Chair of Aerodynamics and Fluid Mechanics
Department of Mechanical Engineering
Technical University of Munich

Secondary atomization of liquid metal droplets

Master's Thesis, Term Project

Background

Atomization of liquid metal is an essential process in a variety of production methods such as spray forming or laser sintering. A critical part of all atomization processes is the breakup of single droplets, also termed secondary atomization. The breakup of droplets follows different patterns depending on the ratio between the disruptive aerodynamic force and the restorative surface tension.

In this project, we investigate the single droplet breakup experimentally using our in-house shock tube facility. We record high-speed videos of the breakups (breakup time ∼2ms) under various conditions and analyze the video with Matlab scripts and image processing tools. The proposed work focuses on the influence of the specific properties of liquid metals and the differentiation to more conventional liquids like water. Of special interest is the effect of higher density and surface tension, as well as the formation of oxide layers. In addition, a variation of the temperature of the liquid metal adds another factor in the parameter space of the investigation.

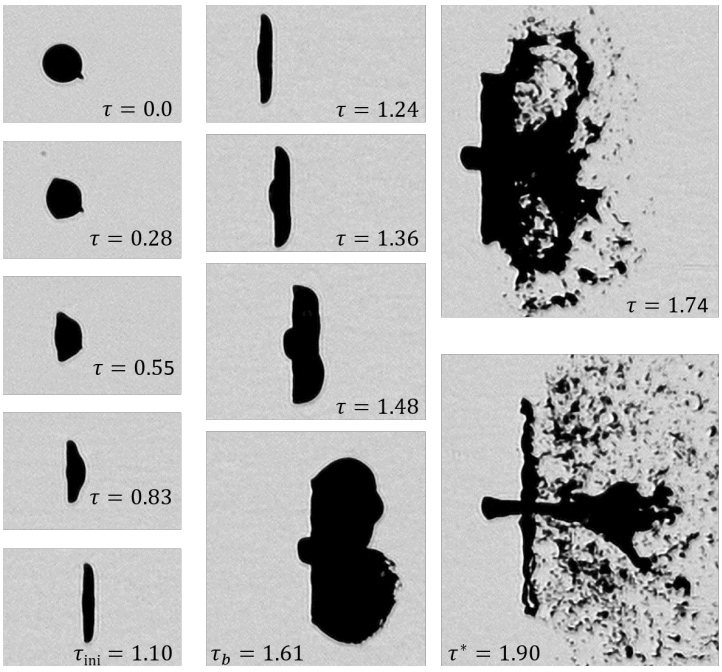

Figure 1: Field's Metal droplet breakup at We = 30.3. Flow from left to right.

Tasks

- Getting to know and setting up measuring equipment, e.g. high-speed camera, droplet generator, etc.
- Planning and conducting droplet breakup experiments with the shock tube
- Image processing and data analysis; qualitative interpretation and quantification of representative parameters

Requirements

- Good team working/communication; creatively and quickly solving practical challenges
- Good understanding of gas dynamics/compressible flow, especially wave dynamics (e.g. lecture Gas Dynamics)
- Basic knowledge of Matlab is beneficial

Take-away:

- Insight into state-of-the-art experimental research with high-end equipment
- Scientific working and writing; project management skills

Contact

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