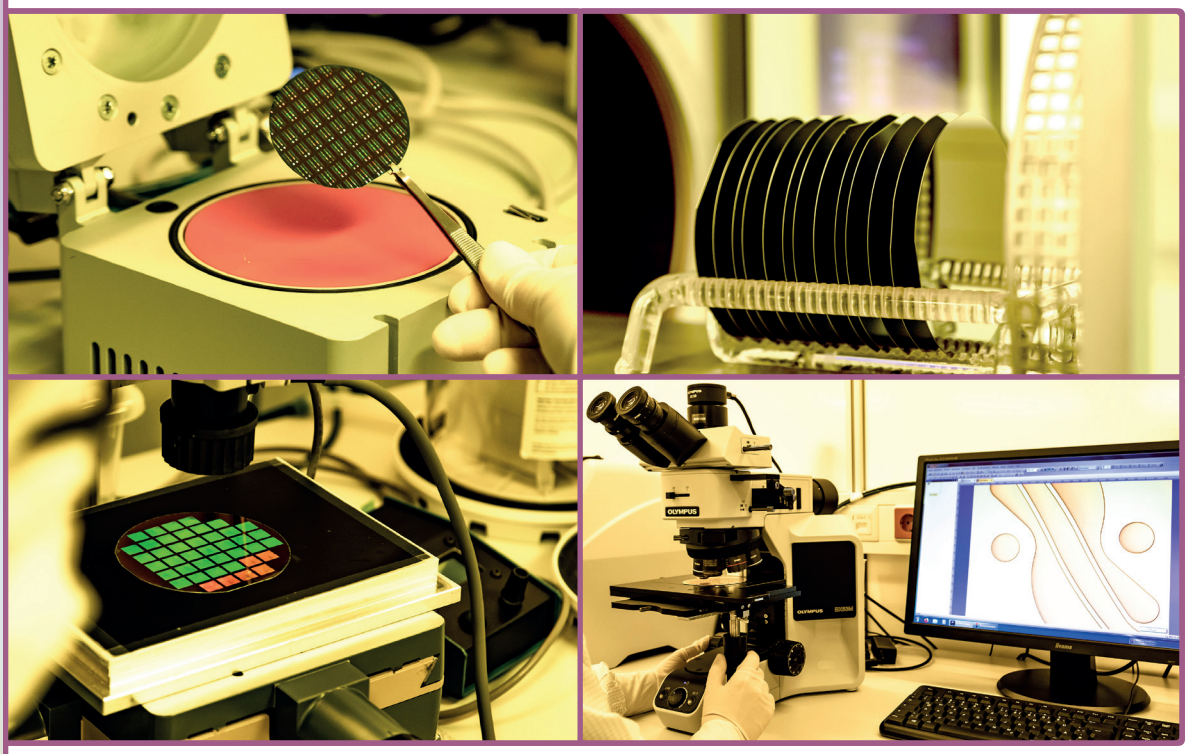
micro resist technology

Lithographic Services & Application Engineering



micro resist technology has a long term experience in material development, processing & patterning as well as application engineering. Based on our product portfolio and hands-on experience, we offer the following lithographic services:

Processing

- Coating / dispensing systems
- Photolithographic tools (mercury arc lamp & UV-LED)
- Imprint tools (thermal & UV-based)
- Bake systems
- Plasma tool
- Anti sticking layer deposition

Metrology

- Film thickness measurements
- Mechanical profilometer
- Scanning electron microscope
- Atomic force microscope
- Spectroscopy (insitu)
- Dill-Parameter

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2024

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Lithographic Services & Application Engineering
Coating – Patterning – Consulting

1. Substrate coating

Fabrication of various film thicknesses (x)

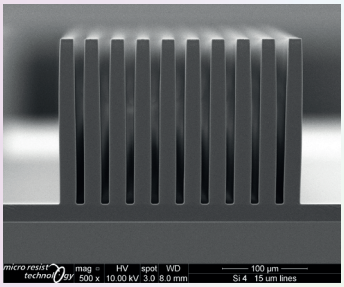
	0.1 - 2 µm	2 - 5 µm	5 - 15 µm	15 - 50 µm	50 - 75 µm	75 - 500 µm	500 - 1000 µm
Positive resists	x	x	x	x	x	x	
Negative resists	x	x	x				
e-beam & DUV resists	x						
SU 8 based resists		x	x	x	x	x	x
Dryfilm resists**			x	x	x	x	
NIL* resists	x	x	x	x	x	x	
Optical polymers		x	x	x	x	x	
UV PDMS				x	x	x	x
Inkjet printing polymers**			x	x	x		

- Substrates: Silicon, glass, Au, Ni, Cu, CrAu, TiAu, flexible substrates, polymeric films, PCB
- Substrate size : Wafer 4“ / 6“, round and square are possible
- Anti-sticking layer for hard & flexible working stamps & masters (F13-TCS)

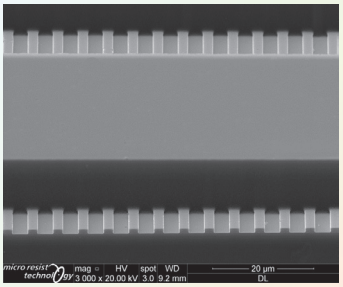
2. Lithographic patterning

Patterning of different thicknesses

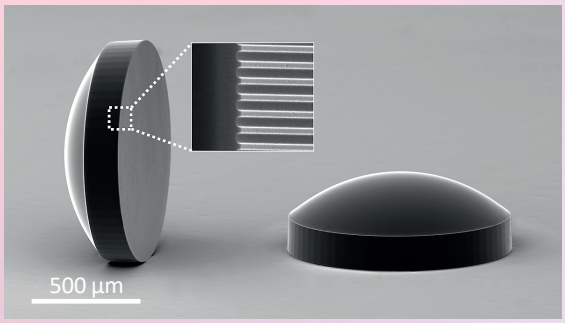
- UV lithography (Hg-lamp: λ = 365 / 405 / 436 nm; LED: λ = 365 / 390 / 410 nm)
- Laser interference lithography, LIL (λ = 405 nm)
- Thermal & UV imprinting (λ = 365 / 390 nm)
- UV molding & replication (λ = 365 nm)
- Inkjet printing**



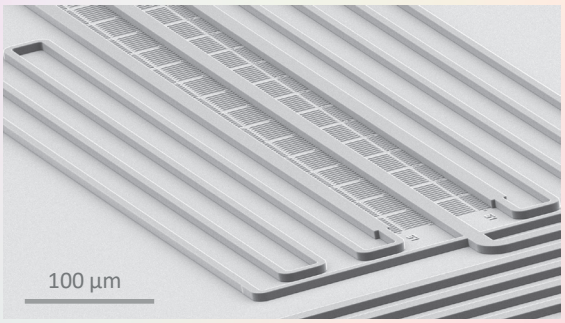
SU-8 lines and spaces with 180 µm height on top of 20 µm SU-8 base layer made by UV-lithography



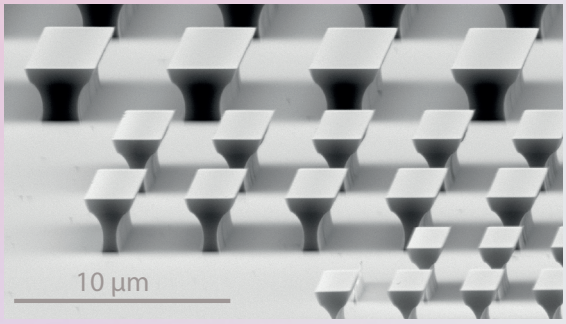
SU-8 multi layers patterned by UV-lithography



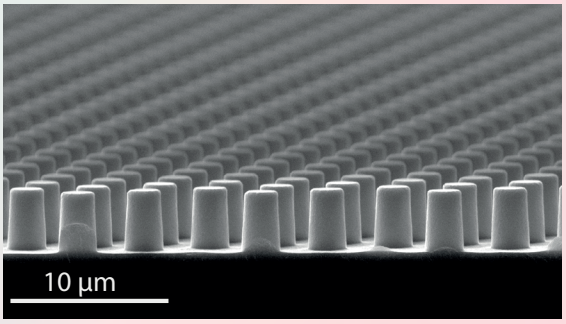
Microlenses made of InkOrmo with integrated nano grating fabricated by a combination of inkjet dispensing and UV-replication



3-layer microfludic pattern made of SU-8 3000 and modified SU-8 all exposed with mask aligner



ma-N490 lift off pattern with noticeable undercut profile



OrmoClear® pillar structure made by nanoimprinting

* NIL stands for Nanoimprint Lithography, ** with external partners if needed

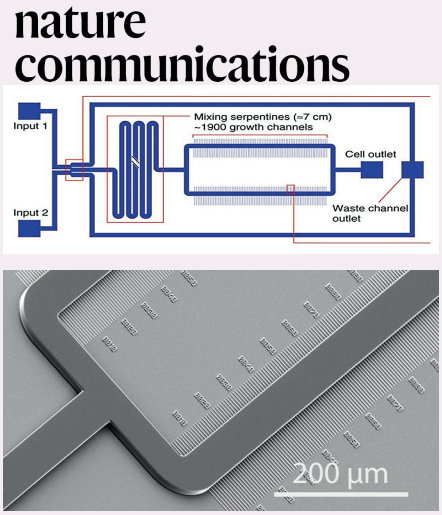
3. Mastering and prototyping: Examples

Fabrication microfluidic masters

For several universities and institutes we fabricated microfluidic masters based on customers chip design (top). These masters are structured with modified **SU-8** (bottom) and subsequently used for the fabrication of PDMS microfluidic devices by our customers themselves. The master design can have up to 4 layers with different dimensions. Possible lateral dimension start at 0.6 µm at lowest film thicknesses of 0.3 µm.

Kaiser, M. et al. Monitoring single-cell gene regulation under dynamically controllable conditions with integrated micro-fluidics and software. Nat Commun 9, 212 (2018)

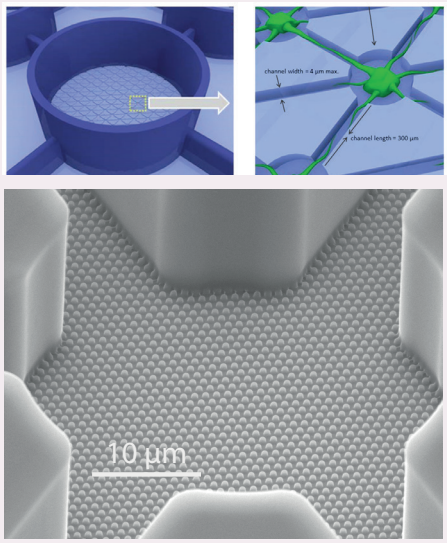
https://doi.org/10.1038/s41467-017-02505-0



Hierarchical structures for Bioanalytical lab-on-chip devices

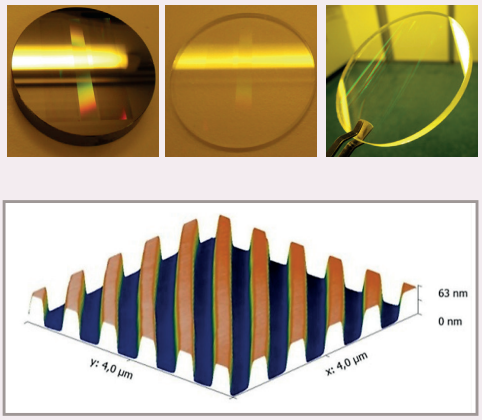
For the growth of neurons in micron-sized patterns (top) we enhanced bioanalytical lab-on-chip devices by transforming micro pattern into a hierarchical pattern.
The hierarchical structure with UV-exposed micropattern were made of SU-8 and are on top of previously nanoimprinted pillars made of **mr-NIL 6000E**. The chip was replicated subsequently into **mr-NIL210** (bottom).

Lohse, M. et al. Versatile fabrication method for multiscale hierarchical structured polymer masters using a combination of photo- and nanoimprint lithography, Micro and Nano Engineering, Volume 10 (2021)



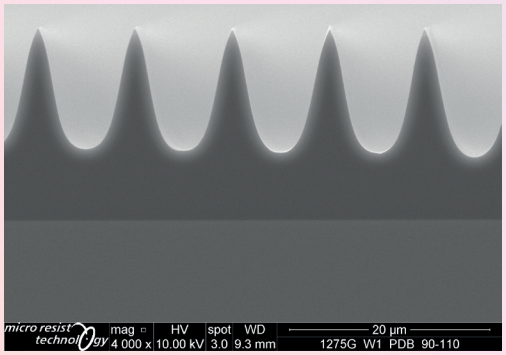
Replicated High-Quality Micro-Optics

For the replication of high end reflection zone plates (top left), we developed a replication process based on **OrmoStamp®** for the working stamp (top middle) and **OrmoComp®** for the final sellable replica (top right). We optimized the UV-curing and baking steps to preserve the surface microroughness (0.5 nm rms), global flatness (< 1 µm PV) and step height (60 nm) of the zone plate master.
These reflection zone plates are e.g. used for state of the art scientific applications in VUV sources for photoelectron spectroscopy.

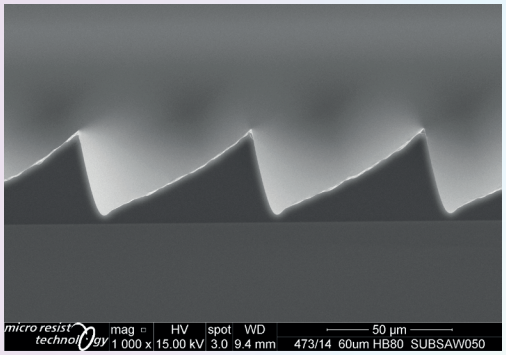


NEW HIGHLIGHTS

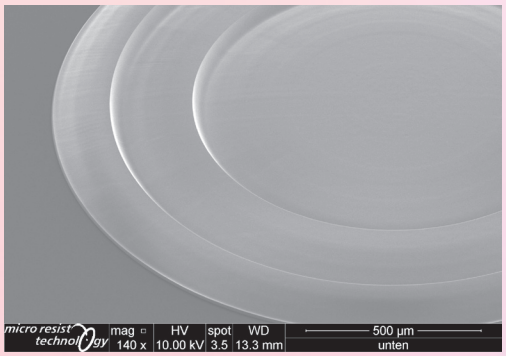
4. Greyscale Photoresist Patterning - Mask based Lithography & Photoresist Processing



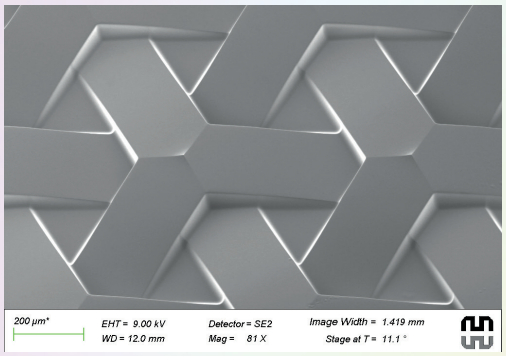
Periodic photoresist pattern in ma-P1200G with pattern depth approx. 13 µm using greyscale chromium mask photolithography process



Aperiodic saw tooth pattern in ma-P1200G with pattern depth approx. 40 µm using greyscale chromium mask photolithography process

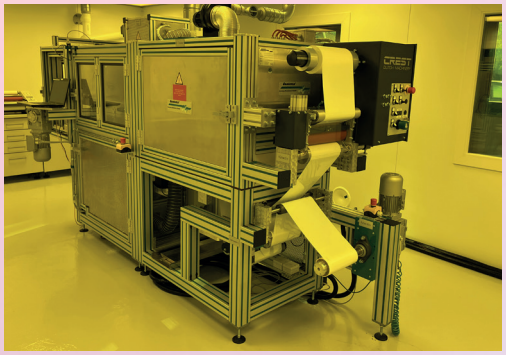


Fresnel lens test pattern in ma-P1200G photoresist with pattern depth approx. 60 µm fabricated by greyscale lithography utilizing a HEBS mask

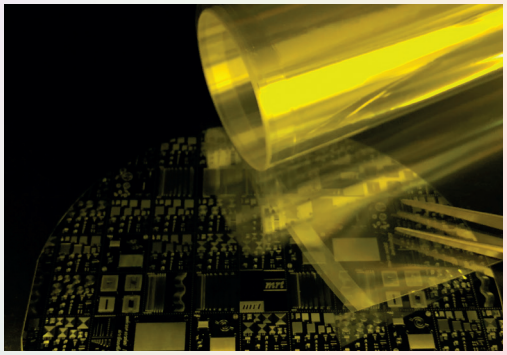


Advanced greyscale micro patterning with pattern depth approx. 90 µm using laser direct writing and an optimized photoresist processing

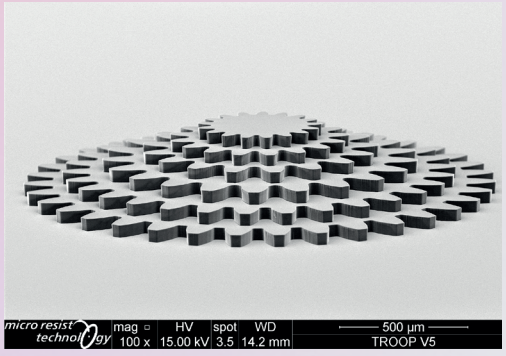
5. Dry Film Production & Dry Film Processing



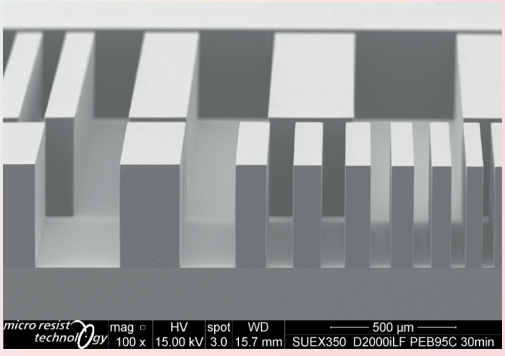
Roll-to-roll coating machine for dry film resists with variable thicknesses (in the example shown, the dry film is sealed with a white protective foil)



In-house fabricated roll of mr-LamiRes dry film resist with 50 µm layer thickness, laminated on a 100 mm wafer and patterned by UV mask-aligner



Multilayer UV-lithography patterning example realized with mr-LamiRes dry film, consisting of 6 layers of 50 µm film thickness each



Test pattern made of SUEX dry film with 350 µm film thickness exposed with i-line filter