SP–C5: Development of Novel Optical Techniques for Micro-Fluid Dynamics

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Brief self-introduction

SP-C5: Development of Novel Optical Techniques for Micro-Fluid Dynamics

Current Position (from 01.05.2017): Post-doctoral Research Associate in DROPIT at ITLR, University of Stuttgart

PhD from Indian Institute of Science (Aerospace Engineering)
MSc from Indian Institute of Science (Aerospace Engineering)

Research Background

- **Micro-textured surfaces**
  - Liquid droplet impact on micro-grooved surfaces

- **Superhydrophobic surfaces (SHS)**
  - Water droplet impact on spray-coated SHS
    *(Colloids Surf A, 2016)*

- **Heated surfaces**
  - Biofuel droplet impact on heated stainless steel surfaces
    *(under revision in Int. J. Thermal Sci., 2017)*

- **Droplet interaction with solid surfaces**
  - Biofuel droplet impact on heated stainless steel surfaces
    *(under revision in Int. J. Thermal Sci., 2017)*

Sources:
- www.aero.isc.ernet.in
- www.aero.isc.ernet.in
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Role in DROPIT

Goal: Implement micro-PIV to study the flow features in the thin wall-film and crown to understand and rationalize the outcomes observed in macro-scale such as deposition–splashing transition.

Fig. Micro-PIV set-up highlighting the main components

*Source: GRK 2160/1 DROPIT presentation
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Tentative Work Plan for SP-C5 ↔ SP-C1 Co-Operation

**Phase I: Calibration experiments**

1. **Velocity measurement**

   - From high speed images:
     \[ U(t) = \frac{\Delta R}{\Delta t} \]

   - From \( \mu\)-PIV:
     \[ t = t_1 \quad \text{and} \quad t = t_2 \]

   - Combination of:
     (i) Chromatic Confocal Imaging (CCI),
     (ii) microscopy, and
     (iii) volume conservation.

   - Challenge: Checking, adapting, and calibrating the measurement techniques for thin wall film seeded with tracer particles.

   - Fig. Schematic of the concept for velocity calibration of micro-PIV

2. **Wall film thickness measurement**

   - Fig. CCI set-up

**Phase II: Preliminary experiments**

- Single-component droplet–wall film interaction

**Phase III: Final experiments**

- Two-component droplet–wall film interaction

- Fig. Schematic of the thin wall film set-up
Thank you!
Vielen Dank! Grazie mille!

Prof. Dr.-Ing. habil. Bernhard Weigand

Dr.-Ing. Grazia Lamanna

Mr. Ronan Bernard, M. Sc.

Dr. Visakh Vaikuntanathan

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* Photo source: http://www.uni-stuttgart.de/ith/institut/mitarbeiter/