Acoustophoretic particle manipulation for cell secretome analysis

One major goal of microbiology is the high throughput analysis of cell secretome using mass spectrometry. This can be realized by encapsulating cells inside a microscale droplet and introducing the droplet into a microfluidic system. This is followed by, focusing of the cells inside the droplet, splitting of the droplet to separate cell and secretome and finally extracting the droplet to analyze the content. The focusing of the cells inside the droplet needs to be contactless and should not influence the viability of the cells.

Acoustophoresis utilizes ultrasonic standing waves to generate forces that can be used to position particles inside microsystems [1]. Therefore, acoustophoretic manipulation is examined in this cooperation project with the Bioanalytics Group.

Figure 1: Sketch of the microfluidic setup used for cell manipulation inside microscale droplets.

In this project completely new devices will be developed. The student sketches some first ideas and evaluates their feasibility with simulations. Promising simulation results will be fabricated using standard cleanroom techniques (only for master thesis carried out by student). Finally the devices are characterized in our laboratories.

Many different aspects can be analyzed such as asymmetric splitting of droplets at a bifurcation, ejection/injection of particles that are encapsulated in microscale droplets, manipulation of the node position of the acoustic standing wave using innovative device designs.


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