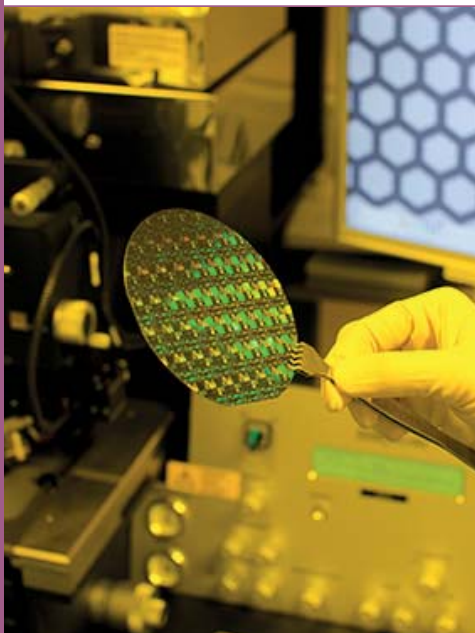


Lithographic Services & Application Engineering



Based on its product portfolio and hands-on experience, micro resist technology offers lithographic micro and nanopatterning services, as well as conducts feasibility studies and the prototyping of demonstrators.

Lithographic processes

- Coating of thin to ultra-thick layers on different substrates
- Patterning by UV-photolithography
- Pattern replication by thermal and UV-NIL
- Inkjet printing

Plasma processes

- Material stripping
- Surface cleaning and activation

Application Engineering

- Made in Germany -



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Our products enabling your Ideas!

Lithographic processes

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		
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	
NIL* resists	x	x					
Optical polymers		x	x	x	x	x	
UV PDMS				x	x	x	x
Inkjet printing polymers**							

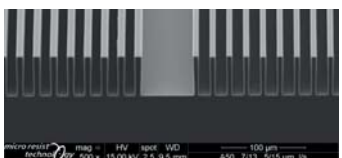
- Substrate of: Silicon, glass, Au, Ni, Cu, CrAu, TiAu, flexible substrates, plastic films
- Substrate size : Wafer 4" / 6", Round and square are possible
- Anti-sticking layer for hard & flexible working stamps & masters (F13TCS)

2. Lithographic patterning

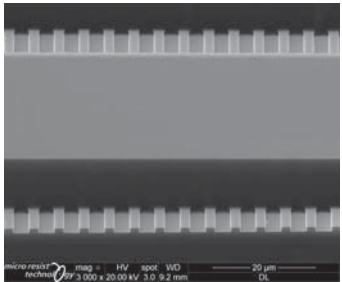
Patterning of different thicknesses

- UV lithography ($\lambda = 365 / 405 / 436 \text{ nm}$)
- Laser interference lithography, LIL ($\lambda = 405 \text{ nm}$)
- Thermal & UV imprinting ($\lambda = 365 / 390 \text{ nm}$)
- UV molding & replication ($\lambda = 365 \text{ nm}$)
- Inkjet printing**

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



50 μm thick SU-8 layer patterned by UV-photolithography



SU-8 multi layers patterned by UV-lithography

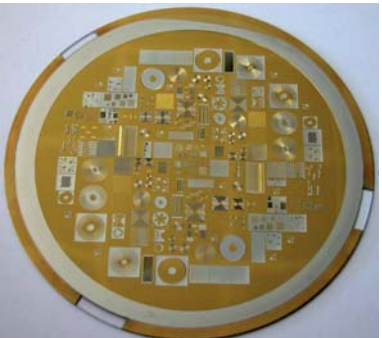
Plasma processes

Surface preparation & cleaning

- Plasma cleaning
- Surface activation

Cross-linked material removal

- Ultra thick organic photoresists (e.g. for MEMS)
- Ultra thick SU-8 layers
- Hybrid polymers *



Fast removal by purely chemical and isotropic etching, Processing temperatures below 100°C, No damage of metals

* depending on substrate

Application Engineering

Based on our lithographic services and product portfolio, applying our hands-on experience, we offer the prototyping of demonstrators, feasibility studies and single process steps for specific application either as services or in a collaborative framework.

Examples

Typical examples of processes which we have been developing for partners & customers:

- Coating and patterning of different kinds of substrates
- UV-replication and Nanoimprint Lithography (NIL) of functional patterns
- Inkjet printing of specific microlens arrays

Fabrication of a multilayer microstructure array

Based on a customer design, a multilayer microstructured array, with insulated gold conductor tracks and electrochemically enhanced contact pads has been fabricated at micro resist technology.

Products involved:
ma-N 415, ma-N 490, ma-P 1275, SU-8



Microstructure array fabricated by multiple UV-photolithography and electroplating steps
(Courtesy of Fritz-Haber-Institute, Berlin, Germany)

NIL based replication of diffractive optical elements (DOEs) for counterfeiting application

A UV-NIL & LiGA based multi-step replication process has been developed in cooperation with Mimotec SA in order to transfer DOEs from a 4"-Silicon master wafer into single final Nickel elements.

Products involved:
OrmoStamp®, OrmoComp®, UV-PDMS and mr-NIL 6000E



UV-NIL & LiGA process developed in cooperation with Mimotec SA : 4"-Silicon master replicated into UV-PDMS, OrmoStamp®, mr-NIL 6000E and electroplated into Nickel elements.

UV-replication of Fresnel zone plates

A UV-replication process has been applied at micro resist technology to replicated Fresnel zone plates from the FhG-HHI into a first replication generation working stamp (one zone plate as an example on the left image) and a second generation of finale zone plate array which functionality is shown on the right image.

Products involved: OrmoStamp®, OrmoComp®

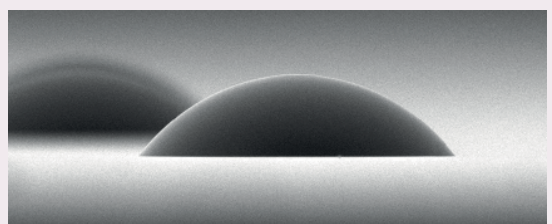


UV-Replication process done in cooperation with the Fraunhofer Heinrich-Hertz-Institute: 4"-Silicon master wafers with Fresnel Zone plates have been replicated into OrmoStamp® and OrmoComp®.

Inkjet printing of refractive microlens arrays

Based on a customer request, convex refractive microlens arrays have been designed and inkjet printed at micro resist technology on a layer of the same optical polymer.

Products involved: OrmoComp®, InkOrmo



Microlenses inkjet printed at micro resist technology. SEM shows a side view of a 60 µm microlens (diameter), part of a 5x5 microlens array.

Equipment

Processing

Coating/Dispensing system

- Sawatec spin-coaters

Mask aligners

- SUSS MicroTec MA56
- SUSS MicroTec MA6

Imprint tools

- NIL Technology CNI v2.0 desktop nanoimprinter
- Obducat NIL 2.5 nanoimprinter

Inkjet-printing tool

- MicroFab Technologies based tool

Bake systems

- Programmable precision hotplates
- Convection Ovens

Plasma tools

- TEPLA 200 SEMI AUTO
- R3T STP 2020 (MUEGGE)

Metrology

Film thickness measurements

- FTP adv. for films $\leq 60 \mu\text{m}$ thick (reflectometer)

Mechanical profilometer

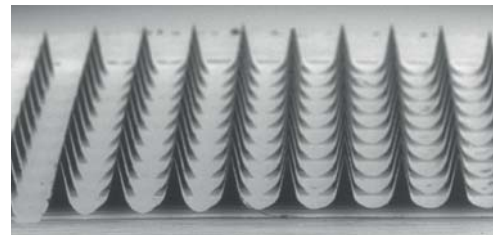
- Bruker DektakXT for structures $\leq 1000 \mu\text{m}$ thick

Scanning electron microscope

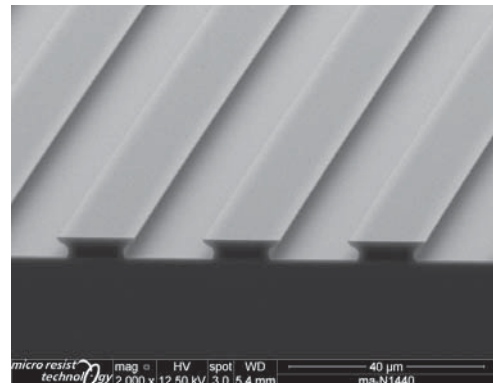
- FEI Inspect S 50



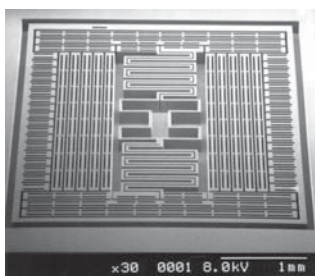
Imprinted with a Cr/Ni-coated OrmoStamp® stamp in mr-BioNIL100_SF_XP on a PET substrate, structure height of 180 nm and diameters of pillars of 400nm (small array in front) and 120 nm for logo



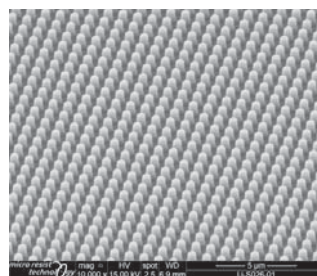
5 mm array of microneedle replicated at micro resist technology GmbH (Courtesy of TheraKine)



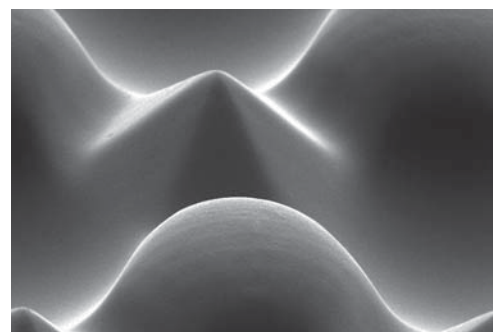
4 μm thick negative resist lift off pattern



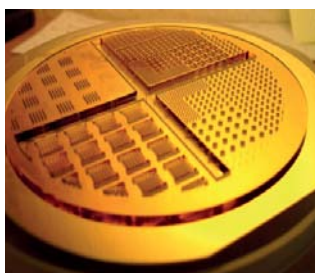
200 μm thick SU-8 layer patterned by UV-photolithography done at micro resist technology



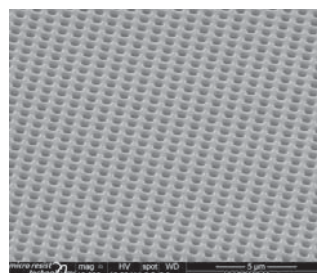
SEM picture of a soft UV-NIL imprint into mr-NIL210



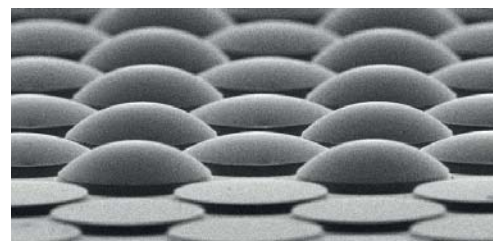
Convex and concave hexagonal lenses and pyramids in ma-P 1275 G, patterned by laser direct writing



1000 μm thick SU-8 patterned by X-ray lithography (in cooperation with HZB)



Corresponding soft UV-NIL working stamp made of KER-4690 UV-PDMS



Inkjet printed array of microlenses having two different focuses. Process done in cooperation with the EPFL