# Master Thesis - Experimental

**Topic:** Interfacial Lipase–Nanoparticle Interactions at Liquid–Liquid Multiphase Systems

Nanoparticles are tiny particles with diameters of 1–100 nm, gaining remarkable applications in chemistry, biotechnology, medicine, pharmaceuticals, surface science, catalysis, and nanotechnology. In chemical engineering, nanoparticles can be used to control transport phenomena or enhance the kinetics of heterogeneous catalysis.

Lipase is a natural enzyme that splits lipids. This process occurs at the oil–water interface. One way to improve the activity and stability of lipase is to immobilize it on nanoparticles. In this project, we study the effect of nanoparticles on the enzymatic activity of lipase at liquid–liquid systems in both single droplet-scale and in droplet swarms.

In droplet-scale, we use a setup called "profile analysis tensiometry" to measure the interfacial tension and dilational rheology of a droplet dynamically while the enzymatic reaction is ongoing. Interfacial adsorptions and desorptions of lipase or lipase–nanoparticle complexes change the droplet's interfacial properties, which we study as a measure of enzymatic activity.

The stability and drop size distributions of the liquid-liquid systems can be determined in two different ways: Either after dispersion in a stirred tank using an in-situ endoscope measurement technique or after dispersion in a rotor-stator homogenizer using ex-situ microscopy. Which method is most suitable depends on system composition, process conditions, and resulting drop size range.

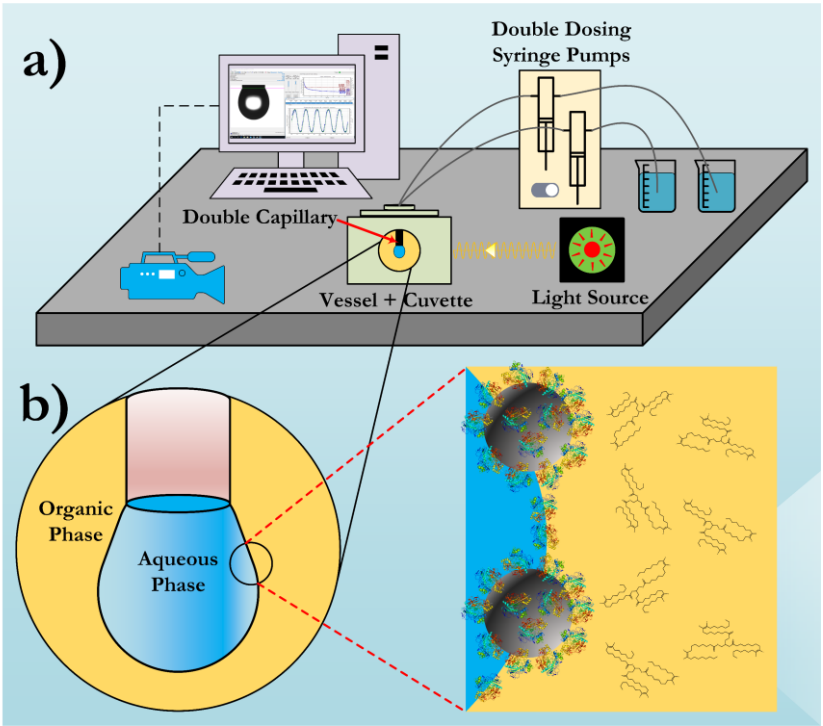


**Figure 1- a) Schematic representation of profile analysis tensiometer; b) a closer look into enzymatic hydrolysis of triglycerides using immobilized lipase at the water–oil interfaces.**

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July 2022