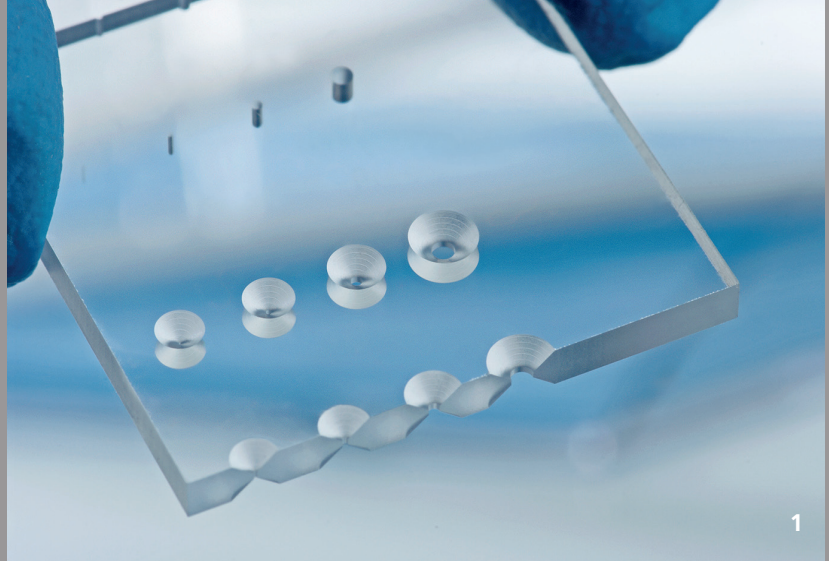

WAVE GUIDE FOR ANGLE-RESOLVED LIGHT SCATTERING

Task

The angle-resolved measurement of the light scattered by particles makes it possible to determine particle sizes and particle shapes rudimentarily. This method – called static laser light scattering – is used in laboratory instruments for the analysis of particle diameters between a few 10 nm and hundreds of µm. For inline-capable, process-analytical immersion probes, however, the method is not yet suitable due to the complex optics with many detection channels, each with a small angle range. In a research project with partners from the industry, Fraunhofer ILT is developing a compact, inline-capable immersion probe that enables angle-resolved scattered light measurements for particle analysis.

Method

Fraunhofer ILT is pursuing a new approach for optical particle analysis that uses waveguides for angle-resolved detection of the particle-scattered light. In a glass chip, a short pulse laser is used to introduce both structural elements (e.g., an opening, which is flushed through by the sample liquid) and waveguides for guiding the scattered light. A CCD line on an outer surface of the glass chip detects the stray light guided by the waveguides.

Results

The waveguides have been optimized for use in a scattered-light probe. For this, the laser parameters for writing the waveguides had to be varied and the optical properties of the waveguides, such as transmission, angle of radiation and minimum radii of curvature, were analyzed. Fraunhofer ILT created a design concept for the construction of an analysis chip with elements for flow shaping.

Applications

The scattered light probe shall be used to measure the size of particles with a diameter between a few 10 nm and many µm. Application fields can be found, for example, in bioprocess analysis and chemical process analytics. Growth processes in biofermenters or particle formation in chemical crystallizations shall be recorded inline during an ongoing process.

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1 Glass chip with laser-structured openings.

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