Innovation
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Customer-specific solutions

Positive Photoresist AR-P 3100

AR-P 3100 photoresist product series for mask production

Adhesion-enhanced positive resists for the production of masks and fine scale divisions

Characterisation

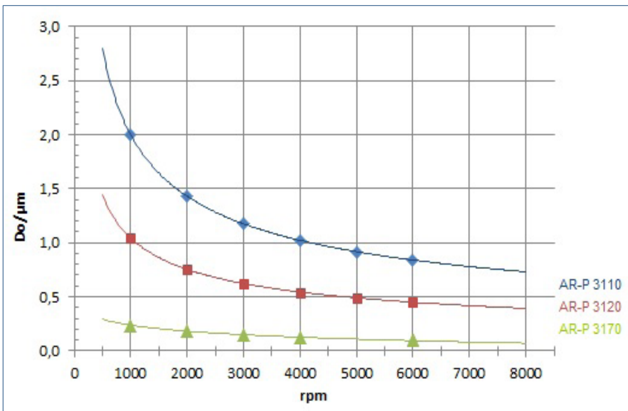
- broadband UV, i-line, g-line
- high photosensitivity, high resolution
- strong adhesion to critical glass/chromium surfaces for extreme stresses during wet-chemical etching processes
- for the production of masks and lattice structures
- 3170 also suitable for laser interference lithography
- plasma etching resistant
- combination of novolac and naphthoquinone diazide
- safer solvent PGMEA

Properties I

Parameter / AR-P	3110	3120	3170
Solids content (%)	28	21	8
Viscosity 25 °C (mPas)	12	5	2
Film thickness/ 4000 rpm (nm)	1000	550	120
Resolution (µm)	0.5	0.4	0.4
Contrast	3.0	3.0	3.0
Flash point (°C)	46		
Storage temperature (°C)*	10 - 18		

* Products have a guaranteed shelf life of 6 Month from the date of sale if stored correctly and can also be used without guarantee until the date indicated on the label.

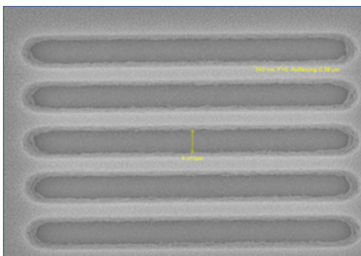
Spin curve



Properties II

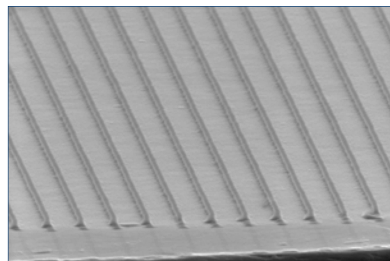
Glass transition temperature	108	
Dielectric constant	3.1	
Cauchy coefficients	N_0	1.621
	N_1	65.6
	N_2	195.6
Plasma etching rates (nm/min)	Ar-sputtering	7
(5 Pa, 240-250 V bias)	O_2	165
	CF_4	38
	80 CF_4 + 16 O_2	89

Structure resolution



AR-P 3120
Film thickness 0.6 µm
Resist structures 0.38 µm L/S

Resist structures



70-nm-lines generated with the AR-P 3170 by laser interference lithography

Process parameters

Substrate	Si 4“ wafer
Tempering	95 °C, 90 s, hot plate
Exposure	i-line stepper (NA: 0.65)
Development	AR 300-47, 1 : 1, 60 s, 22 °C

Process chemicals

Adhesion promoter	AR 300-80 new
Developer	AR 300-26, AR 300-47
Thinner	AR 300-12
Remover	AR 300-76, AR 300-73

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Process conditions

This diagram shows exemplary process steps for AR-P 3100 resists. All specifications are guideline values which have to be adapted to own specific conditions. For further information on processing, ☞ "Detailed instructions for optimum processing of photoresists". For recommendations on waste water treatment and general safety instructions, ☞ "General product information on Allresist photoresists".

Process step	AR-P 3110	AR-P 3120	AR-P 3170
Coating	4000 rpm, 60 s 1000 nm	4000 rpm, 60 s 550 nm	4000 rpm, 60 s 120 nm
Tempering (+/- 1 °C)	100 °C, 1 min hot plate or 95 °C, 25 min convection oven		
UV exposure	Broadband UV, 365 nm, 405 nm, 436 nm Exposure dose (E_0, broadband UV stepper):		
	70 mJ/cm²	65 mJ/cm²	60 mJ/cm²
Development (21-23 °C ± 0,5 °C) puddle	AR 300-26 2 : 5 60 s	AR 300-47, 5 : 1 60 s	AR 300-47, 3 : 1 60 s
Rinse	DI-H_2O, 30 s		
Post-bake (optional)	115 °C, 1 min hot plate or 115 °C, 25 min convection oven		
Customer-specific technologies	Generation of e.g. semi-conductor properties		
Removal	AR 300-70 or O_2 plasma ashing		

Development recommendations

Resist / Developer	AR 300-26	AR 300-35	AR 300-47
AR-P 3110	1 : 2 to 1 : 3	pure	6 : 1
AR-P 3120	1 : 3	5 : 1	5 : 1
AR-P 3170	1 : 4	2 : 1	3 : 1

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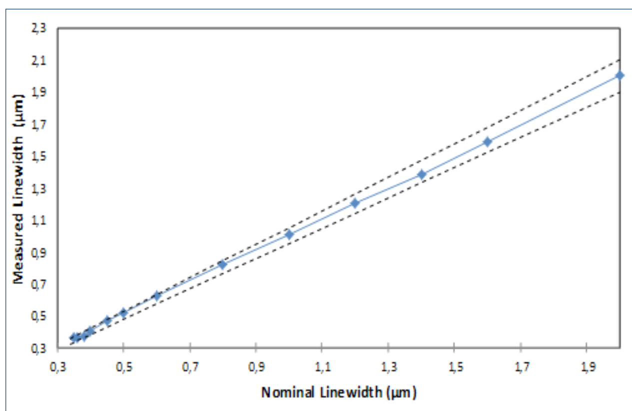
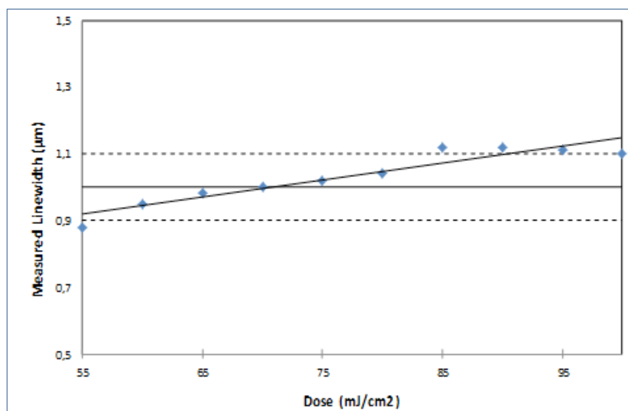
Linearity



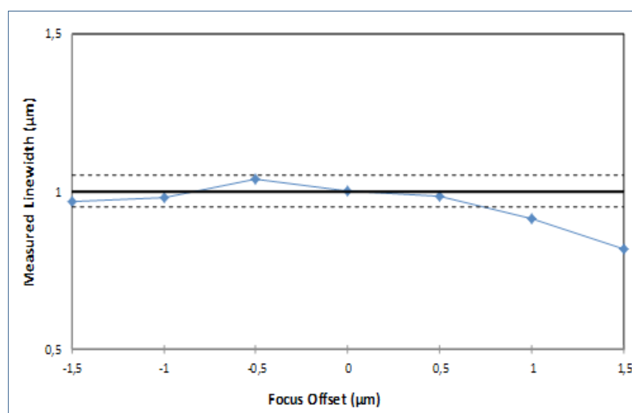
Up to a structure width of 0.38, a very good agreement is obtained. REM measurement: Thickness 560 nm, i-line stepper (NA: 0.65 NA), Developer AR 300-47 1 : 1.

Optimum exposure dose



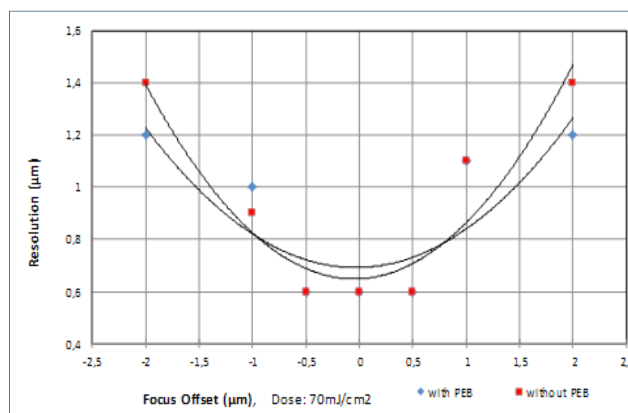
Underexposure leads in the case of complete development (more than 55 ml/cm²) to narrower trenches, while overexposure results in a widening of trenches.

Focus variation



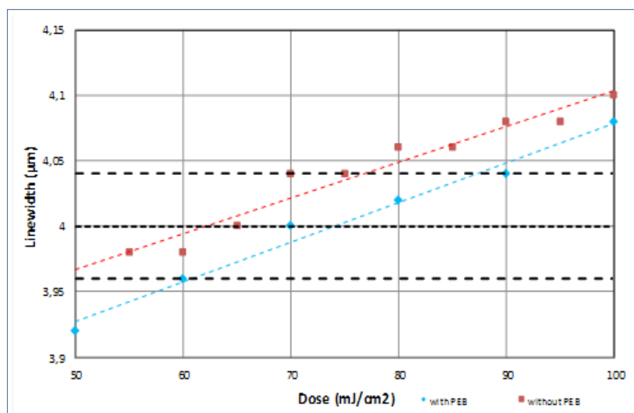
The intended structure sizes can here be realised by varying the focus between -1.5 to 0.8 (parameter see grafic linearity).

Focus variation (with and without PEB)



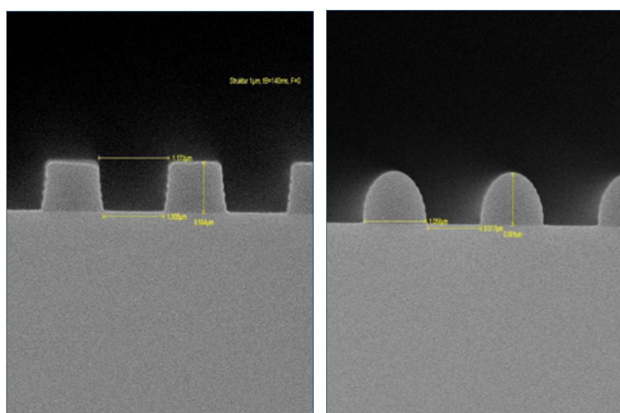
Without PEB, a higher resolution is obtained since the focus curve is steeper (PEB, 90 °C, 60 s).

Comparison exposure dose PEB



Optimum dose, with PEB and without PEB. The additional PEB (PEB, 90 °C, 60 s) requires 15 % more light.

Thermal properties of resist structures



Untempered   Hard bake 115 °C