**PFAS-free products -
we pay attention**

micro resist technology

Positive Photoresists

Ready-to-use high performance photoresists for standard UV, greyscale, and laser interference lithography

- Excellent process compatibility
- Variety of viscosities
- No post exposure bake required
- Easy removal
- RoHS compliance
- Production according to ISO 9001 and ISO 14001
- PFAS-free

- Made in Germany -

micro resist technology GmbH
Gesellschaft für chemische Materialien spezieller Photoresistsysteme mbH

Köpenicker Str. 325
12555 Berlin
GERMANY

phone +49 30 64 16 70 100
fax +49 30 64 16 70 200
mail sales@microresist.de
info www.microresist.com

www.microresist.com

Positive Photoresists

High perfomance materials for the most versatile applications

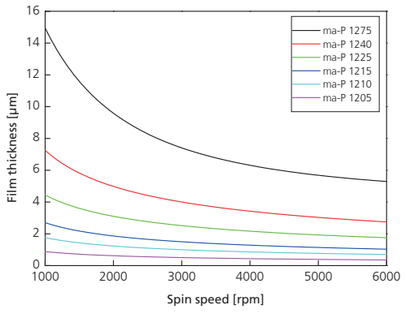
Properties and key parameters

Resist	Patterning method					Spectral sensitivity	Typical film thickness		Developer			Pattern transfer methods
	Standard UV lithography	Pattern reflow	Grey scale lithography: Direct write lithography (DWL)	Grey scale lithography: Mask	Laser interference lithography (LIL)	[nm]	Spin coating @3000rpm [µm]	max. film thickness [µm]	TMAH based	NaOH based	Silicate / phosphate based	
ma-P 1200 series[1]	x	x				330 - 450	0.5 - 7.5		mr-D 526/S	ma-D 331 ma-D 331/S		Dry and wet etching, Electroplating, Ion implantation, Master for thermal (e.g. PDMS) and UV moulding (e.g. OrmoStamp®FF or UV-PDMS) from reflowed patterns
ma-P 1275HV	x	x				350 - 450	11	60 - 70	mr-D 526/S	ma-D 331 ma-D 331/S		
mr-P 1200LIL series[2]					x	330 - 450	0.1 - 0.2				ma-D 374/S	Dry and wet etching
ma-P 1200G series[3]	x		x	x	x	350 - 450	1.5 - 9.5	60[4] 120[5]	mr-D 526/S[6]	ma-D 331[7]		Master for thermal (e.g. PDMS) and UV moulding (e.g. OrmoStamp®FF or UV-PDMS) Electroplating
mr-P 22G_XP			x very deep	(x)	x	330 - 420	17	120 - 140[4] 170 - 200[5]	mr-D 526/S (ma-D 532/S)			

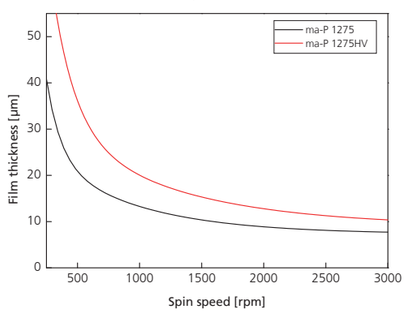
Available types:
[1] ma-P 1205 / ma-P 1210 / ma-P 1215 / ma-P 1225 / ma-P 1240 / ma-P 1275
[2] mr-P 1201LIL / mr-P 1202LIL
[3] ma-P 1215G / ma-P 1225G / ma-P 1240G / ma-P 1275G

[4] single coating
[5] double coating
[6] for greyscale lithography
[7] for binary lithography

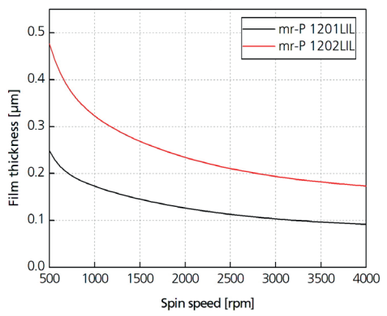
Spin curves ma-P 1200 series
@ 30 s spin time



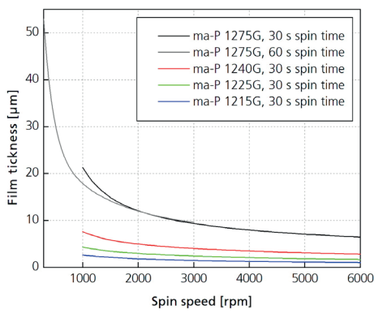
Spin curves ma-P 1275 / 1275HV
@ 60 s spin time



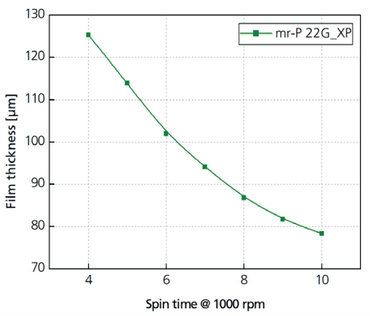
Spin curves mr-P 1200LIL
@ 30 s spin time



Spin curves ma-P 1200G



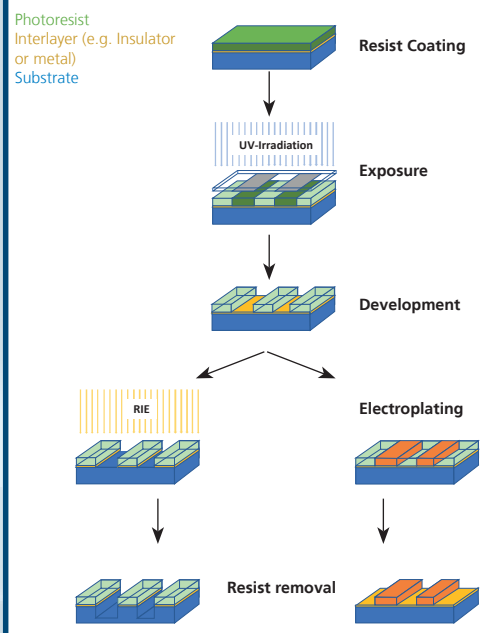
Thinkness vs. spin time mr-P 22G_XP



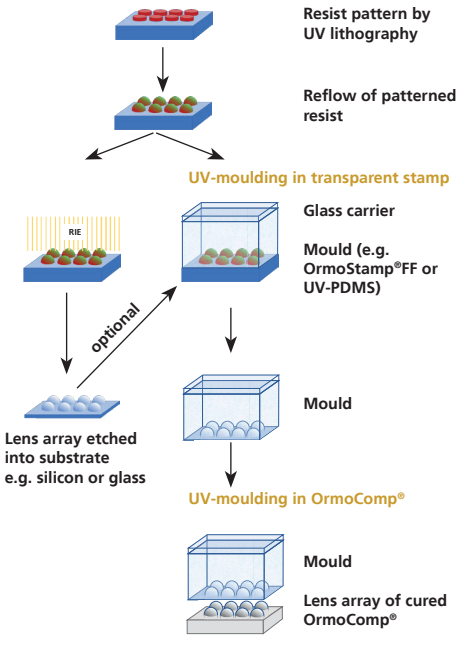
Manufactured in Berlin, Germany

enabled by ready-to-use formulations

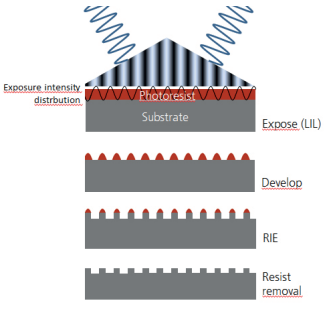
Process flow RIE / Electroplating

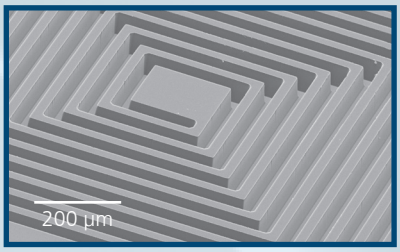


Process flow Reflow of ma-P 1200 / ma-P 1200G and pattern transfer

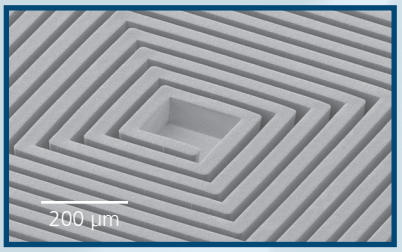


Process flow Laser Interference Lithography and etching

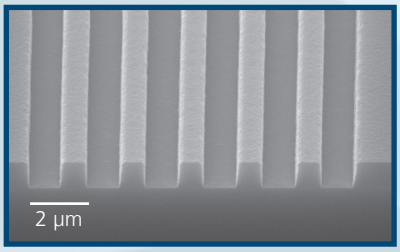




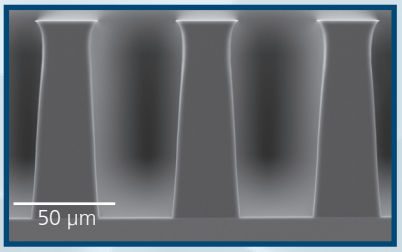
56 µm thick ma-P 1275HV mould



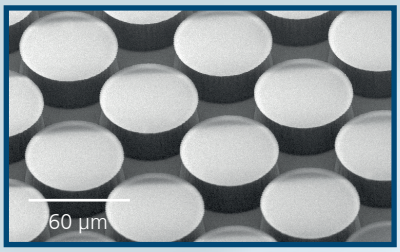
48 µm thick electroplated Ni



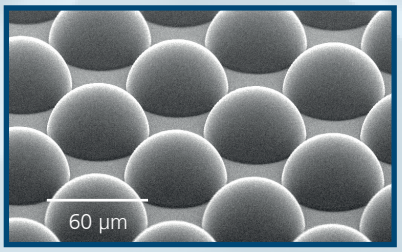
0.8 µm lines in 1.0 µm thick ma-P 1210



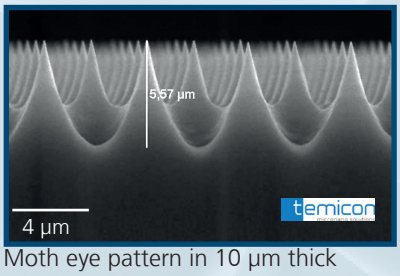
30 µm lines in 100 µm thick ma-P 1275G



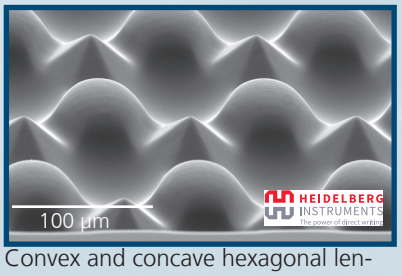
20 µm high ma-P 1275, 60 µm diameter pillars



30 µm high reflowed ma-P 1275, 60 µm diameter

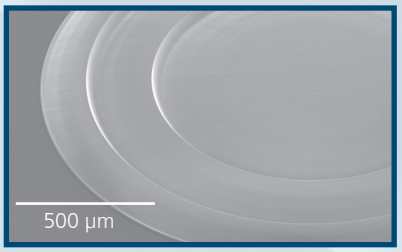


Moth eye pattern in 10 µm thick ma-P 1275G patterned by LIL @ 351 nm

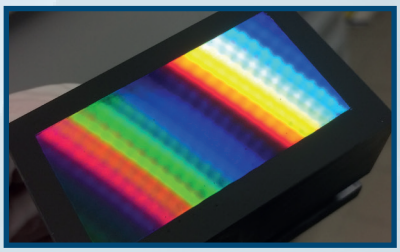


Convex and concave hexagonal lenses, 60 µm diameter in ma-P 1275G

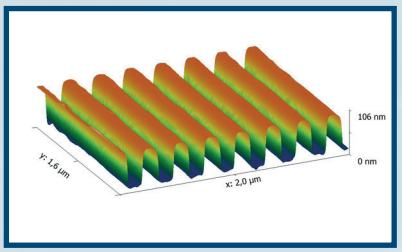
Test pattern, 63µm pattern depth, patterned by Heidelberg Instruments



Fresnel lens, 2 mm diameter, 42 µm depth, patterned in ma-P 1275G



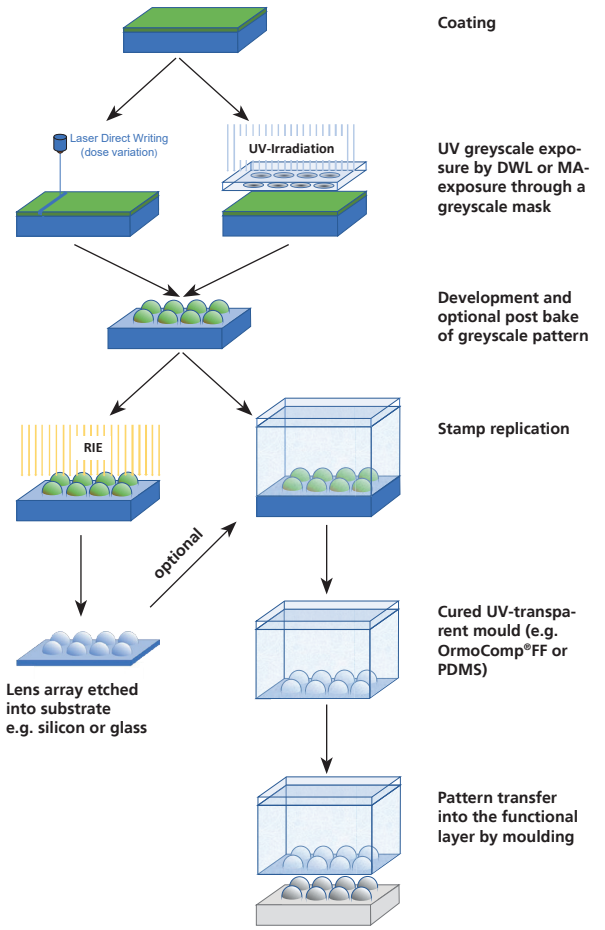
Diffractive optic: laminar grating (50 x 30 mm²) in mr-P 1202LIL

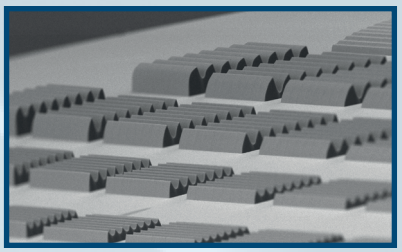


100 nm thick mr P 1201LIL, 125 nm pattern width

Positive Photoresists
e.g. for 2.5 D applications

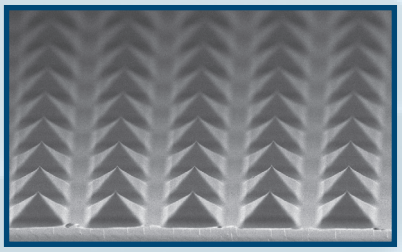
Process flow **Greyscale Lithography and pattern transfer**



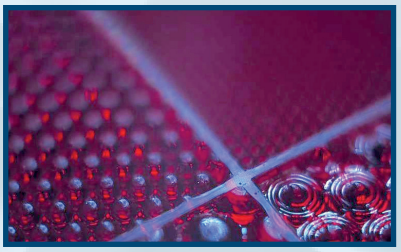


MA exposure with 405 nm filter, HEBS glass greyscale mask (by Canyon Materials Inc.): max. 70 µm high saw tooth patterns in different heights and pitches

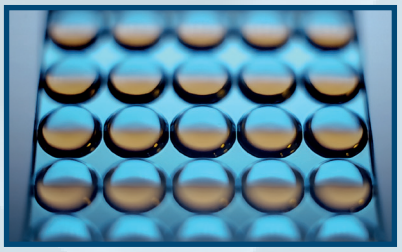
103 µm high, 2 mm diameter Fresnel lens[1] (DWL66+)



DWL @λ = 355 nm
Pyramids, 10 µm base width, 5 µm height, 45 °angle[2]



Direct Write Lithography @λ = 405 nm with (PICOMASTER XF 200): 125 µm high lenses, and Fresnel lenses 500 µm diameter[3]



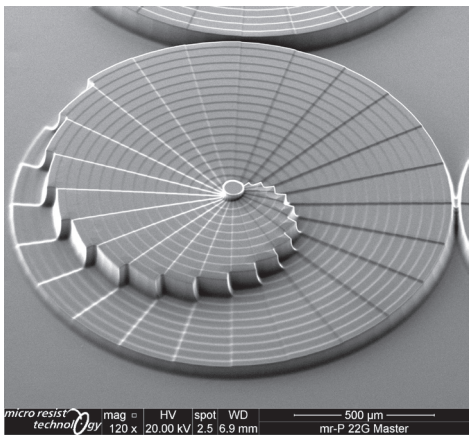
DWL @λ = 405 nm with DWL 66+:
70 µm high, 500 µm diameter lenses[1]

Greyscale pattern in mr-P 22G by Direct Write Lithography @λ = 405 nm with DWL 66+[1]

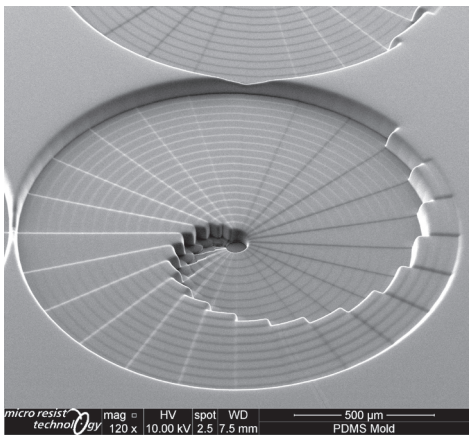
patterning and pictures by courtesy of
[1] Heidelberg Instruments Miktrotechnik GmbH
[2] IMS CHIPS
[3] RAITH laser systems

Pattern transfer by UV moulding

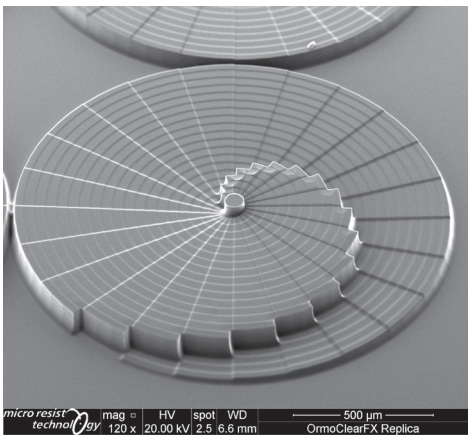
Process flow **Pattern transfer (example)**



Pattern transfer from
130µm deep mr-P 22G_XP pattern



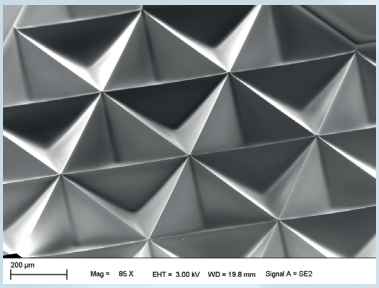
Thermal moulding with PDMS



UV moulding with OrmoClear®FX

Positve Photoresists
highlights and inspirations

Highlight: Thick Film Positive Photoresist for Greyscale Lithography - mr-P 22G_XP



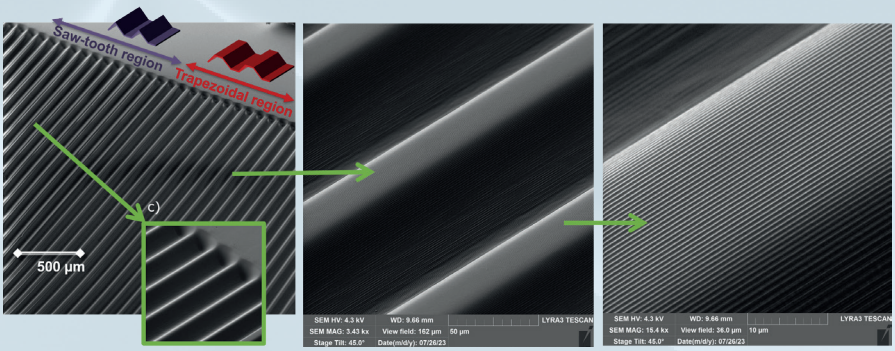
DWL @λ = 405 nm with DWL 66⁺:
155 µm deep pyramid pattern[1)]

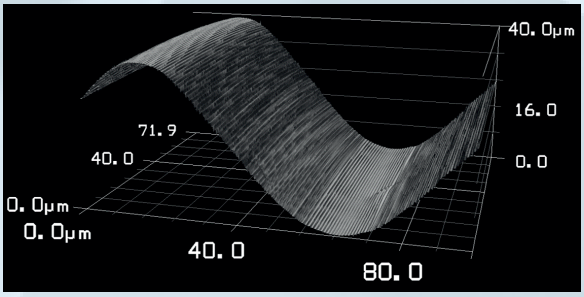
Main features

- ⇨ Specifically designed for the requirements of greyscale lithography in up to 200 µm thick films for up to 140…160 µm deep greyscale patterns
- ⇨ Very low residual absorption after exposure enables up to 150-160 µm pattern depth in greyscale lithography
- ⇨ Suitable exposure wavelengths: λ = 330–420 nm (λ = 405 nm and higher suited for deep patterns)
- ⇨ Aqueous alkaline development with TMAH based developers

Experimental approaches:

ma-P 1275G hierarchical patterns by mix&match (combining DWL & LIL)





- ⇨ Large structure (405nm - DWL manufactured); 100 µm grating period, 40 µm depth
- ⇨ Small structure (405nm - LIL manufactured); 690 nm grating period, ~ 400nm depth

- ⇨ Optical pattern assessment: 405nm - LIL manufactured surface gratings on different parts of the 405nm - DWL fabricated wave pattern in ma-P1275G

patterning and pictures by courtesy of Joanneum Research and University of Žilina

JOANNEUM RESEARCH MATERIALS
UNIVERSITY OF ŽILINA
OPTIMAL
AutOmated Maskless Laser Lithography Platform for First TIme Right Mixed ScALe Patterning

Contacts:

micro resist technology GmbH
Köpenicker Str. 325, 12555 Berlin
Germany
Telefon: +49 30 64 16 70 100
E-Mail: sales@microresist.de

microresist.de

LinkedIn

Distributors