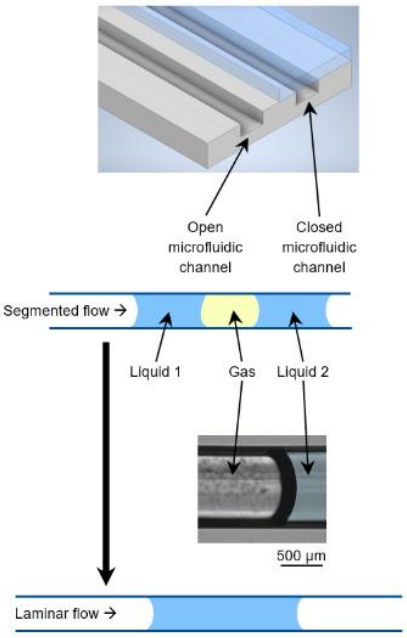
MA EI – Control and investigation of gas bubble formation in microfluidic systems for mixing in Lab-on-a-Chip devices

Mixing of liquids is an important task in microfluidic systems. Especially for Lab-on-a-Chip devices, robust, high throughput and gas bubble free mixing is crucial. Liquids separated by gas bubbles (segmented flows) are widely employed where semi-permeable membranes, gas valves or geometrical elements ensure gas bubble removal for subsequent mixing. Combining classical closed-microfluidic systems with open-microfluidic elements and capillary flows could have beneficial properties.



The **aim of this thesis** is to further investigate mixing of gas separated liquids in an innovative microfluidic channel. For this purpose, a setup for dosing gas will be implemented into a microfluidic channel to generate segmented flows. Subsequently, the flow and bubble generation will be characterized and optimized for high throughput and reproducibility. Microscope video recordings will be taken and evaluated in order to determine quantitative parameters of the flow system. In parallel, different channel geometries will be fabricated by micro-milling and lithography processes to optimize the system properties and facilitate downstream mixing. Finally, fluid mixing should be characterized within the parameter space of the system.

What we offer:

- Master thesis (EI) on the topic of segmented flows and microfluidic mixing in an innovative device.
- You will have the opportunity to gain experience in practical microfluidics, microscopy and fabrication techniques, using state-of-the-art equipment.
- You will learn about characterizing bubble formation and liquid mixing (interface propagation, mixing efficiency, …) at the microscale, next to image analysis and device control.

What you should bring with you:

- You are studying electrical engineering, computer science, mechanical engineering, mechatronics, physics, or a comparable course of study in your master's degree.
- You have solid knowledge in microfluidics / fluid dynamics (optional).
- Experience in microfabrication techniques and/or hands-on lab experience.
- An independent way of working, a high degree of motivation and commitment, as well as the willingness to quickly take on responsibility.
- You are eager to independently tackle challenging tasks and find creative solutions.

Duration: 6 months

Start: February 2025

Where: Heinz Nixdorf Chair of Biomedical Electronics, TranslaTUM, Einsteinstr. 25, 81675 Munich

We are looking forward to receiving your application.

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