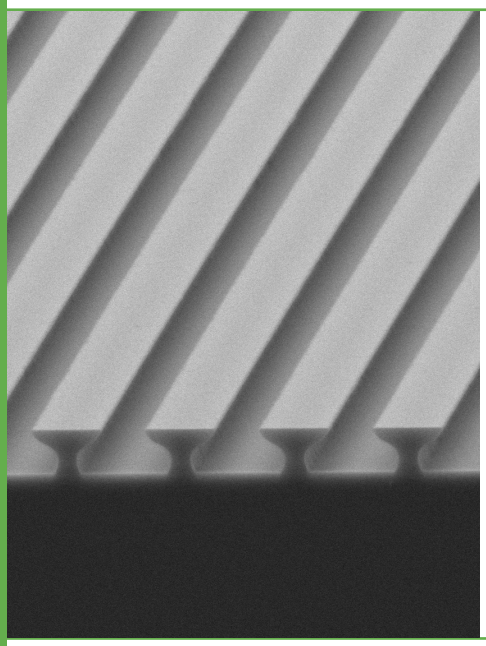
micro resist technology

Negative Photoresists for UV, Laser & Electron Beam Lithography



- **ma-N 400**
- **ma-N 1400**
- **ma-N 2400**
- **mr-EBL 6000 and mr-UVL 6000**
- **mr-DWL**
- **EpoCore and EpoClad**

Unique features of the negative photoresists

- Different negative photoresists series designed for various applications:
  - conventional pattern transfer
  - lift-off process
  - use as permanent material
- Ready-to-use solutions in a variety of viscosities

- Made in Germany -

SCAN ME

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2024

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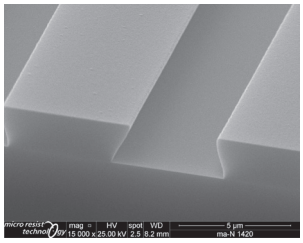
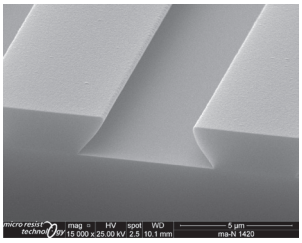
For Conventional Pattern Transfer and Single Layer Lift-Off

Resist	ma-N 400	ma-N 1400
Spectral sensitivity	300 – 380 nm	300 – 410 nm
Exposure dose @ 365 nm	350 – 1900 mJ/cm²	300 – 700 mJ/cm²
Ready-to-use solutions for various film thicknesses @ 3000 rpm	ma-N 402 → 0.2 µm ma-N 405 → 0.5 µm ma-N 415 → 1.5 µm ma-N 420 → 2.0 µm ma-N 440 → 4.1 µm ma-N 490 → 7.5 µm	ma-N 1405 → 0.5 µm ma-N 1407 → 0.7 µm ma-N 1410 → 1.0 µm ma-N 1420 → 2.0 µm ma-N 1440 → 4.0 µm
Thermal stability	up to 110 °C for metal evaporation	up to 160 °C for metal evaporation and sputtering
Developer	ma-D 331/S, ma-D 332/S (NaOH based) ma-D 530/S ma-D 531/S, ma-D 532/S (TMAH based)	ma-D 533/S (TMAH based)

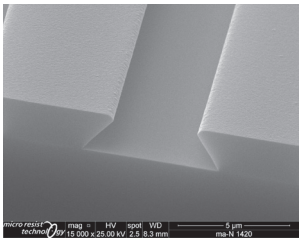
ma-N 1400
Undercut patterns of 2.2 µm thick **ma-N 1420**



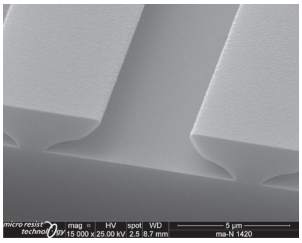
60 s ma-D 533s
→0.5 µm undercut



80 s ma-D 533s
→1.0 µm undercut



100 s ma-D 533s
→1.5 µm undercut



120 s ma-D 533s
→2.2 µm undercut

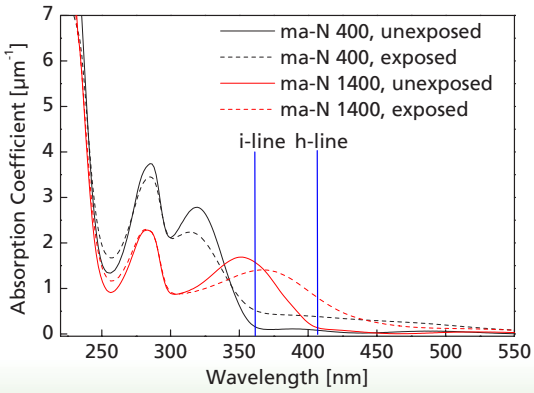
ma-N 400 and ma-N 1400 for conventional pattern transfer, physical vapour deposition (PVD), and lift-off

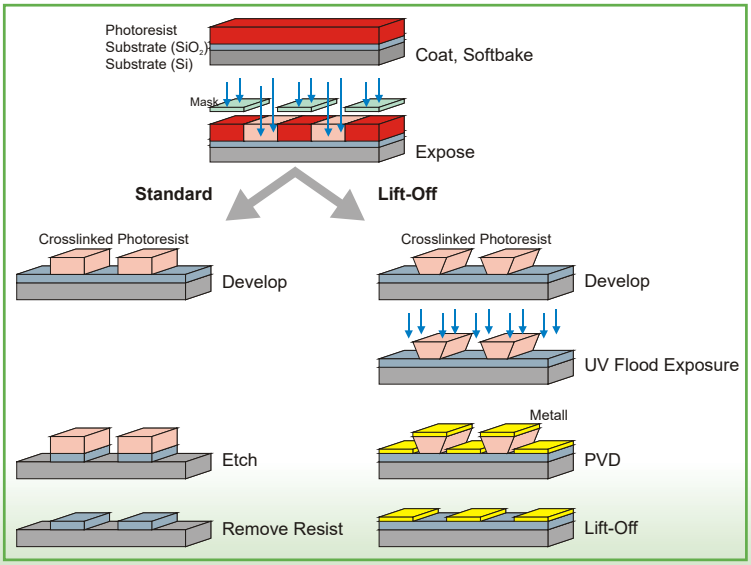
These two series are mainly used as single layer resist for pattern transfer by PVD and lift-off.

- Tunable pattern profile: vertical to undercut
- Aqueous alkaline development
- Good - excellent thermal pattern stability
- High wet and dry etch resistance
- Easy to remove

Main applications

- Microelectronics and micro system technology
- Mask for lift-off processes
- Etch mask for semiconductors and metals

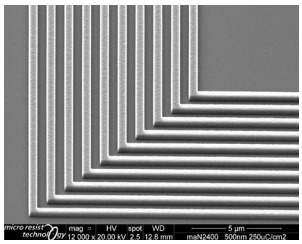




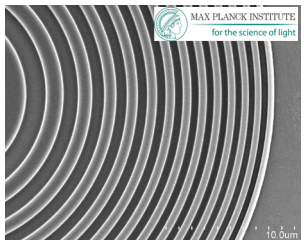
For Thin Film E-Beam, Deep UV or UV Lithography

Resist	ma-N 2400	mr-EBL 6000	mr-UVL 6000
Exposure dose			
E-beam @ 10 keV	-	2 – 5 µC/cm²	-
E-beam @ 20 keV	120 – 250 µC/cm²	4 – 6 µC/cm²	-
E-beam @ 50 keV	100 – 350 µC/cm²	20 – 40 µC/cm²	-
Deep UV [248 nm/ 254 nm]	210 – 420 mJ/cm²	-	-
UV [300 – 365 nm]	-	-	400 – 550 mJ/cm²
Ready-to-use solutions for various film thicknesses @ 3000 rpm	ma-N 2401 → 0.1 µm ma-N 2403 → 0.3 µm ma-N 2405 → 0.5 µm ma-N 2410 → 1.0 µm	mr-EBL 6000.1 → 0.1 µm mr-EBL 6000.3 → 0.3 µm mr-EBL 6000.5 → 0.5 µm	mr-UVL 6000.1 → 0.1 µm mr-UVL 6000.3 → 0.3 µm mr-UVL 6000.5 → 0.5 µm
Developer	ma-D 525 (TMAH based) ma-D 332/ ma-D 331 (NaOH based)	mr-Dev 600 (solvent based)	

ma-N 2400

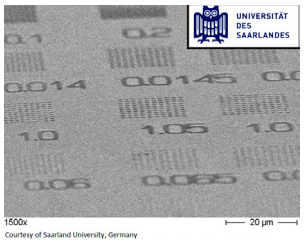


500 nm thick
Elbow pattern

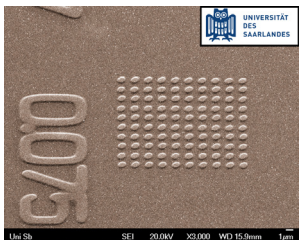


250 nm thick
Fresnel pattern
(Courtesy of Max Planck Institute for the Science of Light, Germany)

mr-EBL 6000



120 nm thick, Resolution < 100 nm



98 nm SiC dots 70 nm thick, after ICP RIE SF_6 etching (150 W RF, 200 W ICP) & resist removal

(Pictures - Courtesy of Saarland University, Germany)

ma-N 2400 and mr-EBL 6000 for pattern transfer

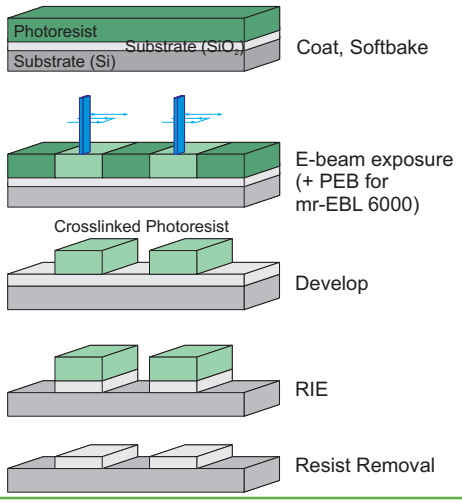
These two series are mainly used for electron beam lithography.

ma-N 2400 e-beam & Deep UV sensitive

- High resolution capability
- Aqueous alkaline development
- Good thermal stability of the resist patterns
- High wet and dry etch resistance
- Lift-off
- Easy to remove

mr-EBL 6000 high e-beam sensitivity

- Excellent thermal stability of the resist patterns
- High dry and wet etch resistance
- High resolution capability
- Post exposure bake (PEB)



mr-UVL 6000 for pattern transfer

Mainly used for thin layer UV lithography.

- High dry and wet etch resistance
- Excellent thermal stability of the resist patterns
- Post exposure bake (PEB)

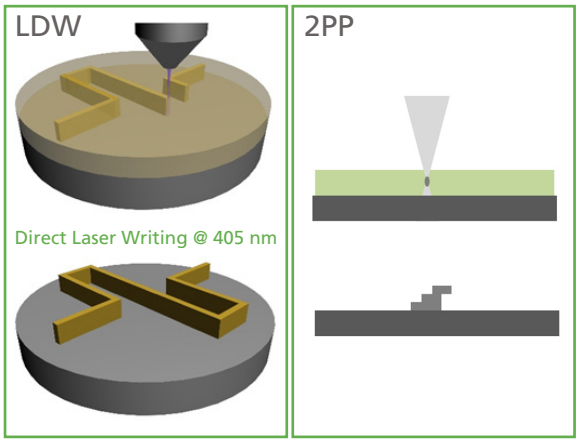
Main applications

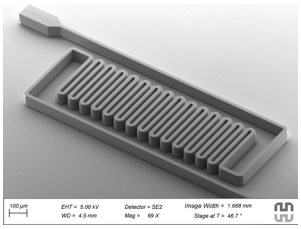
- Use in micro- and nanoelectronics
- Manufacturing of semiconductor devices
- Mask for etching, e.g. Si, SiO_2, Si_3N_4 or metals
- Generation of sub 100 nm pattern
- Generation of stamps with nanopatterns

Highly transparent Materials for Low Optical Loss and Standard Applications

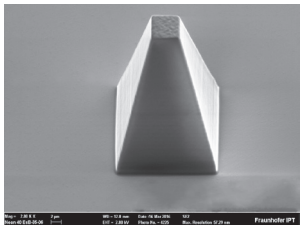
mr-DWL @ 405 nm for Direct Laser Writing (DLW) @ 405 nm & Two Photon Polymerization (2PP)

Resist	mr-DWL
Spectral sensitivity	High sensitivity > 400 nm DLW @ 405 nm
Ready-to-use solutions for various film thicknesses	mr-DWL 5: 3 µm → 12 µm mr-DWL 40: 20 µm → 100 µm mr-DWL 100: 20 µm → 150 µm
Developer	mr-Dev 600 (solvent based)



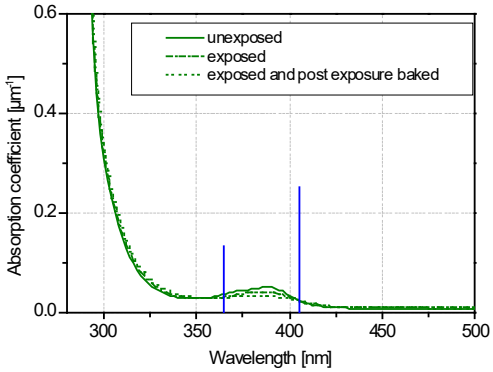


DLW 80 µm



70 µm thick, 2PP

(pictures - DLW: Courtesy of Heiderberg Instruments, 2PP: Fraunhofer IPT Aachen, Germany)

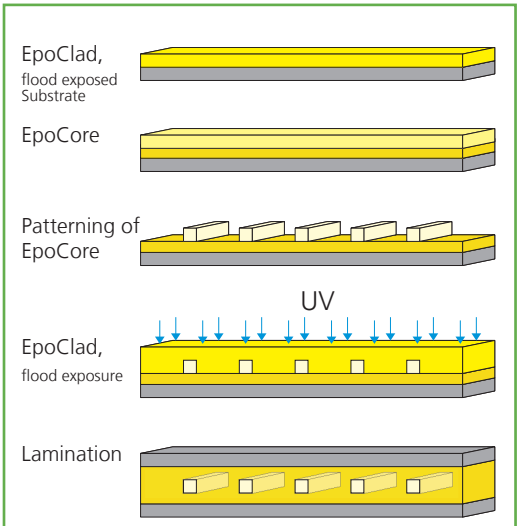


Main applications

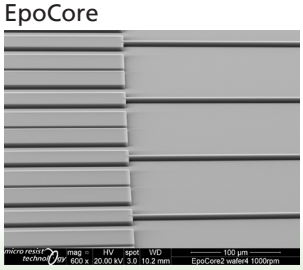
- Fast and contactless prototyping by DLW & 2PP
- Optical applications in micro systems technology
- Etch mask for wet and dry etch processes
- Mould for electroplating
- Mould for stamp fabrication/ template manufacture

EpoCore / EpoClad for preparation of polymer waveguides

Resist	EpoCore	EpoClad
Spectral sensitivity	Broadband, 365 nm	
Ready-to-use solutions for various film thicknesses from 1.5 µm to 120 µm	EpoCore 2 EpoCore 5 EpoCore 10 EpoCore 20 EpoCore 50	EpoClad 2 EpoClad 5 EpoClad 10 EpoClad 20 EpoClad 50
Developer	mr-Dev 600 (solvent based)	
	Properties of cured resist	
Shrinkage	< 3 %	
Thermal stability	up to 230 °C	
Refractive index @ 830 nm	1.58	1.57
Optical loss	~ 0.2 dB/cm @ 850 nm	
Glass transition temperature	> 180 °C	
Excellent stability after lamination	T > 185°C, pressure 23 kp/cm² and reflow tests 3 x 15 s @ 230 C°, TCT: 240 x -40 °C to 120 °C	

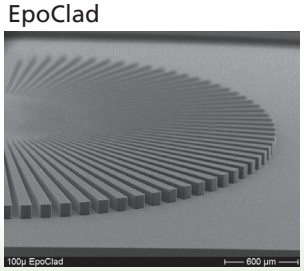


EpoCore



5 µm thick

EpoClad



100 µm thick

Main applications

Singlemode (SM) and Multimode (MM) polymeric optical waveguides