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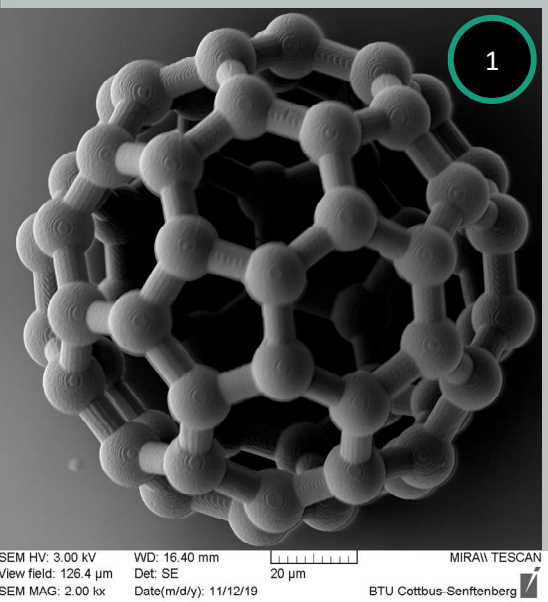

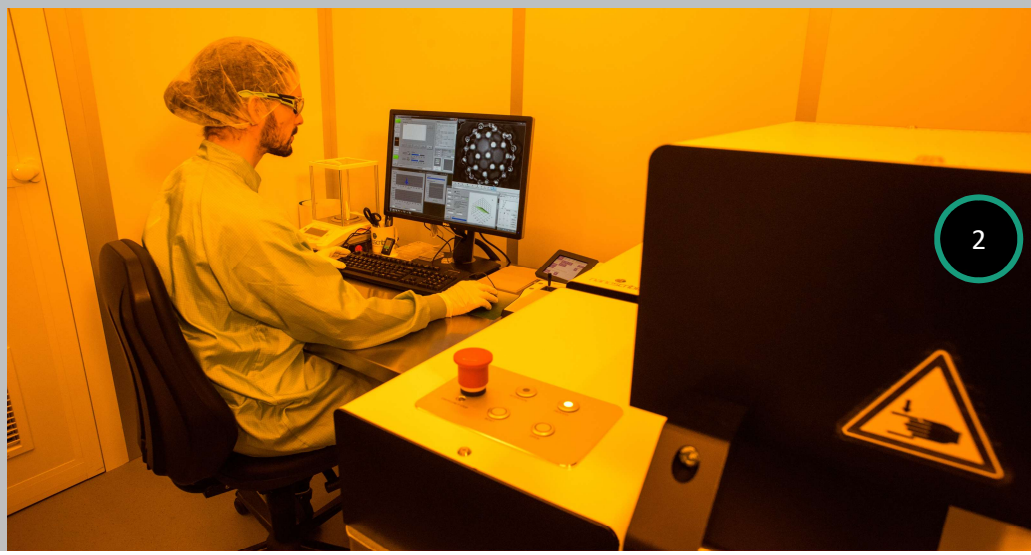

TWO-PHOTON LITHOGRAPHY SYSTEM

Our Photonic Professional GT2 two-photon lithography system from Nanoscribe (Fig. 1) enables nano- to meso to macro additive manufacturing of polymers based on the principles of two-photon absorption. It can be used to create crystal lattice-like, porous or bionic structures, undercuts, smooth contours and sharp edges out of various polymers (Fig. 2 & 3). The flexibility, versatility and speed this system offers, facilitates rapid prototyping of concepts on substrates ranging from wafers to MEMS.

Applications:

- Optical surfaces and structures (Fig. 4)
- Microfluidics
- Photonic & mechanical metamaterials (Fig. 5)
- Master molds for NIL (Fig. 6 & 7)

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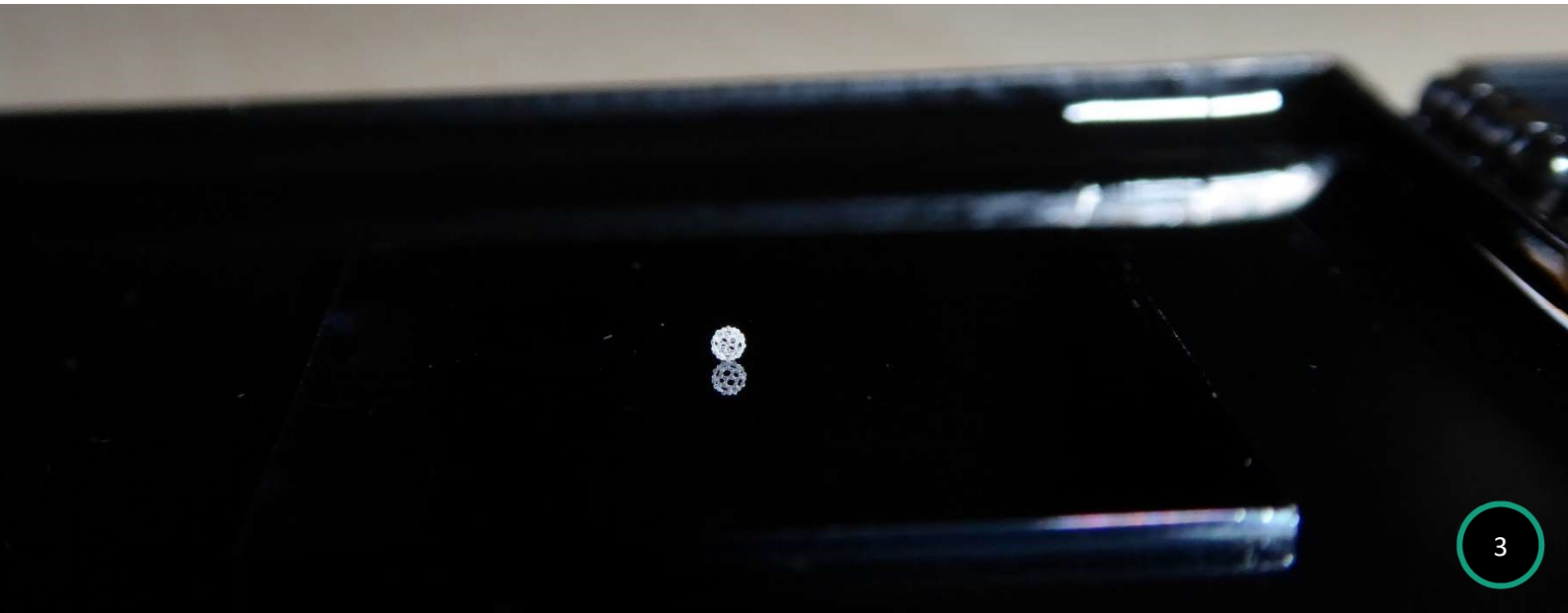

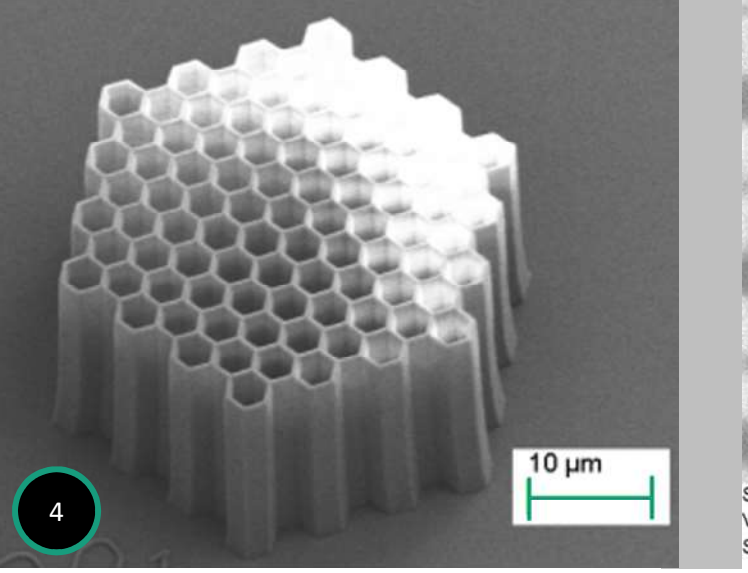

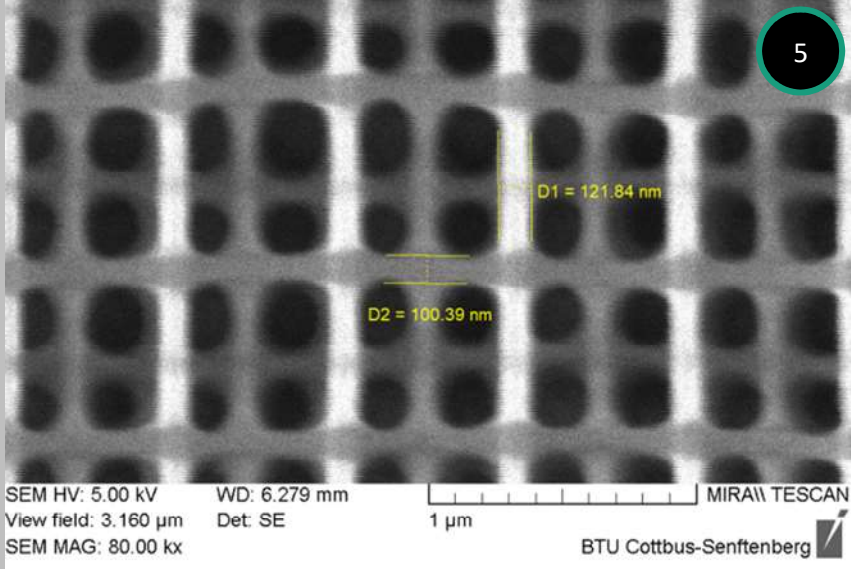

The three-dimensional additive manufacturing of micro- and nanostructures in photo-sensitive materials is based on a non-linear two-photon absorption process. Two photons of near-infrared light need to be absorbed simultaneously. A sufficiently high light intensity is provided by a femtosecond laser beam. The pulsed beam ensures high photon density temporally and focusing it into the resin increases it spatially, allowing two-photon absorption and thus polymerization in the focal volume (voxel). The resin is otherwise transparent to the wavelength of the photons, which is why only the voxel gets polymerized. Moving the laser focus along a trajectory in all three dimensions enables the creation of almost arbitrary structures.

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Pre- and postprocessing options:

- O2-Plasma activation
- Silanization
- Part-removal from substrates
- Optical characterization (DHM, IR-M, opt. microscopy)
- Carbon-, gold- and aluminium sputtering
- SEM characterization

Technical Specifications	
Fs-fiber laser	Pulse length <120 fs
	Repetition rate: 80 MHz ± 1MHz
	Average power >120 mW
	Center wavelength: 780 nm ± 10 nm
	Minimum voxel size: <1 µm
Motorized scanning stage	Maximum writing field 100 x 100 mm²
	Maximum build height 8 mm
Immersion objectives	63x / NA = 1,4 / AA = 190 µm
	25x / NA = 0,8 / AA = 380 µm
	10x / NA = 0,3 / AA = 700 µm
Photoresists	IP-Dip, IP-L, IP-S, IP-Meso, mr-DWL_5, mr-DWL_40