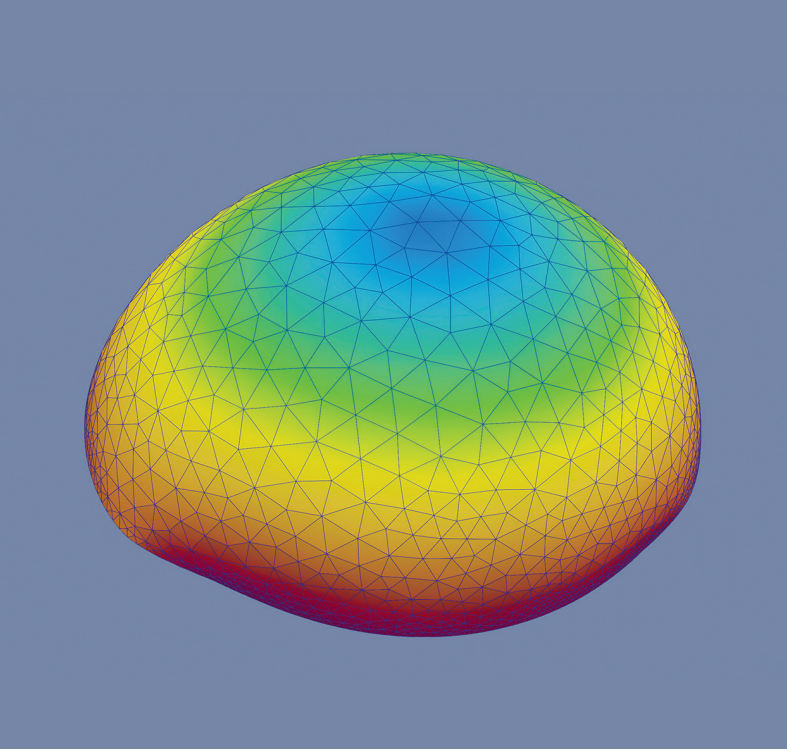

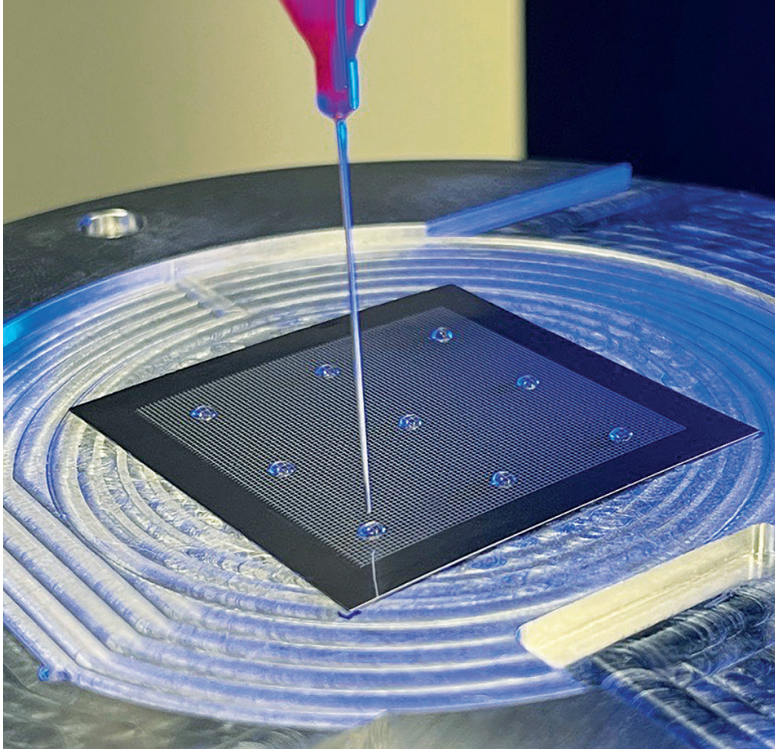

1 Temporal variation of binder concentration at the boundaries.
2 Spatial variation of binder concentration at low and high drying rates.

Optimization of laser structured surfaces by simulation

Surface properties play a central role in nature and in many technical applications. The requirements for technical surfaces are diverse and depend on the respective application. The properties of such surfaces can be specifically changed by structuring with laser radiation; for example, hydrophilic and hydrophobic properties can be adjusted by introducing structures in the micro- and nanometer range. The challenge in doing this lies in the material-specific design of the micro- and nanostructures in order to generate desired wetting properties.

Model for simulation of contact angle and drop shape

A droplet can assume several equilibrium states on a rough substrate, each of which represents local energy minima. The particular shape that a droplet assumes depends on the texture design, the surface chemistry, and the depth of penetration of the liquid into the textures. To predict the contact angle and droplet shape on textured surfaces under heterogeneous wetting conditions, Fraunhofer ILT has developed a macroscopic model based on thermodynamic equilibrium principles.

Wide range of applications

The equilibrium contact angles of liquid droplets on rough surfaces can be predicted as functions of laser-structured surfaces and their chemical properties. On surfaces with locally varying properties, the respective droplet shape and motion can be simulated using differential geometric methods. Fields of application are processes in which surfaces must exhibit specific wetting properties. In the medical field, these include the repulsion of endogenous fluids such as blood on surgical equipment or the wetting and, thus, the growth of cells on surgically transplanted artificial joints. Another new field of application can be found in the targeted integration of wetting-promoting or -repelling properties on bipolar plates for fuel cells.

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