Karlsruhe Institute of Technology

Institute of Fluid Mechanics

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bachelor thesis – numerical

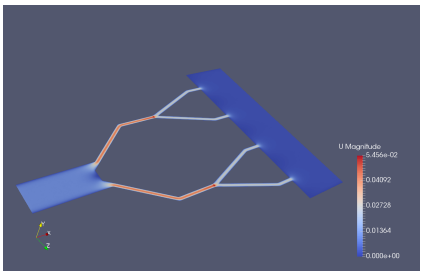
Numerical Simulation of Phase Change in Microevaporator

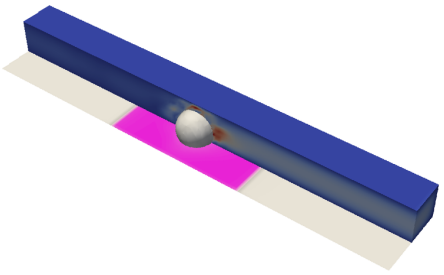
Background

Microstructured devices are of special interest for chemical and thermal processes due to their extraordinarily heat transfer properties, which can exceed those of conventional equipment by orders of magnitude. The enhanced heat transfer properties can be utilized in processes where large amounts of heat have to be transferred. A prominent example of such a process is evaporation. However, the phase change process in micrometer-sized geometries is accompanied by various phenomena absent in the devices of a conventional size. Therefore, multiphase flow in microstructured devices has to be fundamentally investigated in order to fully understand the mechanisms of the occurring phase change.

Content of the Thesis

The aim of the thesis is to investigate phase change in a single microchannel and subsequently flow interaction in two connected microchannels during evaporation process. The simulations model nucleate boiling in microchannels and corresponding phase change implementation requires predefined position and volume of the initial vapor bubble to trigger the evaporation. Parametric study of the bubble location is to be performed in single and dual-channel setup with analysis of pressure, flow fields and heat transfer resulting in force balances and detailed bubble growth description. The simulations will be carried out in multiprocessor environment using interThermalPhaseChange-solver based on OpenFOAM 2.4.x and postprocessed using MATLAB.





Requirements
basic knowledge in fluid dynamics

Beneficial skills
CFD, Linux, OpenFOAM, Matlab

You will learn
methods of scientific research, OpenFOAM, HPC

Start: immediately

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