TAILORED LIGHT

ITA
Institut für Transport- und Automatisierungstechnik

Laser precision machining of polymer-based optics

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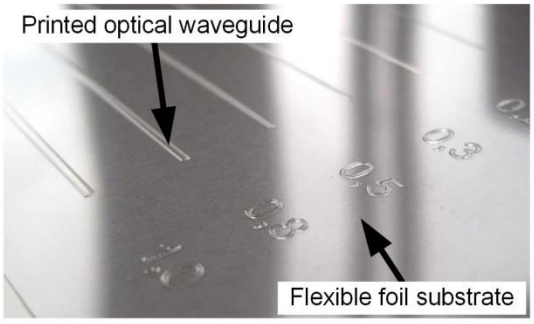
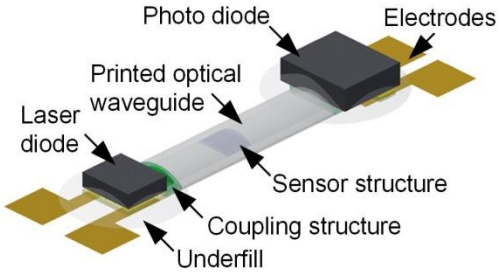
Project ID: A8

Motivation: For the production of tailored surface integrated optical waveguides selective deposition methods are used, such as e.g. printing or dispensing. Here, liquid optical polymers are used, which are cured after application using UV radiation. Coupling of the surface integrated optical waveguides with optical transmitters and receivers currently represents need for research because additional steps are necessary, such as polishing the end facets of the optical waveguide and the use of coupling optics. An integration of these steps in a generative production process increases the variability in the sense of an individualization of optical mass products (mass customization).





Top: Printed optical waveguides,
Bottom: Planar optronic sensor system.

Objective of the PhD project: The objective of this project is to use laser radiation for the preparation of the waveguide's end facets. In addition, certain areas of the applied optical polymers should be structured specifically and precisely to use them as coupling optics. This process allows for an efficient generation of structures for light input and output especially in the single-mode range, thereby eliminating the costly handling, positioning and adjustment of coupling optics.

In addition, it is possible to selectively tailor specific areas of the applied optical waveguides in its optical properties such that a local change of the propagation of light takes place. These modifications can provide a signal analysis on strain and temperature changes in the optical waveguides by using conventional FBG spectrum monitoring, enabling individualized sensor applications.

It is intended to achieve the above objectives by adjusting the laser beam in its wavelength, intensity and pulse duration based on the absorption properties of the optical polymer. A compact laser source can be integrated into the manufacturing process of the optical waveguides, so that the described processing steps take place simultaneously with the application.

This is a PhD-project of Tailored Light. Tailored Light is a coordinated PhD-programme of the Hanover Centre for Optical Technologies from the Leibniz Universität Hannover together with the Hochschule Hannover, the Laser Zentrum Hannover, the HAWK Hildesheim/ Holzminden/ Göttingen, the TU Braunschweig and the TU Clausthal.

Students interested in this or another project of Tailored Light can apply for fellowships. Have a look at www.tailored-light.uni-hannover.de for details.