

Master-Thesis



TECHNISCHE
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Leidenfrost drop on liquid film

Motivation

The levitation of a liquid droplet above a strongly heated solid substrate on its own vapor is called the Leidenfrost phenomenon and can be easily observed in daily life when a small water drop is bouncing on a hot stove plate. The large heat flux from the plate to the drop creates a vapor cushion which thermally insulates the droplet and significantly increases the time it takes to completely evaporate the droplet. The prevailing transport phenomena are relevant for a number of technical applications in the area of film boiling. While this process is well understood for levitation on solid surfaces, little work is available describing the levitation on heated films of another, higher boiling liquid, Fig. 1 and 2. A number of interesting observations linked to the presence of the liquid film were made in a series of preliminary experiments. Exemplarily, the slight indentation of the film free surface at the position of the levitated drop stabilizes it with respect to its lateral motion while the gas flow between the drop and the film might entrain film material into the levitated drop.

Outline

Experiments shall clarify whether contact is made for short periods of time between the film interface and the levitated drop, leading to short interruptions of the emanating gas flow similar to two sheets of paper repeatedly touching each other when air is blown in between them. Tracer particles will be seeded in the liquid film only for this purpose. The process will be recorded with a high-speed camera and investigated whether some of the tracer particles might be transferred to the levitated drop at some instance during the process, indicating a liquid-liquid interactions between the drop and the film.

Requirements

- General interest & knowledge in fluid mechanics & thermodynamics
- Experience setting up experiments is beneficial

Get in touch for more information!

Center of Smart Interfaces
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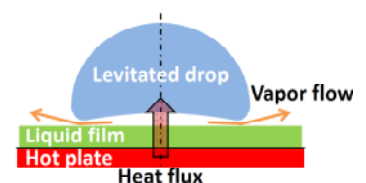


Fig. 1: Leidenfrost drop on film
(schematic)

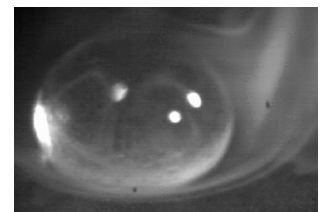


Fig 2: Recorded Leidenfrost drop

