of equations. The solving algorithm is implemented in Python. On this model a numerical investigation on film instabilities need to be conducted (formulation of an optimization problem optional).

Tasks:

- Investigation of film instabilities regarding:
  - Dimensions and forms of microstructure (effect of sharp corners)
  - Dimensions of the domain sizes
  - Reynolds numbers

Candidate's Profile:

- Knowledge in programming in Python
- Knowledge in numerical mathematics
- Additional knowledge in flow simulations helpful, not necessary

Start: from now

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