

## Master or Bachelor Thesis

# Investigating Droplet-Fiber Interactions under Vibrational Conditions Using High-Speed Cameras

### Motivation:

In mist filtration, fiber-based coalescers are a well-established method for filtering droplets present in mist. The filtration process involves distinct steps, outlining the interaction of droplets with fibers, the formation of fluid structures, and the transport of liquid. Coalescence, where smaller droplets merge to form larger ones, is a key mechanism in the development of these fluid structures, giving rise to the term "coalescing filter."

The importance of coalescence filters has grown significantly in recent years due to their efficiency in removing fine droplets from gas streams, protecting equipment from corrosion and contamination, and ensuring high product purity. Moreover, stricter environmental regulations and increasing demands for air and water quality make coalescing filters indispensable in modern industry. They also play a critical role in sustainability efforts by enabling energy-efficient filtration with minimal pressure losses and facilitating resource recovery.

### Contents:

To investigate the mechanisms within depth filters at a microscopic level, studies often focus on single fibers. In this study, the interaction between droplets and a vibrating fiber in a flow channel will be examined. Tiny droplets, in the picoliter range, will be placed on the fiber for this purpose. Handling these media on a microscopic scale presents a significant experimental challenge.

State-of-the-art high-speed optics and custom-developed image analysis tools, including object tracking and contact angle analysis in MATLAB, will be utilized to investigate the mechanisms of droplet-fiber interaction.

If you are interested in microfluidics, filtration, or image and data postprocessing with MATLAB, I would be happy to hear from you via email or phone. Together, we can align the thesis to suit your interests and preferences.

### What I can offer you:

- I maintain an intensive mentoring relationship with my students with regular appointments (if requested) and I'm always available to support with problems
- I give my students the freedom to contribute their own ideas to the final project
- The thesis is your work and not mine, which is why I prefer to be your advisor and not to interfere too much

### Your tasks

- Developing an understanding for optical systems
- Using tools for image analysis
- Creation and tracking of a project plan for your thesis

### What should you bring to the job

- Having fun to try and learn new things
- Ability to communicate
- Goal-oriented working
- Basic knowledge of MATLAB is beneficial

**Start time: now**

**Type of work: Experimental (& Programming)**

### Contact

**Alexander Schwarzwälder**, M.Sc.

E-Mail: [alexander.schwarzwaelder@kit.edu](mailto:alexander.schwarzwaelder@kit.edu)

Tel.: +49 721 608-46573

URL: [https://www.mvm.kit.edu/Mitarbeiter\\_MVM\\_6373.php](https://www.mvm.kit.edu/Mitarbeiter_MVM_6373.php)

