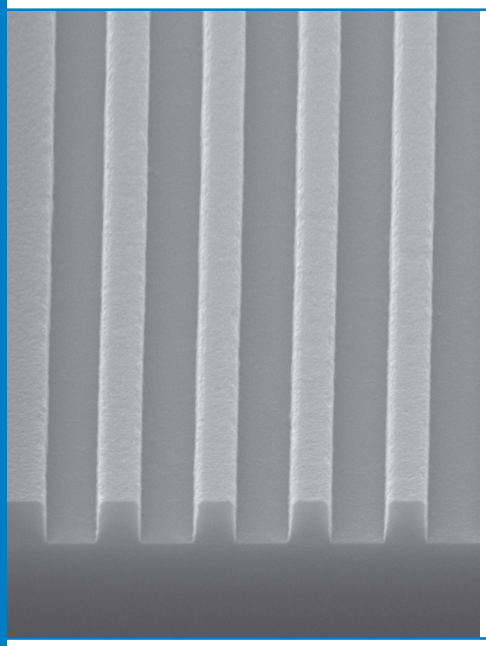
PFAS-free products - we pay attention

micro resist technology

Positive Photoresists for UV, Laser & Greyscale Lithography



- **ma-P 1200 series, ma-P 1275HV** for standard UV lithography
- **ma-P 1200G series** for greyscale lithography
- **ma-P 1200LIL series** for laser interference lithography

Unique features of the positive photoresists

- Designed for - UV Lithography (mask aligner, laser grey-scale lithography, laser interference lithography)
- No post exposure bake
- Easy removal
- Ready-to-use resist solutions in a variety of viscosities

- Made in Germany -

SCAN ME

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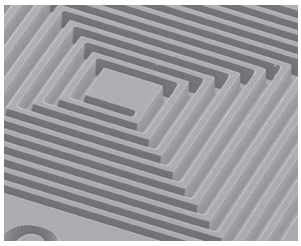
Positive Photoresist Series and Thick Film Photoresists for UV lithography

Resist		ma-P 1200 series	ma-P 1275	ma-P 1275HV
Spectral sensitivity	nm	330 - 450	350 - 450	350 - 450
Ready-to-use solutions for various film thicknesses	µm	ma-P 1205 → 0.5 ma-P 1210 → 1.0 ma-P 1215 → 1.5 ma-P 1225 → 2.5 ma-P 1240 → 4.0 ma-P 1275 → 7.5 @ 3000 rpm	6 - 40 in one spin-coating step	10 - 60 in one spin-coating step
Exposure dose @ 365 nm*	mJ cm^{-2}	35 - 150	150 - 3000	300 - 4000
Developer		ma-D 331 & ma-D 331/S (NaOH based); mr-D 526/S (TMAH based)		

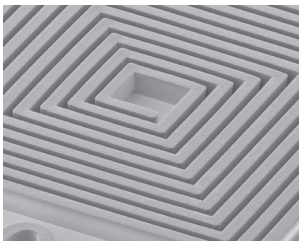
* Mask aligner broadband exposure

Resist patterning with mask aligner broadband exposure and pattern transfer

Resist mould for electroplating

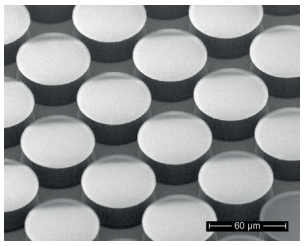


56 µm ma-P 1275HV mould

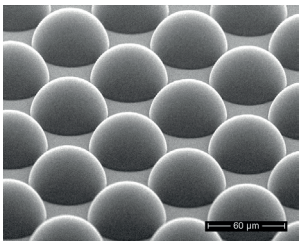


48 µm electroplated Ni

Resist pattern reflow



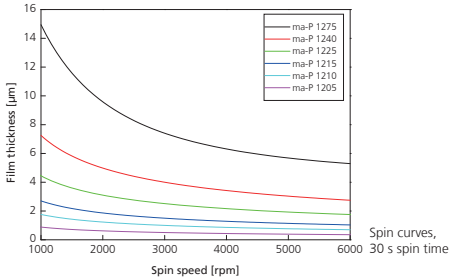
20 µm ma-P 1275,
60 µm diameter pillar



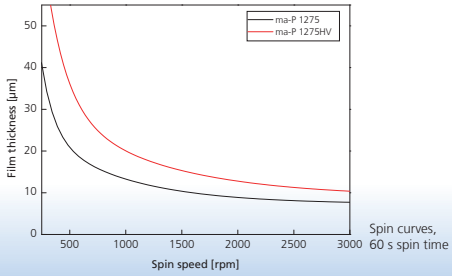
30 µm reflowed ma-P 1275,
60 µm diameter

ma-P 1200 series and ma-P 1275 & ma-P 1275HV
for microsystems technology and microelectronics

- Film thickness up to 50 µm
- Broadband-, g- and i-line exposure
- High stability in acid and alkaline plating baths
- High dry and wet etch resistance
- Good thermal stability of the resist patterns attainable
- Aqueous alkaline development
- Side wall angle up to 87° with mask aligner broadband exposure
- Suitable for pattern reflow

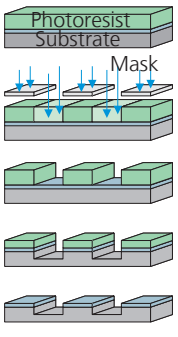


Spin curves, 30 s spin time

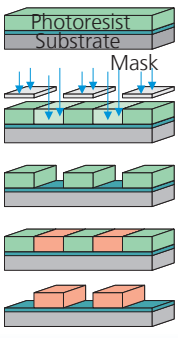


Spin curves, 60 s spin time

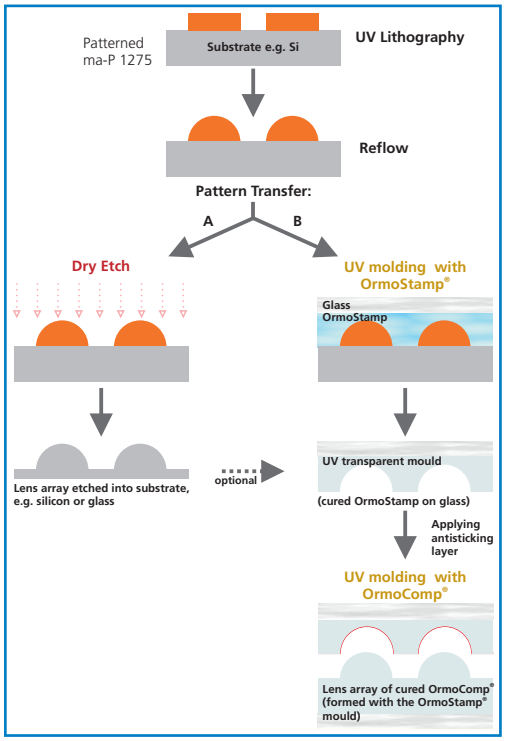
Process flow RIE



Process flow Electroplating



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



Main applications

- Etch mask - metals and semiconductors
- Mould for electroplating
- Fabrication of micro optical components, e.g. micro lenses by pattern transfer from reflowed resist patterns
- Mask for ion implantation

OrmoComp®: DE 30 210 075 433; IR 1 091 982 ; TW 100030626 (application), OrmoStamp®: DE 30 210 075 435; IR 1 092 621; TW 100030629 (application)

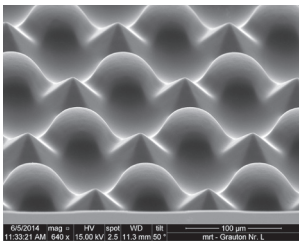
Positive Photoresist Series for Greyscale Lithography

Resist		ma-P 1215G	ma-P 1225G	ma-P 1240G	ma-P 1275G			
Film thickness *	µm	1.5	2.5	4.0	9.5	15	30	60
Spin-coating	rpm s	3000 30	3000 30	3000 30	3000 30	1500 30	500 60	1000 4
Spectral sensitivity	nm	350 - 450						
Exposure dose @ 365 nm**	mJ cm^{-2}	50 - 70	70 - 110	120 - 160	150 - 5000			
Developer		ma-D 532/S, mr-D 526/S (TMAH based) for greyscale lithography ma-D 331 (NaOH based) for standard lithography						

* Resists with different viscosities available as custom-made products
** Mask aligner broadband exposure

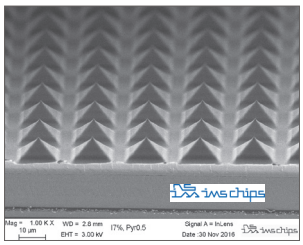
Resist patterning with Laser Direct Writing

* Patterned at Heidelberg Instruments
** by courtesy of IMS CHIPS



Convex and concave hexagonal lenses, 60 µm diameter*

Test patterm, 63 µm pattern depth*

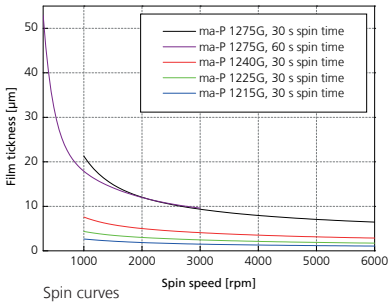


Pyramids, 10 µm base width, 5 µm height, 45 °angle**

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

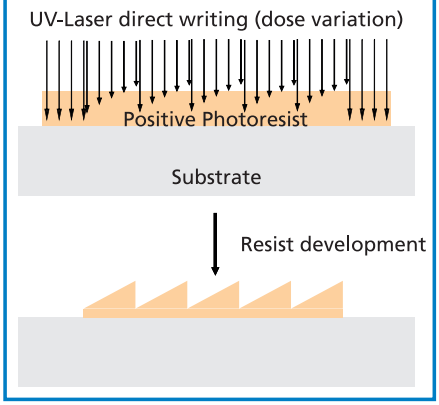
ma-P 1200G
for greyscale lithography

Specifically designed for the requirements of greyscale lithography, application in standard binary lithography also possible.

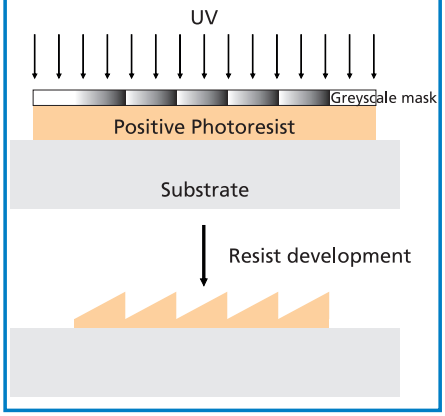


Spin curves

Process flow
Laser Direct Writing



Process flow
Exposure through a greyscale mask



- Reduced contrast, also in thin films
- Film thickness 1 - 60 µm and higher
- Reduced outgassing at laser exposure with higher intensity
- Max. 70 - 80 µm greyscale pattern depth possible
- Aqueous alkaline development
- Suitable for pattern reflow after standard binary lithography

Main applications

Use of manufactured 3D patterns in microoptics, MEMS and MOEMS and displays

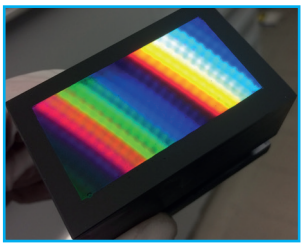
Pattern transfer by

- UV and thermal moulding
- Electroplating
- Etching

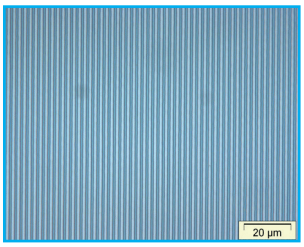
Thin Film Positive Photoresists in Laser Interference Lithography

Resist		mr-P 1201LIL	mr-P 1202LIL
Film thickness @ 3000 rpm	µm	0.1	0.2
Spin coating	rpm	3000	
Spectral sensitivity	nm	330 – 450	
Exposure dose @ 405 nm	mJ cm^{-2}	15 – 50	
Developer		mr-D 374/S (metal ion bearing, silicate/ phosphate based)	

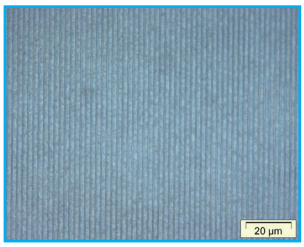
Resist patterning with laser interference lithography



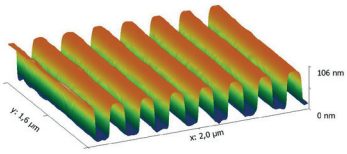
Diffractive optic: laminar grating (50 x 30 mm²), 170 nm thick mr-P 1202LIL, 400 lines/ mm



mr-P 1202LIL, 400 lines/ mm



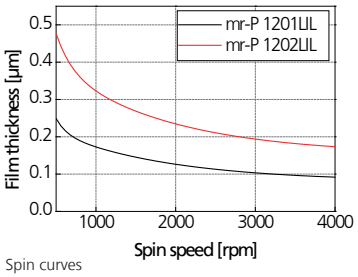
Si pattern after RIE etching, 400 lines/ mm



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

mr-P 1200LIL for high resolution laser interference lithography

- Steep sidewalls due to high contrast enable high quality etched pattern
- Good etch resistance
- Film thickness 100....500 nm

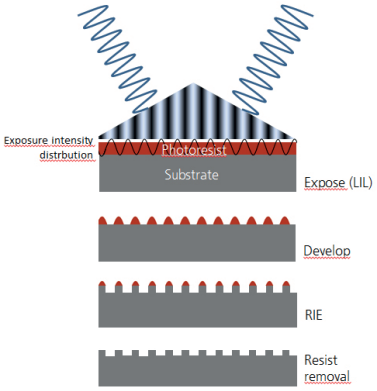


Spin curves

Main applications

- Masking of substrate surface during fabrication of steep-edged nano structures for diffractive optics:
- Laminary gratings
- VLS gratings

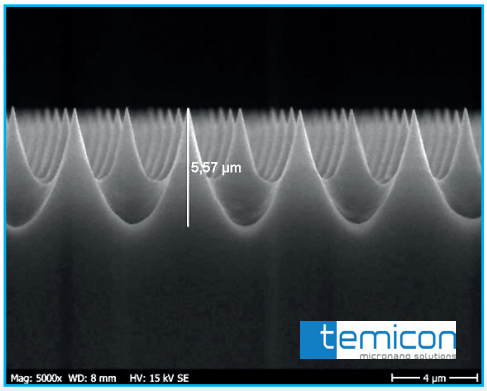
Process flow
Laser Interference Lithography and etching



Greyscale photoresists in special applications

ma-P 1200G
in laser interference lithography

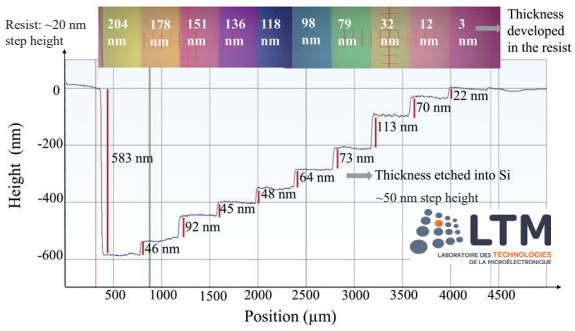
Moth eye patterns for pattern transfer; 10 µm thick ma-P 1275G patterned by Laser Interference Lithography @ 351 nm; 5.6 µm pattern depth



by courtesy of temicon GmbH

ma-P 1200G
for very high vertical pattern resolution

Si staircase structure for Fabry-Perot µ-interferometers array; 500 nm thick ma-P 1200G resist patterned by Laser Direct Writing @ 405 nm[1)]



by courtesy of LTM, CNRS/ Univ. Grenoble Alpes

[1)] N. Gerges, C. Petit-Etienne, M. Panabière, J. Boussey, Y. Ferrec, C. Gourgon; Optimized ultraviolet grayscale process for high vertical resolution applied to spectral imagers ; J. Vac. Sci. Technol. B 39 (2021); doi: 10.1116/6.0001273