Optics / Lasers | Additive manufacturing methods | Technology Offer

Easy integration of functional regions into optical components generated by 3D printing

Field of application

Mature 3D printing technologies, which offer a high degree of freedom in design and a high resolution in printing, make printing optical elements an advantageous alternative to conventional micro-casting.
Printed optical elements can now be produced easily and inexpensively using microfluidic structures that are integrated into the print layout of the optical components and are formed during 3D printing, including functional regions such as apertures or structures for stray light absorption.

State of the art

The 3D printing of optical elements has gained more and more importance in the past few years, as it is more flexible and less expensive than conventional micro-casting. There are 3D printers available on the market that can produce complex optics. However, one of their downsides is that the component to be printed must be completely transparent, at least in the near infrared range (even more so during the stereolithographic process), meaning that no absorbing areas can be "printed" into the optics. There is a system where additional absorbing materials can be applied, but the options for micro-optics are not very flexible.

Innovation

In a project funded by the Baden-Württemberg Stiftung gGmbH, scientists from the University of Stuttgart have now developed a method that enables the simple and precise integration of functional regions (such as apertures and structures for scattered light absorption) into complex printed 3D optics. For this purpose, the micro-optical element is already provided with tiny cavities (micro-cavities) during printing, which later serve to absorb functional substances. Due to the small size of the cavities, capillary forces distribute the liquid within the cavities. For filling, a dispenser can be used. The filling process can be supported by applying pressure. The functional liquid is then dried or hardened.
Properties such as absorption, reflection or scattering properties of the functional areas are precisely determined via selection of the substance or the nanoparticles it contains.

Your benefits at a glance

- ✓ The functionality of optical components can e.g. be extended by
  - apertures
  - color filters
  - achromatic lenses
- ✓ Use of commercially available 3D printers
- ✓ Simple and inexpensive process
- ✓ Easy integration of new materials into the optical design

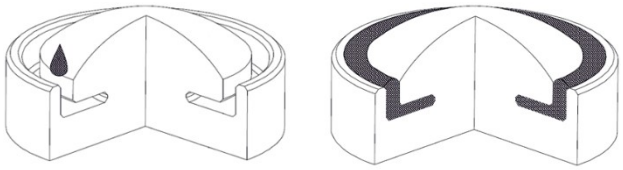

Figure: Schematic drawing of a lens with microcavity when filled with a functional substance (left); lens with resulting aperture (right).

Technology transfer

TLB GmbH manages inventions until they are marketable and offers companies opportunities for license and collaboration agreements.

Patent portfolio

Patent applications are pending in Europe (EP3162549 A1) and the USA (US2017120548 A1).

Contact

Dr.-Ing. Michael Ott
ott@tlb.de
Technologie-Lizenz-Büro (TLB)
der Baden-Württembergischen Hochschulen GmbH
Ettlinger Straße 25, D-76137 Karlsruhe
Tel. 0721 79004-0, Fax 0721 79004-79
www.tlb.de

Reference number: 15/024TLB