



Positive Photoresist AR-P 3100

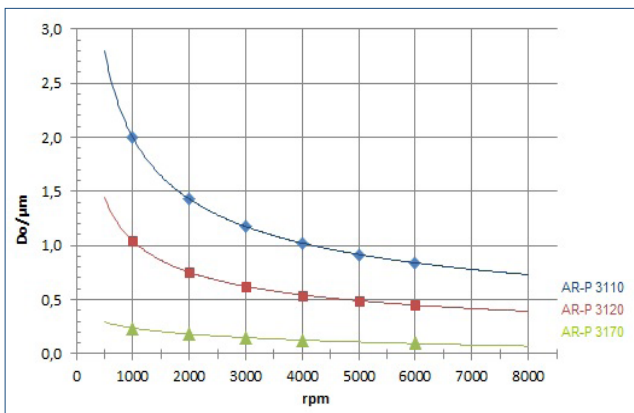
AR-P 3100 photoresist product series for mask production

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

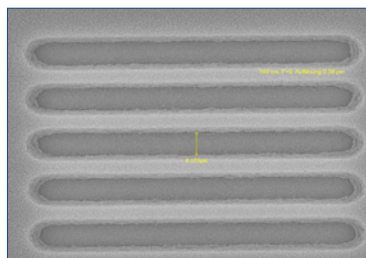
Characterisation

- 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 CD masters and lattice structures
- 3170 also suitable for laser interference lithography
- plasma etching resistant
- combination of novolac and naphthoquinone diazide
- safer solvent PGMEA

Spin curve



Structure resolution



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

Properties I

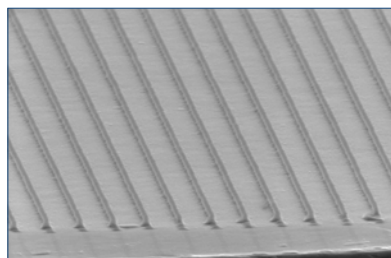
Parameter / AR-P	3110	3120	3170
Solids content (%)	28	21	8
Viscosity 25 °C (mPas)	12	5	2
Film thickness/ 4000 rpm (nm)	1000	550	120
Resolution (μm)	0.5	0.4	0.4
Contrast	3.0	3.0	3.0
Flash point (°C)	42		
Storage temperature (°C)*	10 - 18		

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

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) (5 Pa, 240-250 V bias)	Ar-sputtering	7
	O ₂	165
	CF ₄	38
	80 CF ₄ + 16 O ₂	89

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


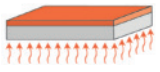
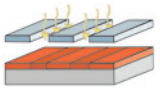
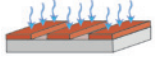
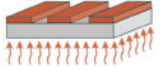
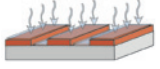
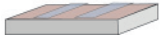
Process chemicals

Adhesion promoter	AR 300-80
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".

Coating 	AR-P 3110 4000 rpm, 60 s 1000 nm	AR-P 3120 4000 rpm, 60 s 550 nm	AR-P 3170 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/cm ² 65 mJ/cm ² 60 mJ/cm ²		
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 ₂ O, 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		

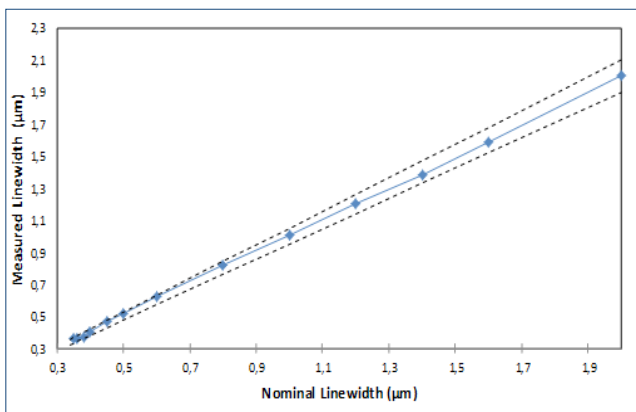
Development recommendations

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



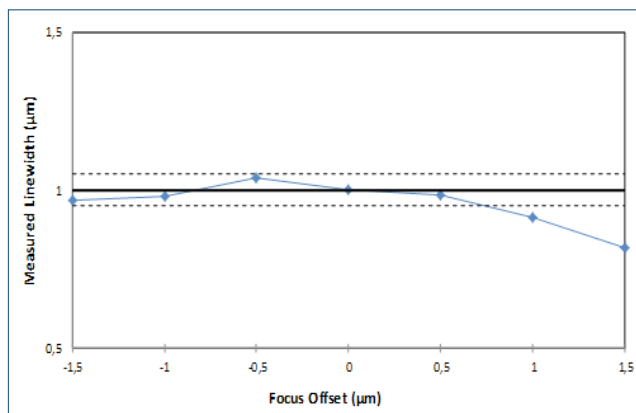
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Linearity



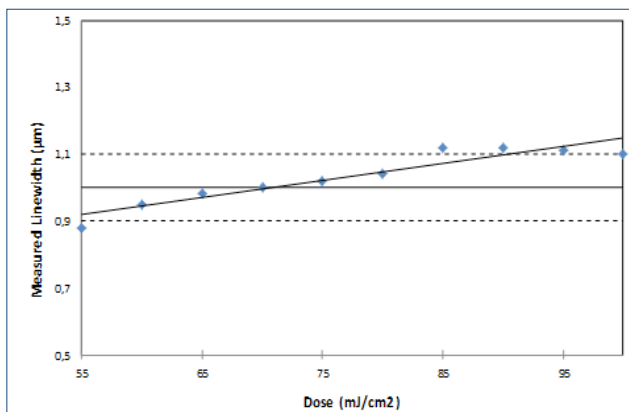
Up to a structure width of 0.38, a very good agreement is obtained. REM measurement: Thickness 560 nm, i-line stepper (NA: 0.65 NA), Developer AR 300-47 1 : 1.

Focus variation



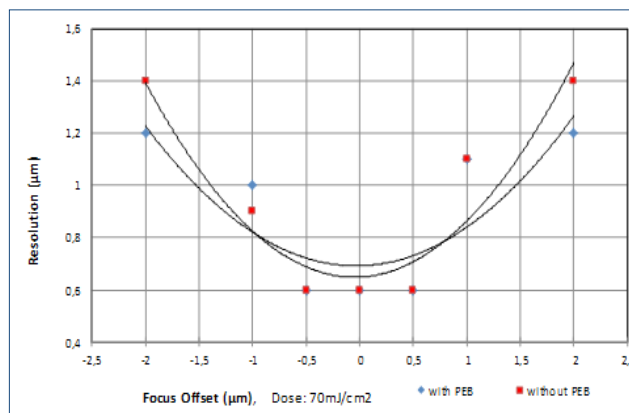
The intended structure sizes can here be realised by varying the focus between -1.5 to 0.8 (parameter see graphic linearity).

Optimum exposure dose



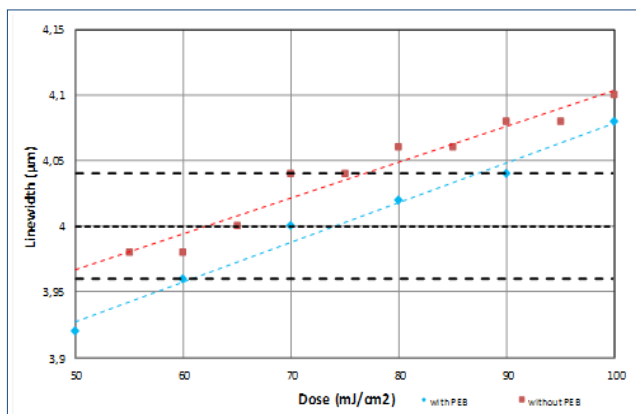
Underexposure leads in the case of complete development (more than 55 mJ/cm²) to narrower trenches, while overexposure results in a widening of trenches.

Focus variation (with and without PEB)



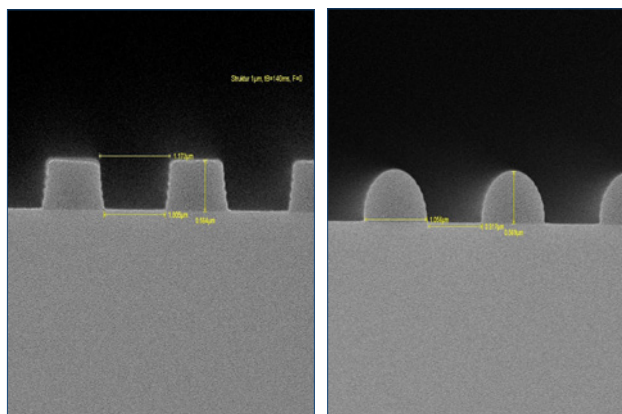
Without PEB, a higher resolution is obtained since the focus curve is steeper (PEB, 90 °C, 60 s).

Optimum exposure dose



Optimum dose, with hard bake (110 °C) and without hard bake. The additional hard bake requires 15% more light (PEB, 90 °C, 60 s).

Thermal properties of resist structures



Untempered

Hard bake 115 °C