PhoenixD
Photonics · Optics · Engineering
Innovation Across Disciplines

Leibniz Universität Hannover

Invitation to the PhoenixD Colloquium

Colloquium Chair: Prof. Dr.-Ing. Hans Jürgen Maier (Task Group M1)

Monday, January 10th, 2022, 10.15 – 12.00 am via Webex

https://uni-hannover.webex.com/meet/plenum

"2.5D & 3D micro-structures with Maskless Laser Lithography: Grayscale lithography & Two-photon Polymerization."

Dominique Collé

Heidelberg Instruments Mikrotechnik GmbH, Heidelberg

'Heidelberg Instruments' systems make it possible to expose any pattern directly onto photoresist coated substrates without fabricating a mask, which results in a significantly shorter prototyping cycle. The use of a digital mask also allows some quick modification of the design when necessary.
The possibility to modulate the energy of each pixel brings the control over the depth of resist removed, after exposure and development. This localized dose modulation can be represented as gray tones in a design between black (no dose / no depth in the resist) and white (highest dose / maximum depth in the resist) with up to 1024 different gray tones. Maskless grayscale lithography opens a new world of application from texturizing to micro-optic.
Micro-lenses array, diffusers, Fresnel lenses, blazed gratings and diffractive optic elements are some typical micro-structures made with grayscale lithography. The pattern made in positive photoresists is typically transferred to the substrate itself via etching or to a different material by replication.
With the acquisition of Multiphoton Optics, Heidelberg Instruments added two-photon polymerization in its portfolio. With this technology, it is possible to directly write some structures in a material that can be use permanently with minimum structure size down to 100 nm. When using liquid resins, it offers the possibility to directly pattern functional micro-objects on an existing device. In this case, a photoresist coated substrate and a pattern transfer via etching or replication are not necessary anymore.
Real 3D structures are fabricated with 2PP: stack of micro-lenses, meta-lenses, photonic crystals, scaffolds, micro-fluidic devices, …
An overview of the possibilities offered by those technologies will be given.

"Polymeric materials for PhoenixD"

Prof. Dr. Henning Menzel

Institute of Technical Chemistry, Macromolecular Chemistry, TU Braunschweig

Polymers are extremely versatile materials for photonics and optics. For example, electrorefractive polymers can be used in active elements. Different approaches to combine polymer chains with chromophores to obtain electrorefractive polymers that can be processed into active optical components are presented. Polymers can also serve as a matrix for dyes or optically active nanoparticles. Electrospinning under stable beam conditions is presented as a method to fabricate very thin fibers from such polymers with incorporated laser dyes and fluorescent nanoparticles. Such fibers may find use as fiber lasers, to redirect light, or in light harvesting applications.