Innovation
Creativity
Customer-specific solutions

Negative E-Beam Resists AR-N 7520 new

AR-N 7520 new e-beam resists for mix & match

with highest resolution and highly sensitive for the production of integrated circuits

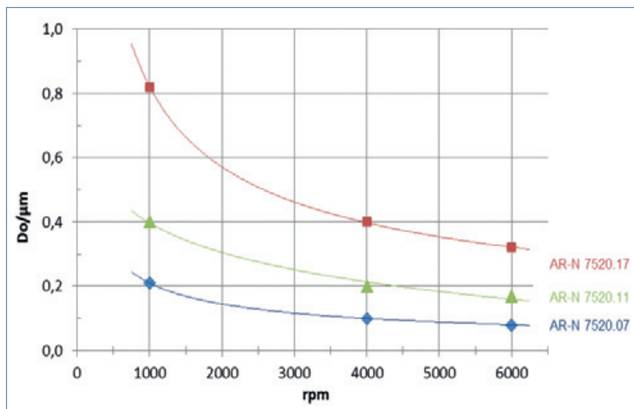
Characterisation

- e-beam, deep UV, i-line (formerly SX AR-N 7520/4)
- short writing times, very high contrast
- mix & match processes between e-beam and UV exposure 248-365 nm, negative in the UV range
- highest resolution, very process-stable (no CAR)
- plasma etching resistant, temp.-stable up to 140 °C
- novolac, organic crosslinking agent
- safer solvent PGMEA

Properties I

Parameter / AR-N new	7520.17	7520.11	7520.07
Solids content (%)	17	11	7
Viscosity 25 °C (mPas)	4	3	2
Film thickness/4000 rpm (µm)	0.4	0.2	0.1
Resolution best value (nm)	28		
Contrast	10		
Flash point (°C)	42		
Storage 6 month (°C)	10 - 18		

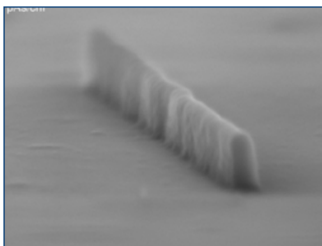
Spin curve



Properties II

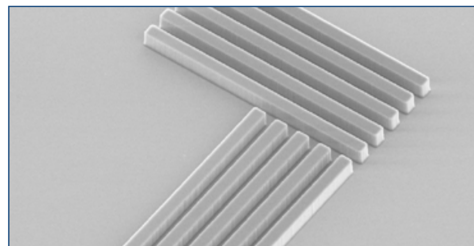
Glass trans. temperature (°C)	102	
Dielectric constant	3.1	
Cauchy coefficients	N_0	1.622
	N_1	123.2
	N_2	0
Plasma etching rates (nm/min)	Ar-sputtering	8
(5 Pa, 240-250 V Bias)	O_2	169
	CF_4	41
	80 CF_4 + 16 O_2	90

Structure resolution



AR-N 7520.07 new 30-nm lines at a film thickness of 90 nm

Resist structures



AR-N 7520.17 new 400- and 600-nm lines, film thickness 400 nm

Process parameters

Substrate	Si 4“ waver
Soft bake	85 °C, 90 s, hot plate
Exposure	Raith Pioneer, 30 kV
Development	AR 300-47, 60 s, 22 °C

Process chemicals

Adhesion promoter	AR 300-80
Developer	AR 300-47, AR 300-46
Thinner	AR 300-12
Remover	AR 300-73, AR 300-76

As of January 2018

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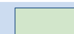
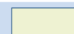
Process conditions

This diagram shows exemplary process steps for AR-N 7520 new 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 e-beam resists”. For recommendations on waste water treatment and general safety instructions, ☞ ”General product information on Allresist e-beam resists”.

Process step	AR-N 7520.17 new	AR-P 7520.07 new
Coating	4000 rpm, 60 s, 0.4 µm	4000 rpm, 60 s, 0.1 µm
Soft bake (± 1 °C)	85 °C, 1 min hot plate or 85 °C 30 min convection oven	
E-beam exposure	Raith Pioneer, 30 kV Exposure dose (E_0): 30 µC/cm^2, 100 nm space & lines	
Development (21-23 °C ± 0,5 °C) puddle	AR 300-46 90 s	AR 300-47 50 s
Rinse	DI-H_2O, 30 s	
Post-bake (optional)	85 °C, 1 min hot plate or 85 °C, 25 min convection oven for enhanced plasma etch resistance	
Customer-specific technologies	Generation of semiconductor properties	
Removal	AR 300-73 or O_2 plasma ashing	

Development recommendations

 optimal  suitable

Developer	AR 300-26	AR 300-35	AR 300-40
AR-N 7520.17, .11; .07 new	3 : 1 ; 1 : 1	-	300-46 ; 300-47

Processing instructions

These resists are predestined for e-beam exposure, but also suitable for UV exposure. Mix & match processes are possible if both exposure methods are carefully coordinated. During e-beam exposure, the resist works in a negative mode.

The resist works also in a negative mode with deep UV (248-270 nm) or mid-UV (290-365) exposure. If a further tempering step (85 °C, 2 min hot plate) is added after image-wise exposure, the sensitivity can be slightly enhanced.

The developer dilution should be adjusted with DI water such that the development time is in a range between 20 s and 120 s. By dilution of the developer, contrast and development rate can be influenced to a large degree. A stronger dilution results in an increased contrast and a reduced development rate.