FRAUNHOFER INSTITUTE FOR SILICATE RESEARCH ISC
WÜRZBURG, GERMANY

PRESS RELEASE

3D-printed optics for individualized mass production

Individually manufactured and still suitable for mass production? Within the framework of the Fraunhofer "Go Beyond 4.0" project, this apparent contradiction is to be eliminated. In the field of illumination optics, the two Fraunhofer Institutes for Silicate Research ISC and for Optics and Precision Engineering IOF developed new material concepts and processing technology for multifunctional and individualized optical components for “lot size 1”.

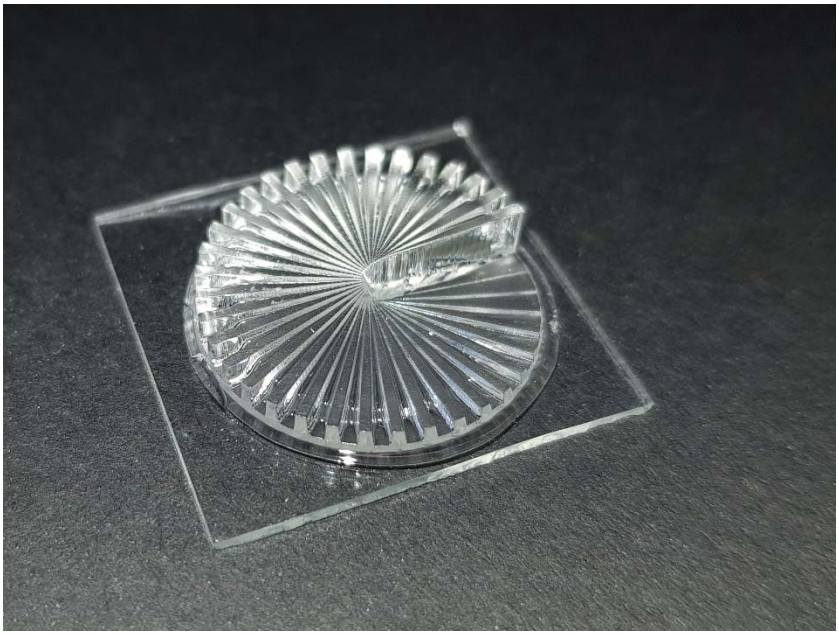
The starting point is the relatively easy customizable 3D printing technology. Disadvantages of three-dimensional printing so far, however, were the disturbing effects in the volume and on the surfaces of printed objects, such as layering artifacts or roughness. Furthermore, the material properties of conventional 3D-printable polymers are usually insufficient for advanced optical components and systems.

High demands are placed on optical systems in the field of lighting. The materials used should be as glass-like as possible, with no yellowing during long term operation and a high transparency in the visible part of the spectrum. Artifacts or inhomogeneities in the printed volume caused by the layer-by-layer processing and not very smooth surfaces due to printing structures on the micrometer scale are unacceptable for use in optical systems. However, with ORMOCER®s – glass-like inorganic-organic hybrid polymers - from the Fraunhofer ISC and an improved printing technology from the Fraunhofer IOF, a leap in optical quality could be accomplished. Specially adjusted optical ORMOCER®s have already been used in the area of optical assembly and connection technology by the Fraunhofer ISC scientists. "The initial material has had very good optical properties at all. Due to further development it was refined for the enhanced 3D printing process, as provided by the colleagues of the Fraunhofer IOF. The combination of material and technology avoids defects on surfaces and in volumes that would otherwise result from 3D printing", explains Dr. Sönke Steenhusen, project manager at Fraunhofer ISC.

In addition, other required functional components such as apertures, electrically conducting tracks or mirrors can be integrated into the printed optical components during the manufacturing process. This simplifies later assembly and enables highly complex optical components. Thus optical systems can be created easily by combining optical ORMOCER® and digital manufacturing processes. Thus, the printed optics are also interesting for advanced lighting tasks, which couldn’t be realized so far by other means. For larger quantities, the Fraunhofer researchers are already working on the parallelization of processes.

Editorial Office
Marie-Luise Righi | Fraunhofer-Institut für Silicatforschung ISC | Phone +49 931 4100-150 |
Neunerplatz 2 | D-97082 Würzburg | www.isc.fraunhofer.de | righi@isc.fraunhofer.de |

Footage:



ORMOCER®-based, 3D printed optical components © S. Steenhusen, Fraunhofer ISC

The **Fraunhofer-Gesellschaft** is the leading organization for applied research in Europe. Its research activities are conducted by 72 institutes and research units at locations throughout Germany. The Fraunhofer-Gesellschaft employs a staff of more than 26,600, who work with an annual research budget totaling 2.6 billion euros. Of this sum, 2.2 billion euros is generated through contract research. Around 70 percent of the Fraunhofer-Gesellschaft's contract research revenue is derived from contracts with industry and from publicly financed research projects. International collaborations with excellent research partners and innovative companies around the world ensure direct access to regions of the greatest importance to present and future scientific progress and economic development.

The **Fraunhofer Institute for Silicate Research ISC** (director Prof. Dr. Gerhard Sextl) is one of the leading Bavarian R&D centers for material-based research and development in the fields of energy, environment and health. With a permanent staff of about 380 scientists and technicians the Institute works to develop innovative materials and technologies for sustainable products and make essential contributions to solving the major global issues and challenges of the future. With its parent Institute and the Translational Center in Wuerzburg, and its Center for High-Temperature Materials and Design HTL at Bayreuth Fraunhofer ISC combines first-rate expertise in materials science with long-standing experience in materials processing, industrial application and the upscaling of production and process technologies to pilot scale as well as in materials analysis and characterization. With a clear focus on sustainability, the Institute with its project groups is a strong R&D partner for industrial partners.

Contact
Dr. Sönke Steenhusen I Phone +49 931 4100-551 I soenke.steenhusen@isc.fraunhofer.de | Fraunhofer-Institut für Silicatforschung ISC, Würzburg I www.isc.fraunhofer.de