Karlsruhe Institute of Technology

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bachelor thesis

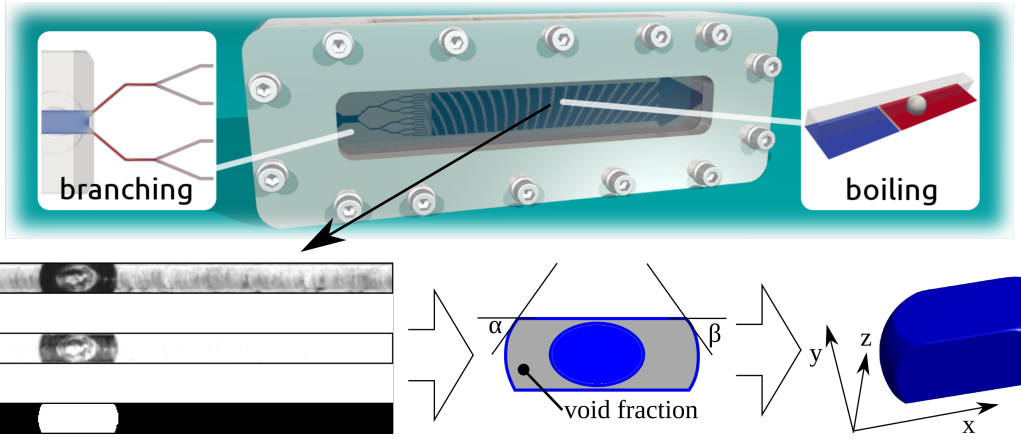
Analysis of vapor bubble growth in a microchannel

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. A prominent example of such a device is a microevaporator. In order to model evaporation in a microchannel using numerical simulation a precise description of initial conditions and properties of the vapor and liquid phase are needed. Some of the properties can be evaluated from the high-speed videos recorded in a corresponding experiment.

Content of the Thesis

Video sequences of vapor bubble growth in a microchannel have to be analysed with the aim to extract information regarding three-dimensional bubble geometry. For this purpose an automatic postprocessing routine has to be implemented using Matlab. The main focus of the work is set on evaluation of the contact angle for vapor/water interface and the void fraction of the vapor phase (time-dependent). For the characterization of the bubble shape and detection of its features a set of appropriate filters, refinement algorithms and morphological processing has to be applied. The results of the postprocessing deliver both an important additional input for the simulation setup (advancing & receding contact angle) and can also be used for validation purposes (evolution of void fraction).



Requirements

basic knowledge in fluid dynamics

Beneficial skills

Matlab

You will learn

image processing, Matlab

Start: immediately

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