



1 Microreaction vessels.  
2 System for cell insulation.

## Isolation of B cells using laser-based cell printing

### State of the art and application

When patients fall ill with a virus such as SARS-CoV-2, the body's immune system responds and forms pathogen-specific receptors on its own immune cells (B cells). The presence of such a receptor provides information about the immune status of the affected patients after infection or vaccination. To provide rapid information on immunization in the population during an epidemic, large patient cohorts need to be screened using time-consuming and cost-intensive procedures. For this reason, the BMBF project "B-Cell-Immune" aims to develop a miniaturized process chain that enables laboratories to rapidly analyze several 100,000 samples in microvessels.

### Process chain and solution

The project partner LPKF Laser & Electronics SE provides microreaction vessels with a diameter of 200 to 400  $\mu\text{m}$ . Filling these vessels efficiently in a needle-based approach is still an unsolved problem today. Fraunhofer ILT is, therefore, developing a laser-based process that enables users to both filling microreaction vessels with cell culture medium at a rate of up to 1 kHz and separate B cells from a patient sample into these vessels. The samples are then analyzed by the clinical partners at Hannover Medical School.

### Successful material transfer for cell analysis

Fraunhofer ILT has shown that microreaction vessels in glass with a diameter of up to 200  $\mu\text{m}$  can be reliably filled with cell culture medium without contaminating the neighboring vessels. This material template forms the basis for the subsequent isolation of individual cells in the microreaction vessels. For this purpose, the institute uses laser-induced forward transfer (LIFT) with a MIR laser beam source of emission wavelength  $\lambda = 2.94 \mu\text{m}$  to vaporize water and trigger a microjet. This microdispensing process can print at rates of up to 1 kHz without contact and without needles. The partners have demonstrated that single cells can be transferred into microreaction vessels and are carrying over the process for use with B cells. The joint project "B-Cell-Immune" underlying this report was carried out on behalf of the Federal Ministry of Education and Research under the grant number 13GW0590D.

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