

## Vapor bubbles

### Description

Did you ever wonder why hot oil spills out when a water droplet is added during cooking? In this project, we will explore the vaporisation dynamics of water droplets immersed in hot oil. The dynamics will be captured by performing side-view as well as bottom view high-speed imaging experiments. Furthermore, the student will have a chance to learn about image processing in order to quantify the vapour bubble dynamics.

### Assignment

**Stage 1:** Learning phase – 1/2 weeks

**Topic:** Single droplet vaporization

- The project starts with initial learning experiments of a single water-in-oil droplet.
- The data from learning experiments will be analyzed in MATLAB with image processing. You would be expected to quantify the experimental data by tracking the evolution of the bubble.
- Student is expected to learn:
  - How to build a high-speed imaging experiment.
  - How to use MATLAB for image processing.
  - How to quantify data.
  - Safety measures required to work with high-temperature setup.

**Stage 2:** Deliverable – remaining duration

**Topic:** Multiple droplet vaporization. You will:

- Continue with the same setup to study multiple droplet vaporization, starting with two droplets and moving towards multiple droplets.
- Extend/develop a MATLAB code to track the dynamics of multiple droplets
- Quantify the data w.r.t: droplet size, phase change dynamics, distance between droplets, temperature.
- Understand the theory that governs the dynamics, the role of different time scale in the formation of vapor bubble until complete vaporization of the droplet.

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