



## LASER DRILLING OF MICROFILTERS

### Task

Mechanically stable surface filters are commonly used to treat wastewater, fuel or for applications in the food and cosmetics industry. These filters are characterized by their low material thickness and large number or density of holes. Yet the industry faces a great technical challenge in producing filters with pore sizes in the single-digit micron range and large open area.

### Method

In this context, Fraunhofer ILT is employing a percussion drilling process using ultrashort pulsed (USP) laser radiation. The process uses laser radiation with a wavelength of 532 nm (green) or 355 nm (ultraviolet), which enables precise machining since it has a focus diameter of less than 10 µm. Due to its very short light-matter interaction times, USP laser radiation makes it possible to process material not only with high-precision, but also with negligible thermal influence in the workpiece. Thus, very small holes can be precisely drilled in fields, thus creating a thin webbed structure. At the same time, the high intensity of the ultrashort pulses allows an almost material-independent ablation, which makes it possible to produce tight drill patterns in plastics, metals, ceramics or glass.

1 *Entry side of a hole grid  
with sub-10 µm drill holes.*

2 *Hole exit with a diameter of 2 µm  
in 50 µm thick titanium foil.*

### Results

The process presented here can be used to generate individual holes as well as hole patterns with customized hole size, geometry and pitch (hole-to-center distance). The open area can be set tailored to a specific application. Due to the reduced heat input into the workpiece, the process can reproducibly drill hole sizes with a diameter of up to 2 µm in the exit and a maximum open area of approx. 20%. The USP laser percussion drilling is almost independent of material and can be used for workpieces with a thickness of up to 500 µm.

### Applications

Such a dense hole matrix, consisting of holes with a diameter of less than 10 microns, can be used to produce perforated foils or filters for the separation of particles from liquids or gases. Possible applications are the filtration of food, such as beer filtration, whey separation and juice production, the separation of microplastics or the treatment of wastewater and fuels. Furthermore, emulsions can be produced with such fine-pored filters.

### Contact

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