Positive E-Beam Resists AR-P 6500

AR-P 6510 e-beam resists for high film thicknesses

Thick positive resists for the production of microcomponents

Characterisation

- e-beam (no yellow light required)
- excellent image quality
- solvent-based developer
- film thickness values of 10 μm to 100 μm
- process-stable
- high molecular weight poly(methyl methacrylate)
- safer solvent PGMEA

Properties I

Parameter / AR-P 6510	.15	.17
Solids content (%)	15	17
Viscosity 25 °C (Pas)	12.2	24.5
Film thickness/200 rpm (μm)	45	95
Resolution best value (μm)	1	
Contrast	10	
Flash point (°C)	42	
Storage temperature (°C) *	10-22	

* 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.

Film thickness values

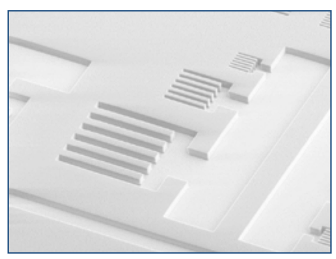
2 min / 30 s	.15	.17
200 / 350 rpm (μm)	45	95
350 / 500 rpm (μm)	28	56

These resists are designed for high film thicknesses which can only be obtained with low spin speeds. At spin numbers of < 1000 rpm, resists tend to form strings (candy floss effect). Thinner films can be realised if dilutions are used.

Properties II

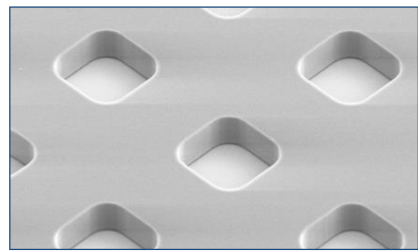
Glass trans. temperature (°C)	105	
Dielectric constant	2.6	
Cauchy coefficients	N_0	1.480
	N_1	41.9
	N_2	0
Plasma etching rates (nm/min)	Ar-sputtering	22
(5 Pa, 240-250 V Bias)	O_2	350
	CF_4	61
	80 CF_4 + 16 O_2	169

Structure resolution



AR-P 6510.17
Film thickness 40 μm,
structures up to 5 μm

Resist structures



AR-P 6510.17 (diluted), exposure with e-beam (developer AR 600-55), film thickness 5 μm

Process parameters

Substrate	Si 4“ waver
Soft bake	100 °C, 4 h, convection oven
Exposure	e-beam
Development	AR 600-56, 20 min
Stopper	AR 600-60, 3 min

Process chemicals

Adhesion promoter	AR 300-80 new
Developer	AR 600-56
Thinner	AR 300-12
Stopper	AR 600-60
Remover	AR 600-71, AR 300-76

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Process conditions

This diagram shows exemplary process steps for AR-P 6500 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	Conditions
Coating	AR-P 6510.17 350 rpm, 5 min 45 µm
Soft bake (± 1 °C)	95 °C, 60 min hot plate (temperature ramps recommended) 90 °C, 3 h convection oven (temperature ramps recommended)
E-beam exposure	e-beam Exposure dose (E_0): 5000 µC/cm^2
Development (21-23 °C ± 1 °C) Immersion	AR 600-56 15 min
Stopping / Rinse	AR 600-60, 30 s / DI-H_2O, 30 s
Post-bake (optional)	100 °C, 10 min hot plate or 95 °C, 60 min, convection oven for complete drying and slightly enhanced plasma etching resistance
Customer-specific technologies	LIGA procedures or the fabrication of X-ray masks
Removal	AR 300-71 or O_2 plasma ashing

Processing instructions for coating

Prior to spin coating it is recommended to remove gases which may possibly be present. The highly viscous resist should therefore rest a few hours before use. A warming of resist bottles in a water bath to 50 °C max. to reduce the viscosity and the utilisation of ultrasound support the removal of gas bubbles. Resist deposition should be performed as carefully as possible to avoid any additional introduction of air bubbles. Slow spin speeds and low exposure times are advantageous (200 to 350 rpm, > 3 min). Edge bead formation can be reduced if the rotational speed is briefly increased towards the end of the coating procedure (for 10 s to max. 500 rpm). The amount of resist will also influence the film thickness; for 4 inch-wafers, the use of at least 10 g of resist are recommended. In order to obtain optimum film qualities, own experiments of each user are required.