



Negative E-Beam Resists AR-N 7520 new

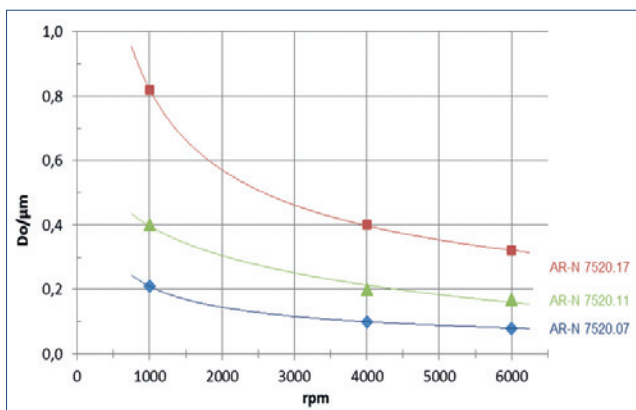
AR-N 7520 new e-beam resists for mix & match

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

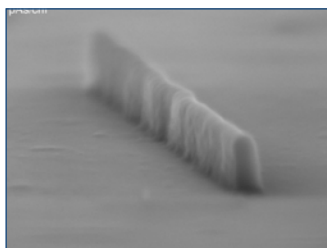
Characterisation

- 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

Spin curve



Structure resolution



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

Properties I

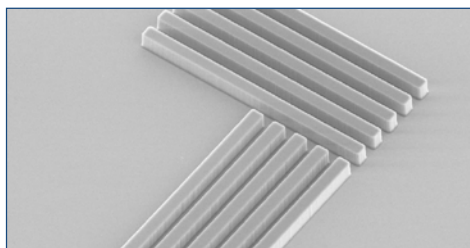
| Parameter / AR-N | new | 7520.17 | 7520.11 | 7520.07 |
|------------------------------|-----|---------|---------|---------|
| Solids content (%) | | 17 | 11 | 7 |
| Viscosity 25 °C (mPas) | | 4 | 3 | 2 |
| Film thickness/4000 rpm (µm) | | 0.4 | 0.2 | 0.1 |
| Resolution best value (nm) | | 28 | | |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

* Products have a guaranteed shelf life of 6 months 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 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) (5 Pa, 240-250 V Bias) | Ar-sputtering | 8 |
| | O ₂ | 169 |
| | CF ₄ | 41 |
| | 80 CF ₄ + 16 O ₂ | 90 |

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 |

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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".

| | | | |
|---|--|---|---|
| Coating | | AR-N 7520.17 new 4000 rpm, 60 s, 0.4 µm | AR-P 7520.07 new 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 ₂ O, 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.