



Bachelor or Master Thesis

Drop-Particle collisions

In this project, we are interested in the collisions of one freely moving drop with one freely moving particle of comparable size. This field of research has been attracting much attention due to its relevance to many coating, spraying or drying processes, which still rely on empirical know-how. The difficulties related to the control of both the drop and the particle trajectories have so far limited the studies to numerical approaches, which still miss experimental data for validation. To overcome this issue, we propose to use the unique set-up we recently developed to acquire data a meaningful data set about the mentioned collisions. The set-up itself combines two well-known drop generators with ultra-fast UV-polymerization, which is applied to one of the two droplet streams only, see Figure 1. Images of the collisions have already been successfully obtained and analyzed, see figure 2. Yet, at this stage, a single value of drop and particle diameter has been investigated (300 μm) and only one liquid has been used, limiting our knowledge on the process. The goal of this project is thus to complete the collision data employing drops and particles of other sizes, as well as different liquid viscosity, density and surface tension. In this way, the influence of the previously mentioned parameters could be characterized and a model proposed, which should then be published in a scientific journal.

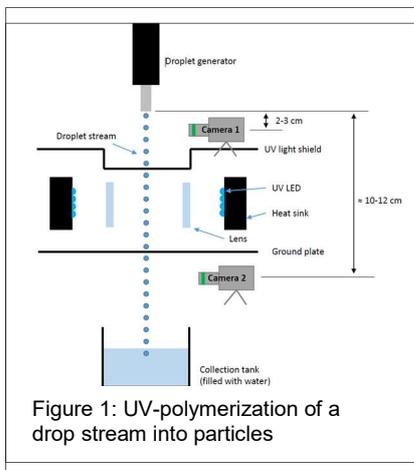


Figure 1: UV-polymerization of a drop stream into particles

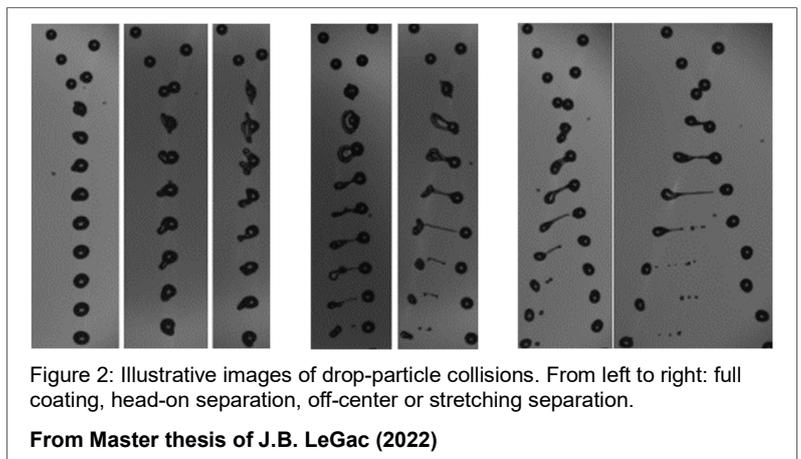


Figure 2: Illustrative images of drop-particle collisions. From left to right: full coating, head-on separation, off-center or stretching separation.

From Master thesis of J.B. LeGac (2022)

Tasks

- Get familiar with the set-up to image drop-particle collisions with various sizes and liquids
- Analyze the data (image analysis) to obtain the collisions parameters and describe the collision outcomes. Routines have been developed already but could be improved if necessary
- Propose relevant dimensionless numbers to distinguish the different regimes (regime maps)
- Support the redaction of a scientific article for a peer-review journal.

We offer

- A scientific supervision of high quality
- An international and dynamic work atmosphere
- Access to all the required facilities of the Institute

The project will be accomplished at the Institute of Fluid Mechanics and Heat Transfer (Graz University of Technology). The project can start any time. If interested, please contact Carole Planchette, Tel. 0316 873-7357, Email carole.planchette@tugraz.at