

Copolymer PMMA/MA 33 % as E-Beam Resist Series

AR-P 610 in 2-methoxyethanol and AR-P 617 in 1-methoxy-2-propanol

1. Description

The e-beam resist series AR-P 610 and 617 are positive working resists suitable for all kinds of e-beam applications. These resists are filtered to a particle size of 0.2 µm.

The resists AR-P 610 and 617 are designed to meet high requirements of mask production in advanced integrated circuit fabrication. The copolymer layers are distinguished by an excellent adhesion on glass, silicon and metal.

By reason of their specific chemical properties the copolymer e-beam resists show a significant 3-4 times higher sensitivity and even higher contrast as PMMA resists. Developed pattern have a thermal stability up to 140 °C.

The AR-P 610 and 617 can be used for multilayer processes and planarisation. Resists with low solids content for resist thickness` down to 30 nm are suitable especially for the nanometer lithography.

2. Chemical composition

Copolymers based on methylmethacrylate and methacrylic acid mainly dissolved in 2-methoxyethanol (AR-P 610, Flash point: 39 °C), 1-methoxy-2-propanol (AR-P 617, Flash point: 38 °C).

3. Process description and storage

• Coating	6000-2000 rpm in air conditioned working areas at 20-25 °C and a humidity of 30-50 % (☞ Tab).
• Baking	210 ± 2 °C, 60 min convection oven or 200 ± 2 °C, 10 minutes hot plate.
• Exposure	With usual devices for e-beam lithography. ☞ A typical dose to clear is about 25 µC/cm ² (20 kV, resist thickness 1.0 µm).
• Development	2-5 minutes with the developers AR 600-50, AR 600-55 and 600-56. ☞ strong undercut patterns are possible by using AR-P 610, 617 as two layer system (first bake of bottom layer: 210 °C, second bake of both layers: 190 °C, removing with AR 300-47, AR 300-70 or 300-73).
• Stopping	30 seconds with the stopper AR 600-60.
• Post bake	For special processes 30 minutes in a convection oven at 130 °C. ☞ For high etching resistance in wet chemical and plasma chemical etch processes.
• Cleaning	Substrates and equipment can be cleaned with Thinner AR 600-00 (for AR-P 610), AR 600-07 (for AR-P 617) or remover AR 600-70.
• Removing	Hard-baked layers can be stripped with AR 600-70, 300-70, AR 300-47. ☞ Higher baked layers (> 210 °C) need the use of oxidizing acids or oxygen plasma.
• Storage	Functionality guaranteed for 6 months from date of sale if stored dry at a constant temperature between 10 - 22°C.

4. Disposal and Safety References

Liquid or solid wastes have to be disposed at proper deposit places or by controlled combustion in officially authorized plants. Resists and thinner contain organic solvents. Adequate ventilation in the working area is demanded. Avoid direct contact with products and their vapours.

Wear chemical goggles and protective gloves! Please ask for safety data sheets!

As of Oct.'06

Specifications of PMMA-Copolymer PMMA/MA 33% in different solvents Allresist GmbH · Am Biotop 14 · 15344 Strausberg · as of Jan. '06

Solvents of Resist main component	product name		Solids content [%]	Viscosity 25 °C [mPa·s]	Film thickness 1000 rpm [µm]	Film thickness 2000 rpm [µm]	Film thickness 4000 rpm [µm]	Film thickness 6000 rpm [µm]	Density content 20 °C [g/cm ³]
2-Methoxyethanol	AR-P	610.01	1,0	2,7		0,03	0,02	0,01	0,959
2-Methoxyethanol	AR-P	610.03	3,0	5,4		0,13	0,08	0,07	0,965
2-Methoxyethanol	AR-P	610.04	4,0	8,9		0,20	0,15	0,12	0,968
2-Methoxyethanol	AR-P	610.06	6,0	18,4		0,40	0,29	0,23	0,973
2-Methoxyethanol	AR-P	610.08	8,0	36,4		0,68	0,48	0,39	0,977
2-Methoxyethanol	AR-P	610.12	12,0	117	2,48	1,62	1,14	0,96	0,989
2-Methoxyethanol	AR-P	610.14	14,0	244		2,50	1,75	1,45	0,995
1-Methoxy-2-propanol	AR-P	617.03	3,0	7,1		0,13	0,09	0,08	0,965
1-Methoxy-2-propanol	AR-P	617.06	6,0	19,7		0,40	0,29	0,23	0,973
1-Methoxy-2-propanol	AR-P	617.08	8,0	36,2		0,68	0,48	0,39	0,976
1-Methoxy-2-propanol	AR-P	617.12	12,0	120	2,48	1,62	1,14	0,98	0,988
1-Methoxy-2-propanol	AR-P	617.14	14,0	235		2,50	1,75	1,45	0,994

The bold faced type resists of the series AR-P 610 und 617 are standard products; their prices are included in the prices list. All other resists are delivered with a 25% added regular price in comparison with next higher solid content.

