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Master Thesis

Numerical Modeling of Multicomponent Single Droplet Flash Boiling Behavior at Low Ambient Pressures

Flash boiling occurs when a liquid is injected into an environment where the local pressure is below the saturation pressure of the liquid. It leads to a rapid disintegration of the liquid jet via the formation and subsequent growth of the vapor bubble nuclei. Spray formed by flashing liquid jets are characterized by wider cone angle, shorter penetration, and smaller mean diameter compared to the one formed by mechanical means. To accurately quantify the macroscopic characteristics of flash boiling spray, it is necessary to understand the detailed underlying physics at a single droplet level. A numerical framework for single component flash boiling droplets is already developed in our in-house solver CIAO. In this work, the flash boiling phenomena of multicomponent single droplets will be investigated for the newly developed fuel blends within the “Cluster of Excellence-The Fuel Science Center”.

Tasks

- Literature review
- Implementation of the multicomponent flash boiling models
- Validation of the model with the experimental data available in literature
- Analysis of the influence of fuel composition, system pressure and temperature on flashing phenomena

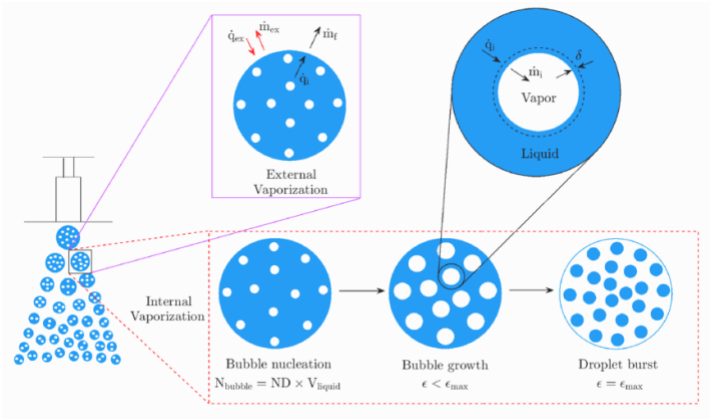

Fig 1. Schematic of flash boiling processes

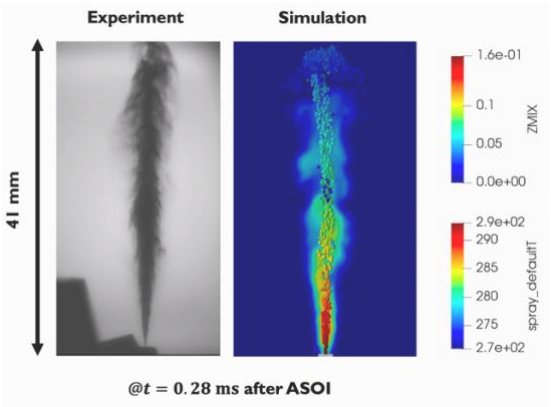

Fig 2. Dimethyl ether (DME) flash boiling spray (Superheating degree = 27.85 K)

Prerequisites/Requirements

- Familiar with programming
- Fluent in English
- Ability to work independently
- Self-motivation and commitment

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