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Design and Testing of a Liquid Metal Droplet Generator

Semester's Thesis

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Motivation

Powder based additive manufacturing of metal parts requires metal powder. For high quality parts the requirements on the shape and size of the metal powder are very high. The main way of producing metal powder is by atomization of a liquid metal jet in a gas atomizer. The key process which determines the powder quality is the secondary atomization, where single droplets break into multiple child droplets. Recent findings show differences in the secondary atomization of liquid metals and common liquids (e.g. water). To study secondary atomization of liquid metals we need to melt the metal and generate droplets with a defined size and spherical shape. We use a shock tube to generate a flow which atomizes the droplet and record the breakup with a high-speed camera.

Figure 1: Levitation Melting using a copper coil (Sassonker et al. 2019)

Objectives

In the scope of this thesis different drop-on-demand methods shall be compared and evaluated. After a suitable method is identified, a droplet-generator for melting a aluminum and generating droplet is designed and built. Finally, the droplet generator will be set up, tested and different droplet properties are investigated.

Requirements

- Knowledge of CAD software

- Interest in fluid mechanics optional but not mandatory

What you learn during this thesis

- Practical working with an experimental setup

- Going through the whole production process from design to testing