Summary of Photoresists

Type	application / condition	Do [µm] 4000 rpm	product	
Positivresists	production of masks, optical applications	1,0 ; 0,6 ; 0,1	AR-P 3110, 3120, 3170	
	thick resist layers up to 30 µm	10 ; 5	AR-P 3220, 3250	
	thick resist layers up to 100 µm, high sensivity	10	AR-P 3210 former XAR-P 3210/17	new
	wide process range for patterns < 2 µm	2,0 ; 1,4	AR-P 3510, 3540	
	high resolution for sub-structures	1,4 ; 1,4	AR-P 3740, 3840 dyed	
	protective coating, KOH-resistent	2,2	AR-PC 504(0)	
	lift-off-structures	1,0	AR-P 5350	
	additional with high layer thickness	5	AR-P 5320 former XAR-P 5300/1	new
	two-layers-lift-off-system with AR-P 3510	1,0 ; 0,5	AR-P 5460, 5480 X617/6,-8	new
Image reversal	optional positive or negative	1,8 ; 1,4 ; 0,6	AR-U 4030, 4040, 4060	
Negativresists	stable sub-µm structures, mid and deep UV	1,4	AR-N 4240	
	high response to i-line (g-line, deep UV)	1,4	AR-N 4340 former XAR-N 4340/1	new
	New developed system CAR 44:	1000 rpm:	former XAR-N 4400-10, -25, -50; X4450-10	
	layers up to 100 µm, aqueous alkaline development, easy to remove	10 ; 25 ; 50	AR-N 4400-10, -25, -50	new
	additional for lift-off-structures	10	AR-N 4450-10	new
New developments	experimental samples, ready for production	4000 rpm:	new developments:	
	resists for spray coating		X AR-P 1250, 1270	
	thick resist for HF etching	5	X AR-P 3100/10	
	thick resist with high vicosity and thermal stability	6	X AR-P 3220/7	
	resist for deep UV, etch resistant	0,6	X AR-P 5800/7	
	alkaline stable, able for structuring	1,4	X AR-P 5900/4	
	protective coating, KOH-resistent, adh.	2,0 ; 1,0	X AR-PC 5000/19, -30	new
Process chemicals	thinner: safer solvent		AR 300-12	
	developer: buffered systems, concentrat		AR 300-26, 300-35	
	developer: metal ion free, different concentrations		AR 300-40	
	Remover: organic solvents		AR 600-70, 300-70, -72	
	Remover: aqueous-alkaline		AR 300-73	
	adhesion promoter		AR 300-80, HMDS	
☞	price lists: photoresists, experimental samples, AVB		as of January 2007	

Mask Photoresist Series AR-P 3100

with high sensitivity and additionally with strong adhesion

1. General description

The Positive Mask Photoresists of the serie AR-P 3100 are high-sensitive resists in safer solvents. They lead to very thin and completely striation-free resist films.
The resists AR-P 3110, 3120 and 3170 shows excellent adhesion on critical glass- and chromium-surfaces. Therefore, they are especially suitable for the manufacturing of divided optics and of masks as well as under extreme conditions during wet chemical processes. Due to the high sensitivity at 450 nm they are suitable for the manufacturing of CD masters.
The resists contain a combination of novolac resin with diazonaphthoquinone, dissolved in a mixture of safer solvents (main component: propylene glycol methyl ether acetate).

2. Parameters

Properties / Resist	AR-P	3110	3120	3170
Solids content	%	28	20	7
Viscosity (25 °C)	mPa·s	12	5	2
Film thickness at 4000 rpm Semitec CPS 20, uncovered chuck, 2" Si-wafer	**nm**	**1000**	**550**	**120**
Film thickness at 6000 - 2000 rpm	nm	800 - 1400	450 - 760	100 - 170
Flash point	°C	42		
Filtration	µm	0.2		
Storage at temperatures	°C	10 - 18		
Guarantee from date of sale	months	6		

3. Process chemicals

Developer	AR	300-35
Thinner	AR	300-12
Remover	AR	300-70

4. Processing

Before handled the resist has to be adapted to the temperature of the working area (recommended is a range of 20 - 25 °C at a relative humidity from 30 to 50%). The unexposed resist should be handled under yellow safe light.
The spin coated substrates should be baked on a hot plate under usual conditions or in a convection oven preferably at a temperature between 90 - 100 °C for 20 - 30 minutes. Previous to the exposure the baked substrates should be adapted to the temperature of the working place.

The resists is suitable for applications in the wavelength range of 308 - 450 nm.

Instructions for Development			
Developer suitable for Photoresists	**AR 300-26** immersion-, puddle- and spray-development, 21-23 °C	**AR 300-35** immersion- and puddle-development, 21-23 °C	**AR 300-40** immersion-, puddle- and spray-development, 21-23 °C
AR-P 3110	1 : 1,5	**pure**	**AR 300-46**
AR-P 3120 - 3170	1 : 3	**5 : 1**	**AR 300-47** 1.5 to 1 : 1 diluted with DI-H_2O
These concentrations should only be taken as guidelines. For every process the exact concentration of the developer should be individually adjusted (depending on film thickness, time of development, bake). See also ☞ information about developers. ☞ The dilution of the developer leads to an increase of contrast by decreasing speed. For concentrated developers an immersion time of at least 60 s is recommended. For diluted developers the time can be extended up to 120 seconds. Spray development reduces the development time.			

Contrast and speed can be widely influenced by variation of the concentration of the **Developer AR 300-35.** Developed images have to be rinsed in deionized water immediately after developing process.
A post development bake at about 110 °C improves the adhesion and the resistance of the resist structure which leads to good etching stability

5. Cleaning and Removal

Substrates and equipments can be cleaned with the **Thinner AR 300-12** or the **Remover AR 600-70**. To remove hard-baked layers it is recommended to use the **Remover AR 300-70.** Very hard-baked layers (plasma processing or UV-stabilization) need a treatment with oxidizing acids.

6. Waste Water Disposal

Up to 90% of the organic material of used developer and aqueous alkaline remover can be separated by precipitation through pH-adjustment in a range of 9-10. Filtered solutions have to be adjusted to 6.5–8.0 for final waste disposal. Liquid or solid wastes have to be disposed at proper deposit places or by controlled combustion in officially authorized plants.

7. Safety References

Resists and thinner contain organic solvents. Adequate ventilation in the working area is demanded. Avoid direct contact with products and their vapours!
Wear safety goggles and rubber gloves!
Please ask for safety data sheets!

As of Jan. ´07

Photoresist serie for thick resist films AR-P 3200 (new)

1. General description

The Photoresists of the series AR-P 3200 are positive liquid resists with high viscosity for high film thicknesses. These resists are well suitable for covering edges of topographies on complicated wafer surfaces (good levelling). It is possible to generate resist pattern with a vertical profile. The resolution of the thick resist layers is very high. The profile of lines shows very steep edges so that a high degree of pattern resolution is given in these films.
Double coatings are possible. By use of "Closed Chuck-Systems" (gyrset) higher resist thickness can be generated. **The new created AR-P 3210 has a high sensitivity and shows a higher transparency in the UV-range.** Unexposed areas are very stable against attacks of the developer, so it is possible to expose and develop a 100-µm-layer in one step.
The resists contain a combination of novolac resin with diazonaphthoquinone, dissolved in a mixture of solvents main component safer solvent propylene glycol methyl ether acetate.

2. Parameters

Properties / Resist	**AR-P**	**3210 new**	**3220**	**3250**
Solids content	%	50	50	43
Viscosity (25 °C)	mPa·s	≥ 800	≥ 800	≥ 200
Film thickness at 4000 rpm Semitec CPS 20, uncovered chuck, 2" Si-wafer	**µm**	**10**	**10**	**5.0**
Film thickness at 6000 - 2000 rpm Film thickness at 1000 - 250 rpm	µm	8 – 15 20 – 40	8 – 15 20 – 50	4 – 8 10 – 40
Flash point	°C	42		
Filtration	µm	0.8		
Storage at temperatures	°C	10 – 18		
Guarantee from date of sale	months	6		

3. Process chemicals

Developer	AR	300-26
Thinner	AR	300-12
Remover	AR	300-70

4. Processing

Before handled the resist has to be adapted to the temperature of the working area (recommended is a range of 20 – 25 °C at a relative humidity from 30 to 50%). The unexposed resist should be handled under yellow safe light.
Equal quantities of resist (e.g. 10 g for 4inch wafers) ensure equal film thickness. Usual coat and bake procedure of standard resist (AR-P 3500) is needed for layers < 10µm. Thicker layers (10-30 µm) should be spin coated for 30-60 seconds. Layers > 30µm should be coated in two steps. Low starting revolution should be followed by a main revolution of 250-500 rpm, for at least 2-5 minutes. Marginal beads are reduced by a final spin rotation at 800 rpm for 5 seconds.
10-30 µm layers should be prebaked on hot plate (95-100 °C, 8-15 min) or in convection oven (85-90 °C, 30-60 min). For higher thickness (> 30 µm) a two step bake is recommended:
1.) 70 °C for 30 min in convection oven or 5 minutes using a hot plate.
2.) 85-90 °C for 60-90 min in convection oven or 95 - 100 °C for 15-30 min on hot plate.

A longer bake reduces the sensitivity as well as the possibility of undercut patterns.
These resists are suitable for application in the wavelength range of 308 - 450 nm.

Instructions for Development		
Developer suitable for Photoresists	**AR 300-26** immersion-, puddle- and spray-development, 21-23 °C	**AR 300-35** immersion- and puddle-development, 21-23 °C
AR-P 3210	1 : 3, 5…20 min	undiluted to 3-10 µm
AR-P 3200, 3250	1 : 1, 1…3 min	undiluted to 3-10 µm
These concentrations of developer are recommended values. The exact concentration of developer should be adjusted to the special parameters (film thickness, time of development, bake). See also ☞ information about developers. ☞ Dilution of developer leads to an increase of contrast by decreasing the speed.		

Developed images have to be rinsed in deionized water immediately after developing process.
A post development bake at about 110 °C improves adhesion and resistance of the structure which leads to good etching stability.

5. Cleaning and Removal

Substrates and equipments can be cleaned with the **Thinner AR 300-12** or the **Remover AR 600-70**. Hard-baked layers can be stripped with the **Remover AR 300-70.** Very hard-baked layers (plasma processing or UV-stabilization) need a treatment with oxidizing acids.

6. Waste Water Disposal

Up to 90% of the organic material of used developer and aqueous alkaline remover can be separated by precipitation through pH-adjustment in a range of 9-10. Filtered solutions have to be adjusted to 6.5–8.0 for final waste disposal. Liquid or solid wastes have to be disposed at proper deposit places or by controlled combustion in officially authorized plants.

7. Safety References

Resists and thinner contain organic solvents. Adequate ventilation in the working area is demanded. Avoid direct contact with products and their vapours.
Wear safety goggles and rubber gloves!
Please ask for safety data sheets!

As of Jan. ´07

Photoresist series with wide process range AR-P 3500 (new)

1. General description

The Positive Photoresists of the series AR-P 3500 are striation free standard resists. They meet the requirements for lithographic mask processing of integrated circuit fabrication.

AR-P 3500 resists exhibit high sensitivity and high resolution in addition to excellent adhesion on metal and oxide surfaces.
The resists contain a combination of novolac resin with diazonaphthoquinone, dissolved in a mixture of solvents main component safer solvent propylene glycol methyl ether acetate.

2. Parameters

Properties / Resist	AR-P	3510	3540
Solids content	%	35	31
Viscosity (25 °C)	mPa·s	33	18
Film thickness at 4000 rpm Semitec CPS 20, uncovered chuck, 2" Si-wafer	**µm**	**2.0**	**1.4**
Film thickness at 6000 - 2000 rpm	µm	1.6 – 3.0	1.1 – 2.0
Flash point	°C	42	
Filtration	µm	0.2	
Storage at temperatures	°C	10 – 18	
Guarantee from date of sale	months	6	

3. Process chemicals

Developer	AR	300-35
Thinner	AR	300-12
Remover	AR	300-70

4. Processing

Before handled the resist has to be adapted to the temperature of the working area (recommended is a range of 20 – 25 °C at a relative humidity from 30 to 50%). The unexposed resist should be handled under yellow safe light.
Coated substrates should be prebaked at a temperature between 90 – 100 °C on hot plate for 1 - 2 minutes or in convection oven for 20 or 30 minutes.
Previous to the exposure the baked substrates should be adapted to the temperature of the working place.
These resists are suitable for application in the wavelength range of 308 - 450 nm.

Instructions for Development			
Developer suitable for Photoresists	**AR 300-26** immersion-, puddle- and spray-develop-ment, 21-23 °C	**AR 300-35** immersion- and puddle-development, 21-23 °C	**AR 300-40** immersion-, puddle- and spray-develop-ment, 21-23 °C
AR-P 3500 (new)	**1 : 5**	**1 : 1**	**AR 300-47** 1 : 1 diluted with DI-H_2O
These concentrations of developer should only be taken as guidelines. The exact concentration of developer should be optimized for each process (film thickness, time of development, bake). See also ☞ information about developers. ☞ The dilution of the developer leads to an increase of contrast by decreasing speed. For concentrated developers an immersion time of at least 60 s is recommended. For diluted developers the time can be extended up to 120 seconds. Spray development reduces the development time.			

Contrast and speed can be widely influenced by variation of the concentration of the **Developer AR 300-35.**
Developed images have to be rinsed in deionized water immediately after developing process.
A post development bake at about 110 °C improves adhesion and resistance of the structure which leads to good etching stability.

5. Cleaning and Removal

Substrates and equipments can be cleaned with the **Thinner AR 300-12** or the **Remover AR 600-70**. Hard-baked layers can be stripped with the **Remover AR 300-70.** Very hard-baked layers (plasma processing or UV-stabilization) need a treatment with oxidizing acids.

6. Waste Water Disposal

Up to 90% of the organic material of used developer and aqueous alkaline remover can be separated by precipitation through pH-adjustment in a range of 9-10. Filtered solutions have to be adjusted to 6.5–8.0 for final waste disposal. Liquid or solid wastes have to be disposed at proper deposit places or by controlled combustion in officially authorized plants.

7. Safety References

Resists and thinner contain organic solvents. Adequate ventilation in the working area is demanded. Avoid direct contact with products and their vapours.
Wear safety goggles and rubber gloves!
Please ask for safety data sheets!

As of Jan. ´07

Photoresist Systems for Sub µm structures AR-P 3700 and AR-P 3800 (new)

1. General description

The positive photoresists of the series AR-P 3700 and AR-P 3800 are striation-free coat able resists specially designed for producing highly integrated circuits with structures up to the micron range.
They excel by optimised coating properties on topologically prominent structured substrate surfaces high sensitivity, high contrast, excellent dimensionally stability and a wide process range.
Dyed the resist **AR-P 3840** will oppress within the spectral range of 340 - 450 nm the effect of standing waves and scattered radiation on highly reflective surfaces.
The resists contain a combination of novolac resin with diazonaphthoquinone, dissolved in a mixture of safer solvents (main component: propylene glycol methyl ether acetate).

2. Parameters

Properties / Resist	**AR-P**	**3740**	**3840**
Solids content	%	27	27
Viscosity (25 °C)	mPa·s	45	45
Film thickness at 4000 rpm Semitec CPS 20, uncovered chuck, 2" Si-wafer	**µm**	**1.4**	**1.4**
Film thickness at 6000 - 2000 rpm	µm	1.1 – 2.0	1.1 – 2.0
Flash point	°C	42	
Filtration	µm	0.2	
Storage at temperatures	°C	10 - 18	
Guarantee from date of sale	months	6	

3. Process chemicals

Developer	AR	300-47
Thinner	AR	300-12
Remover	AR	300-70

4. Processing

Before handled the resist has to be adapted to the temperature of the working area (recommended is a range of 20 - 25°C at a relative humidity of 30 to 50%). The unexposed resist should be handled under yellow safe light.
Coated substrates should be prebaked at a temperature between 90 – 100 °C on hot plate for 1 - 2 minutes or in convection oven for 20 or 30 minutes.
Previous to the exposure the baked substrates should be adapted to the temperature of the working place. Spectral range for pattern wise exposure is between 308 and 450nm.

Instructions for Development			
Developer suitable for Photoresists	**AR 300-26** immersion-, puddle- and spray-development, 21-23 °C	**AR 300-35** immersion- and puddle-development, 21-23 °C	**AR 300-40** (undiluted) immersion-, puddle- and spray-development, 21-23 °C
AR-P 3700, 3800 (new)	1 : 3	4 : 1	**AR 300-46, 300-47**
These concentrations of developer should only be taken as guidelines. The exact concentration of developer should be optimized for each process (film thickness, time of development, bake). See also ☞ information about developers. ☞ The dilution of the developer leads to an increase of contrast by decreasing speed. For concentrated developers an immersion time of at least 60 s is recommended. For diluted developers the time can be extended up to 120 seconds. Spray development reduces the development time.			

The **developer AR 300-46 (high speed)** and **AR 300-47 (high contrast)** minimize the possibility of a metal ion contamination at the substrate surface and ensure an optimal resolution at a wide process range.
Developed images have to be rinsed in deionized water immediately after developing process.
A post development bake at about 110 °C improves adhesion and resistance of the structure which leads to good etching stability.

5. Cleaning and Removal

Substrates and equipments can be cleaned with the **Thinner AR 300-12** or the **Remover AR 600-70**. Hard-baked layers can be stripped with the **Remover AR 300-70.** Very hard-baked layers (plasma processing or UV-stabilization) need a treatment with oxidizing acids.

6. Waste Water Disposal

Up to 90% of the organic material of used developer and aqueous alkaline remover can be separated by precipitation through pH-adjustment in a range of 9-10. Filtered solutions have to be adjusted to 6.5–8.0 for final waste disposal. Liquid or solid wastes have to be disposed at proper deposit places or by controlled combustion in officially authorized plants.

7. Safety References

Resists and thinner contain organic solvents. Adequate ventilation in the working area is demanded. Avoid direct contact with products and their vapours.
Wear safety goggles and rubber gloves!
Please ask for safety data sheets!

As of Jan. ´07

Protective Coating AR-PC 504 (0)

1. General description

The AR-PC 504 is a protective coating for KOH etching. The resist is used on back side of wafers to avoid mechanical damages and as reliable protection of the structures against etching processes. Resist is offered as well for acid as for alkaline media (up to 40% KOH). The adhesion of resists on the substrate is of decisive importance for good results.
The generated layer is non light sensitive (> 300 nm) and optical transparent > 270 nm.
The protective coating AR-PC 504 is based on polymers of methyl methacrylate with different molecular weights, dissolved in chlorobenzene.

2. Parameters

Properties / Resist	**AR-PC**	**504(0)**
Solid content	%	13
Viscosity (25 °C)	mPa·s	350
Resist thickness by 1000 rpm Resist thickness by 4000 rpm Semitec CPS 20, uncovered chuck, 2" Si-wafer	**µm**	**4,5** 2.2
Flash point	°C	28
Filtration	µm	0.45
Storage	°C	18 - 25
Guarantee from date of sale	months	6

3. Process chemicals

Adhesions promoter	AR	300-80
Remover	AR	300-70

4. Processing

A pre-treatment of substrates with **adhesion promoter AR 300-80** is recommended for increasing the adhesion (☞ process description AR 300-80).
Before handled the resist has to be adapted to the temperature of the working area (recommended is a range of 20 – 25 °C at a relative humidity from 30 to 50%). The resist can be processed under normal light (yellow safe light is not necessary) by means of spin coating. Spin rotation between 800 - 2000 rpm are possible but to protect the edges as well as to avoid "candy floss effect" a spin rotation of **1000 rpm** is advisable.
Coated substrates should be prebaked on a hot plate under usual conditions (5 minutes at 150 °C) or in convection oven at a temperature of 150 °C for 60 minutes. In most cases a bake at 100 °C will be enough. But baking temperatures up to 190 °C are possible.
The etching process takes place in 40% KOH at 80 °C.
The protective coating is not attacked by KOH. Problems during etching process will only be caused by insufficient adhesion. By a pretreatment of the surface with **addition promoter AR-P 300-80** the time of protection can be extended up to 8 hours.
The **remover AR 300-70** can be used for removing. For lower baked layers the **AR 600-70** is sufficient. The process of removing needs some minutes.
Removing by oxygen plasma is also possible.

5. Cleaning and Removal

Substrates and equipments can be cleaned with the **Thinner AR 600-01** or the **Remover AR 600-70**. Hard-baked layers can be stripped with the **Remover AR 300-70.** Very hard-baked layers (plasma processing or UV-stabilization) need a treatment with oxidizing acids or oxygen plasma.

6. Waste Water Disposal

Up to 90% of the organic material of used developer and aqueous alkaline remover can be separated by precipitation through pH-adjustment in a range of 9-10. Filtered solutions have to be adjusted to 6.5–8.0 for final waste disposal. Liquid or solid wastes have to be disposed at proper deposit places or by controlled combustion in officially authorized plants.

7. Safety References

Resists and thinner contain organic solvents. Adequate ventilation in the working area is demanded. Avoid direct contact with products and their vapours.
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Please ask for safety data sheets!

As of Jan. ´07

Positive Photoresists for lift-off-application AR-P 5300 (new)

1. General description

The Positive Photoresist AR-P 5350 is used to produce undercut structures for generating vapour phase patterns from metal by means of lift-off-technique.
Undercut profiles are manufactured in common lithographic processes including deposition, bake, exposure and development without any additional technological, temporary and energetic expenses.
AR-P 5300 resists exhibit high sensitivity and high resolution in combination with a good adhesion to metal and oxide surface. Resist formulation contains components which harden the resist surface during the normal bake (hot plate or convection oven). The undercut structures occur during the following development.
The new developed AR-P 5320 generates lift-off structures up to 10 µm thickness.
The resists contain a combination of novolac resin with diazonaphthoquinone, dissolved in a mixture of solvents main component safer solvent propylene glycol methyl ether acetate.

2. Parameters

Properties / Resist	AR-P	5320 new	5350
Solids content	%	43	27
Viscosity (25 °C)	mPa·s	$\geq$ 200	13
Film thickness at 4000 rpm Semitec CPS 20, uncovered chuck, 2" Si-wafer	**µm**	**5.0**	**1.0**
Film thickness at 6000 - 2000 rpm	nm	10 (1000 rpm)	0.8 – 1.4
Flash point	°C	42	
Filtration	µm	0.2	
Storage at temperatures	°C	10 - 18	
Guarantee from date of sale	months	6	

3. Process chemicals

Developer	AR	300-26
Thinner	AR	300-12
Remover	AR	300-70

4. Processing

Before handled the resist has to be adapted to the temperature of the working area (recommended is a range of 20 – 25 °C at a relative humidity from 30 to 50%). The unexposed resist should be handled under yellow safe light.
Spin coated substrates should be baked on hot plate by 100 – 110 °C for 3 – 5 minutes or in convection oven at a temperature between 95 - 105 °C for 30 or 40 minutes. Higher baking temperatures as usual are important for the formation of undercuts.
Previous to the exposure the baked substrates should be adapted to the temperature of the working place. These Resists are suitable for application in the wavelengths range of 308 to 450 nm.

Instructions for Development			
Developer suitable for Photoresists	**AR 300-26** immersion-, puddle- and spray-development, 21-23 °C	**AR 300-35** immersion- and puddle-development, 21-23 °C	**AR 300-40** immersion-, puddle- and spray-development, 21-23 °C
AR-P 5320 (new)	1 : 1 to 1 : 2	undiluted to 5 µm	**AR 300-46**
AR-P 5350	1 : 5	1 : 1	**AR 300-47** 1 : 1 diluted with DI-H_2O
These concentrations of developer should only be taken as guidelines. The exact concentration of developer should be adjusted to the special parameters (film thickness, time of development, bake). See also ☞ information about developers. ☞ The dilution of the developer leads to an increase of contrast by decreasing speed. For concentrated developers an immersion time of at least 60 s is recommended. For diluted developers the time can be extended up to 120 seconds. Spray development reduces the development time.			

Contrast and speed can be widely influenced by variation of the concentration of the **Developer AR 300-26.** The profile of the resist lines depends considerably on the processing parameters (bake, exposure and develop process).
Developed images have to be rinsed in deionized water immediately after developing process. A post development bake at about 110 °C improves adhesion and resistance of the structure which leads to good etching stability.

5. Cleaning and Removal

Substrates and equipments can be cleaned with the **Thinner AR 300-12** or the **Remover AR 600-70**. Hard-baked layers can be stripped with the **Remover AR 300-70.** Very hard-baked layers (plasma processing or UV-stabilization) need a treatment with oxydizing acids.

6. Waste Water Disposal

Up to 90% of the organic material of used developer and aqueous alkaline remover can be separated by precipitation through pH-adjustment in a range of 9-10. Filtered solutions have to be adjusted to 6.5–8.0 for final waste disposal. Liquid or solid wastes have to be disposed at proper deposit places or by controlled combustion in officially authorized plants.

7. Safety References

Resists and thinner contain organic solvents. Adequate ventilation in the working area is demanded. Avoid direct contact with products and their vapours.
Wear safety goggles and rubber gloves!
Please ask for safety data sheets!

As of Jan. ´07

Two-Layer-System for lift-off-structures AR-P 5400 - 3510

1. General description

The two-layer-system AR-P 5400 - AR-P 3510 can be used for production of

- **optical transparent structures** (transparent from 270 nm to infrared)
- **thermal stable resist structures** (up to 230 °C)
- **lift-off-structures.**

At first the **PMMA-copolymer AR-P 5400** is coated. The **Photoresist AR-P 3510** is brought on top of this tempered copolymer layer.
The two-layer lift-off-system is developed in aqueous-alkaline developers.
Resists are solved in safer solvents. **Resists AR-P 5400** are copolymers on base of methyl methacrylate and methacrylic acid mainly in 1-methoxy-2-propanole. **AR-P 3510** is a novolac-naphthoquinondiazide-combination mainly in propylene glycol monomethyl ether acetate.

2. Parameters

Properties / Resist	AR-P	5460	5480	3510
Solids content	%	12	7	35
Film thickness at 4000 rpm Semitec CPS 20, uncovered chuck, 2" Si-wafer	**µm**	**1.0**	**0.5**	**2.0**
Film thickness at 6000 - 2000 rpm	µm	0.8 – 1.4	0.4 – 0.7	1.6 – 3.0
Flash point	°C	38	38	42
Storage at temperatures	°C	10 – 18		
Guarantee from date of sale	months	6		

3. Process chemicals

Developer	AR	300-47 (1 : 1 diluted with DI-H_2O)	
Thinner	AR	600-07	300-12
Strip with Remover	AR	300-72	

4. Processing

Process recommendations			
I.	**Coating AR-P 5460** **Coating AR-P 5480** (spin coating; open chuck)	2000 - 1000 rpm 2000 - 1000 rpm	1.4 – 2.0 0.7- 1.0
II.	**Drying hot plate** Drying convection oven	150 °C 150 °C	5 min 30 min
III.	**Coating AR-P 3510** (spin coating; open chuck)	4000 - 1000 rpm	2.0 – 4.0 µm
IV.	**Drying hot plate** **Drying convection oven**	100 °C 95 °C	2 min 30 min
V.	**UV exposure** (310 – 450 nm)	mJ/cm²	50 - 100
VI.	**Development**	**AR 300-47** (1 : 1 diluted with DI-H_2O)	30 - 120 s
VII.	**Selective strip-off for AR-P 3510** for use of copolymer (thermal stable)	**AR 600-70** fast drying or spin coating	5 - 10 s
VIII.	**Strip of AR-P 5400**	**AR 300-72, AR 300-73**	1 - 5 min

Before handled the resist has to be adapted to the temperature of the working area (recommended is a range of 20 – 25 °C at a relative humidity from 30 to 50%).

(I.) and **(II.)** At first the PMMA-Copolymer **AR-P 5400** is coated and soft baked (recommended speed between 1000 and 3000 rpm). Soft baked with 180 °C (in difference to the recommended 150 °C) solution speed of polymers is reduced to a half.

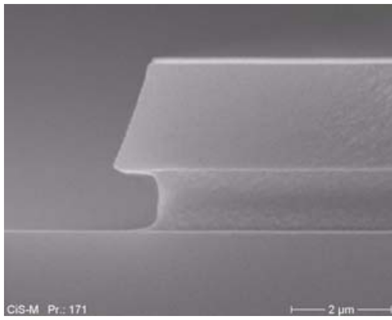
(III.) and **(IV.)** After cooling process the photoresist **AR-P 3510** is applied on top of the copolymer. Liquid photoresist should not remain on a standing wafer for more than 30 sec. Layer thickness can be verified in the range from 1.6 – 4.0 µm. Afterwards the two-layer-system can be soft baked.

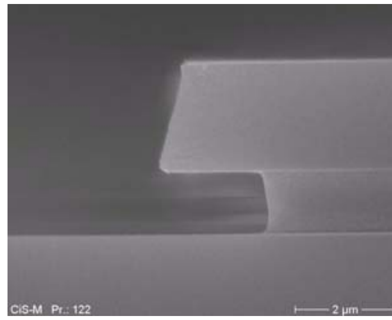
(V.) and **(VI.)**
AR-P 3500: Exposure and aqueous-alkaline development (possible are spray, dip and puddle coating) are as usual. (see AR-P 3500).
AR-P 5400: By itself the PMMA-copolymer is not sensitive to light in UV range of 300 - 450 nm. Conditions of the layer are such that the polymer dissolves defined quickly in the recommended aqueous-alkaline developer.
After the uppermost photoresist layer is developed at the exposed parts the developer starts to dissolve the copolymer. The dissolution succeeds isotropic. Therefore the AR-P 5400 dissolves below as well as to the right and to the left and undercuts will be formed. Undercuts are more prominent if the developer affects longer (see illustration 1).
Structure geometry is influenced by the relation of thickness of both layers. In order to acquire a prominent lift-off effect the photoresist layer should be relatively thin while the copolymer should be thicker. For dimensional stable structure transfer into the copolymer layer the photoresist has to be thick in relation to the PMMA. The complex of the whole system is to be optimised according to the respective application.
For further information on resists and developers ☞ product information.

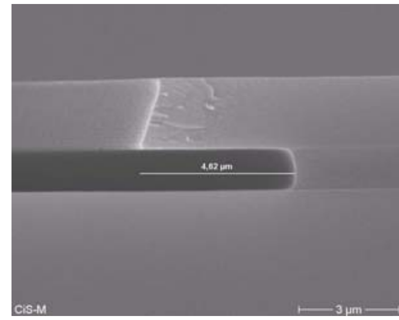
(VII.) To use only the copolymer structure the remaining photoresist can selectively be removed after the development with **AR 600-70**. Therefore the substrate is dipped shortly into the remover AR 600-70 and instantly dried with compressed air.

(VIII.) For lift-off processes the remover **AR 300-72** (NMP-base) and **AR 300-73** (TMAH-base, aqueous alkaline, attacks aluminium) are suitable. If lift-off structures are not stressed thermally while steamed or sputtered lifting will take place within a minute.
After thermal stress (> 150 °C) lift-off process is notably prolonged. Removing is eased by ultrasonic and heating. Both removers can be heated up to 80 °C.

Two-layer-system for lift-off-structures AR-P 5400 - 3510







25 s development	40 s development	90 s development
0.8 µm undercut	1.6 µm undercut	4.6 µm undercut

5. Cleaning and Removal

Substrates and equipment can be cleaned with **thinner AR 300-12** or **remover AR 600-70**. To remove hard-baked layers it is recommended to use the **remover AR 300-72** or **remover AR 300-73**.

6. Disposal

Up to 90% of the organic material of used developer and aqueous alkaline remover can be separated by precipitation through pH-adjustment in a range of 9-10. Filtered solutions have to be adjusted to 6.5–8.0 for final waste disposal. Liquid or solid wastes have to be disposed at proper deposit places or by controlled combustion in officially authorized plants.

7. Safety References

Resists and thinner contain organic solvents. Adequate ventilation in the working area is demanded. Avoid direct contact with products and their vapours.
Wear safety goggles and rubber gloves!
Please ask for safety data sheets!

As of Jan. ´07

Image Reversal Resist System AR-U 4000

1. General description

The Image Reversal Resists of the serie AR-U 4000 are safer-solvent resists. Depending on process parameters positive or negative tone images can be generated. The photoresists permit reproduction of patterns in the range of sub micrometers. The resists work in a positive mode without additional process steps.
By means of special processing (bake after image like exposure and following flood exposure) the material provides a negative resist image of the optical transmitted pattern. A very high contrast of patterns is reached by using the **Image Reversal Resist AR-U 4000**. It is the only negative resist with an exposure wavelength up to 450 nm.
In negative mode it is possible to create undercut profiles (lift-off-structures). The resists respond to radiation in range of 308 - 450 nm. An image like exposure in the g- and i-line range needs a dose of about 70 mJ/cm² (1.4 µm thickness).
The resists are liquid resists containing novolac resins, photoactive and amine compounds in safer solvents propylene glycol methyl ether acetate

2. Parameters

Properties / Resist	AR-U	4030	4040	4060
Solids content	%	37	34	23
Viscosity (25 °C)	mPa·s	28	19	6
Film thickness at 4000 rpm Semitec CPS 20, uncovered chuck, 2“ Si-wafer	**µm**	**1.8**	**1.4**	**0.6**
Film thickness at 6000 - 2000 rpm	µm	1.5 - 2.5	1.2 - 2.0	0.5 - 0.8
Flash point	°C	42		
Filtration	µm	0.2		
Storage at temperatures	°C	8 – 12		
Guarantee from date of sale	months	6		

3. Process chemicals

Developer	AR	300-35
Thinner	AR	300-12
Remover	AR	300-70

4. Processing

Positive Process		Negative Process
• Coating	**I.**	• Coating
• Soft bake 94 ± 1.0 °C, 30 min, convection oven	**II.**	• Soft bake 85 ± 1.0 °C, 30 min, convection oven
• Image like exposure	**III.**	• Image like exposure
	IV.	• Crosslinking bake 100 ± 1.0 °C, 30 min, convection oven or 115 ± 1.0 °C, 5 min, hot plate
	V.	• Flood exposure
• Development	**VI.**	• Development

(I.) Before handled the resist has to be adapted to the temperature of the working area (recommended is a range of 20 – 25 °C at a relative humidity from 30 to 50%). The unexposed resist should be handled under yellow safe light. Resists should be spin coated in range of 3000 - 7000 rpm.

(II.) Coated substrates should be prebaked in a convection oven within the range 80 - 95 °C (positive: 94 ± 1.0 °C and negative: 85 ± 1.0 °C) for 30 minutes or on hot plate for 2 minutes.

(III.) Previous to the exposure the baked substrates should be adapted to the temperature of the working place. These resists are suitable for application in wavelength range of 308 - 450 nm. A resist layer of 1.4 µm requires an exposure dose of about 70 mJ/cm². It corresponds to approximately 90% of film thickness in negative patterning.

(IV.) The reversal bake yields a negative tone image. The recommended value for the reversal bake is 100 °C, 30 minutes (oven) or 115 °C, 5 minutes (hot plate). Concerning contrast and speed the reversal bake temperature can be chosen in the range of 95 - 120 °C whereupon the steps exposure, flood exposure and development have to be coordinated according to each temperature. Higher reversal temperature needs higher image wise exposure and flood exposure as well as an adapted developing process.

(V.) The flood exposure converts the unexposed area in a developable form. According to the processing conditions the required flood exposure should be 2 or 3 times as high as image wise exposure (image wise exposure of 70mJ/cm² requires a flood exposure of 180 mJ/cm²).

(VI.) Developers AR 300-35, AR 300-26 (containing alkali hydroxides) and **AR 300-47** (metal ion free) are recommended for development of exposed resist layers. The developers are suitable for immersion and puddle development in the temperature range of 21 - 23 °C. Besides that, the developers **AR 300-26 and AR 300-47** (1 : 1 diluted with DI-H_2O) are suitable for spray development.
Contrast and speed can be widely influenced by variation of the concentration (40-90%) of the **Developer AR 300-35.**
Diluting of developer leads to an increase of contrast by a decrease of speed. Development time takes about 60 seconds by use of concentrated developer and 120 seconds in case of diluted developer. Corresponding to the required image geometry and the tolerance in size the **Developer AR 300-26** can be diluted with deionized water. In general 4 parts of deionized water are added to 1 part of developer.
The metal ion free Developer AR 300-47 of the series 300-40 is designed for a wide range of normality. The application of **metal ion free Developer of the series AR 300-40** prevents metal ion contamination and ensures optimum detail resolution in connection with high process latitude.
For further information see data sheets of Developer series.
⇒ In case of an increase in reversal bake temperature from 100 to 115 °C developer concentration and developing time have to be increased too. Especially the developer AR 300-35 has to be used undiluted for resists reversal baked at higher temperatures.
Developed images have to be rinsed in deionized water immediately after developing process.
A post development bake at about 110 °C improves adhesion and resistance of the structure which leads to good etching stability.

5. Cleaning and Removal

The cleaning of substrates and equipments can be carried out by using the **Thinner AR 300-12** or the **Remover AR 600-70**.
Hard-baked layers can be stripped with the **Remover AR 300-70**. Very hard-baked layers (plasma processing or UV-stabilization) need a treatment with oxidizing acids.

6. Waste Water Disposal

Up to 90% of the organic material of used developer and aqueous alkaline remover can be separated by precipitation through pH-adjustment in a range of 9-10. Filtered solutions have to be adjusted to 6.5–8.0 for final waste disposal. Liquid or solid wastes have to be disposed at proper deposit places or by controlled combustion in officially authorized plants.

7. Safety References

Resists and thinner contain organic solvents. Adequate ventilation in the working area is demanded. Avoid direct contact with products and their vapours!
Wear safety goggles and rubber gloves!
Please ask for safety data sheets!

As of Jan. ´07

Negative Photoresist System for mid and deep-UV AR-N 4240

1. General description

The Negative Photoresist AR-N 4240 is a non chemical amplified resist. It is designed to meet critical geometry requirements of advanced integrated circuit fabrication.
The AR-N 4240 is especially suited for wavelength range of 300 – 365 nm and also responds to deep-UV radiation (248 – 265 nm). It shows high plasma etching stability.
The resist features good sensitivity, high resolution and good adhesion on metal- and oxide surfaces. It can be developed in aqueous alkaline developer. Undercut profiles can be obtained by variation of the developing process (lift-off-structures).
The resist contains a combination of novolac resin with a photoactive compound (cross linker), dissolved in a mixture of safer solvents (main component: propylene glycol methyl ether acetate).

2. Parameters

Properties / Resist	**AR-N**	**4240**
Solids content	%	30
Viscosity (25 °C)	mPa·s	10
Film thickness at 4000 rpm Semitec CPS 20, uncovered chuck, 2" Si-wafer	**µm**	**1.4**
Film thickness at 6000 - 2000 rpm	µm	1.1 - 2.0
Flash point	°C	42
Filtration	µm	0.2
Storage at temperatures	°C	14 – 20
Guarantee from date of sale	months	6

3. Process chemicals

Developer	AR	300-47
Thinner	AR	300-12
Remover	AR	300-70

4. Processing

Before handled the resist has to be adapted to the temperature of the working area (recommended is a range of 20 – 25 °C at a relative humidity from 30 to 50%). The unexposed resist should be handled under yellow safe light.
The spin coated substrates should be baked on a hot plate (85 ± 1.0 °C, 2 min) or in a convection oven at a temperature of 85 ± 1.0 °C for 30 minutes
Previous to the exposure the baked substrates should be adapted to the temperature of the working place. This resist is suitable for application in the wavelength range of 300 - 365 nm. It also responds to deep UV radiation (248 – 265 nm).
Exposure depends on the used exposure equipment, therefore corresponding tests are necessary.
☞ An additional bake (85 °C, 2 minutes hot plate, 30 minutes oven) is recommended after exposure.
Exposed resist layer should be developed with the **Developer AR 300-47** (metal ion free) for 1-2 min. The developer is suitable for immersion, puddle and spray development within the temperature range of 21-23 °C.

☞ The profile of the resist structures depends considerably on time of the development. An extended development time leads to a pronounced under cut. The under cut profiles can be used in lift-off application.
Developed images have to be rinsed in deionized water immediately after developing process.
A post development bake at about 110 °C improves adhesion and resistance of the structure which leads to good etching stability.

5. Cleaning and Removal

Substrates and equipments can be cleaned with the **Thinner AR 300-12** or the **Remover AR 600-70**. Hard-baked layers can be stripped with the **Remover AR 300-70.** Very hard-baked layers (plasma processing or UV-stabilization) need a treatment with oxidizing acids.

6. Waste Water Disposal

Up to 90% of the organic material of used developer and aqueous alkaline remover can be separated by precipitation through pH-adjustment in a range of 9-10. Filtered solutions have to be adjusted to 6.5–8.0 for final waste disposal. Liquid or solid wastes have to be disposed at proper deposit places or by controlled combustion in officially authorized plants.

7. Safety References

Resists and thinner contain organic solvents. Adequate ventilation in the working area is demanded. Avoid direct contact with products and their vapours!
Wear safety goggles and rubber gloves!
Please ask for safety data sheets!

As of Jan. ´07

New Development

Negativ-Photoresist for mid UV (i-line) AR-N 4340

1. General description

The Negative Resist AR-N 4340 is a high sensitive, chemical amplified photoresist.
An optimum exposure is possible in wavelength range of 300 – 390 nm, specially for i-line. The resist responds to deep-UV (248 – 265 nm) and g-line (436 nm) as well.
The resist exhibits a very high sensitivity, high resolution and good adhesion on metal- and oxide surfaces. AR-N 4340 is more sensitive to i-line radiation than AR-N 4240. The resist can be developed in aqueous alkaline developer. Undercut profiles can be obtained by variation of the developing process. (lift-off-structures).
The resist contains a combination of novolac resin with a photoactive compound (acid generator) and amine components. The resist is solved in the safer solvent propylene glycol methyl ether acetate (PGMEA).

2. Parameters

Properties / Resist	**AR-N**	**4340**
Solids content	%	31
Viscosity (25 °C)	mPa·s	10
Film thickness at 4000 rpm Semitec CPS 20, uncovered chuck, 2" Si-wafer	**µm**	**1.4**
Film thickness at 6000 - 2000 rpm	µm	1.1 - 2.0
Flash point	°C	42
Filtration	µm	0.2
Storage at temperatures	°C	10 – 18
Guarantee from date of sale	months	6

3. Process chemicals

Developer	AR	300-475
Thinner	AR	300-12
Remover	AR	300-70

4. Processing

Before handled the resist has to be adapted to the temperature of the working area (recommended is a range of 20 – 25 °C at a relative humidity from 30 to 50%). The unexposed resist should be handled under yellow safe light.
Coated substrates should be prebaked on hot plate (85 ± 1.0 °C, 2 minutes) or in a convection oven at a temperature of 85 ± 1.0 °C for 30 minutes.
Previous to the exposure the baked substrates should be adapted to the temperature of the working place. This resist is suitable for application in the wavelength range of 300 – 390 nm. It responds to deep UV radiation (248 – 265 nm) and g-line as well.
Exposure depends on the used exposure equipment, therefore corresponding tests are necessary.
After exposure a crosslinking bake (95 °C, 5 minutes hot plate, 20 - 30 minutes oven) is necessary.
The **Developer AR 300-475** (metal ion free) is recommended for development. This developer is suitable for immersion, puddle and spray development in the temperature range of 21- 23 °C.

The profile shape of the resist lines depends considerably on the time of development. An extended development time leads to a more pronounced under cut of the sidewall which can be used in lift off application.
Developed images have to be rinsed in deionized water immediately after developing process.
A post development bake at about 110 °C improves adhesion and resistance of the structure which leads to good etching stability

5. Cleaning and Removal

Substrates and equipments can be cleaned with the **Thinner AR 300-12** or the **Remover AR 600-70**. Hard-baked layers can be stripped with the **Remover AR 300-70.** Very hard-baked layers (plasma processing or UV-stabilization) need a treatment with oxidizing acids.

6. Waste Water Disposal

Up to 90% of the organic material of used developer and aqueous alkaline remover can be separated by precipitation through pH-adjustment in a range of 9-10. Filtered solutions have to be adjusted to 6.5–8.0 for final waste disposal. Liquid or solid wastes have to be disposed at proper deposit places or by controlled combustion in officially authorized plants.

7. Safety References

Resists and thinner contain organic solvents. Adequate ventilation in the working area is demanded. Avoid direct contact with products and their vapours.

Wear safety goggles and rubber gloves!
Please ask for safety data sheets

As of Jan. ´07

Negative Resist System for thick layers AR-N 4400 (CAR 44)

1. General description

The resists of the serie AR-N 4400 (CAR 44) are chemical amplified negative resists for thicknesses from 5 to 100 µm. They are mainly used for applications in the photo lithography. Double coating is possible. Resists thicknesses can be doubled by using „Closed-Chuck-System" (gyrset).
The acid generated during exposure is a precondition for the thermal cross linking.
The resists respond to UV (250 – 436 nm) as well as to e-beam and synchrotron radiation.
It is possible to generate resist patterns with a vertical profile and an excellent resolution. These thick resists are especially suitable for covering edges of topographies of complicated wafer surfaces (good levelling).
The resist **AR-N 4450** can be used for generating undercut profiles (lift-off-structures).
Distinctive feature of the Negative Resist System AR-N 4000 is the aqueous alkaline development. Additionally the cross linked structures are easy to remove by use of commercial removers. The resists are suitable for galvanic processes (pH 1 – 13).
The resists contain a combination of specific novolac resins with a photoactive acid generator dissolved in a mixture of safer solvents (main component: propylene glycol methyl ether acetate).

2. Parameter of the series CAR 44

Properties / Resist	**AR-N**	**4400-10**	**4400-25**	**4400-50**	**4450-10**
Solids content	%	45	52	58	45
Film thickness at 1.000 rpm Semitec CPS 20, uncovered chuck, 2" Si-wafer	**µm**	**10**	**25**	**50**	**10**
Film thickness at 4000 - 250 rpm	µm	5 - 20	13 - 50	25 - 100	5 - 20
Flash point	°C	42			
Storage at temperatures	°C	10 – 18			
Guarantee from date of sale	months	6			

3. Process chemicals

Developer	AR	300-40
Thinner	AR	300-12
Remover	AR	300-72

4 a. Processing of AR-N 4400:

	Processing steps and Processing recommendations	AR-N 4000 - 250 rpm	4400-10 4450-10 5 - 20 µm	4400-25 13 - 50 µm	4400-50 25 - 100 µm
I.	**Spin coating; uncovered chuck**				
II.	**Soft bake hot plate** **Soft bake convection oven**	85 - 95 °C 85 - 95 °C	5 - 10 min 40 - 60 min	8 - 45 min 1 - 4 h	30 - 90 min 2 - 6 h
III.	**Synchrotron-, e-beam radiation or UV-exposure** (250 – 400 nm)				
IV.	**Crosslinking bake (hot plate)** **Crosslinking bake convect. oven**	95 - 105 °C 95 - 105 °C	5 - 10 min 30 min	10 - 15 min 30 - 60 min	10 - 30 min 45 - 75 min
V.	**Development**	AR (diluted with $DI\text{-}H_2O$)	**300-47** (3 : 2) to **300-47** pure	**300-47** pure (300-46, 5 : 1) to **300-46** pure	**300-46** pure (300-44, 8 : 1) to **300-44** pure
VI.	**Removing simple crosslinking** **Removing strong crosslinking**	AR AR	600-70, 300-72 300-72, 300-73		

(I.) Before handled the resist has to be adapted to the temperature of the working area (recommended is a range of 20 – 25 °C at a relative humidity from 30 to 50%). The unexposed resist should be handled under yellow safe light.
It is recommended to treat the liquid resists (high viscosity) with ultra sonic or vacuum for avoidance of bubbles. Before coating the resist should rest at least for one day. Resist should be applied slowly and from low distance to the substrate (to avoid bubbles). It is recommendable to apply equal quantities of resist (e.g. 10 ml is the minimal quantity for 4″ wafer).
Special coating processes have to be created for different spin coaters (open chuck, gyrset a.o.). Generally it is recommendable to apply the resist to a non rotating wafer and then slowly pick up the speed (250 - 400 rpm) for 10 seconds. Afterwards the spin speed can be increased to the desired value. Duration of spin coating effects film thickness, shorter times increase the thickness. For **Resist AR-N 4400-50** a spin rotation of more than 1000 rpm is not advisable (poor surface quality).
Resist thicknesses up to 1000 µm can be obtained by cast technique. These layers need an extreme long soft bake. A new formulation of AR-N 4400 with advanced soft bake parameters is in development.

(II.) Duration of soft bake at 85-95 °C depends on intended resist thickness. A long intensive bake time leads to a lower sensitivity. For 20 µm layers the bake duration is about 1h (in convection oven); 50 µm need about 4 h. Thicker layers require an even longer bake. The use of temperature ramps as well as a slow cooling process is recommended. Long intensive bake leads to lower sensitivity.

(III.) Prior to exposure baked substrates should be adapted to the temperature of the working area. These resists respond to radiation in range of 250 – 400 nm (UV) as well as to e-beam radiation and synchrotron radiation.
The exposure depends on the special exposure machine, corresponding tests are necessary. A typical exposure dose for i-line is 150 mJ/cm² (30 µm-layer, developer AR 300-47). The CAR 44 system reacts 50 times as sensitive to synchrotron radiation as PMMA.

(IV.) Exposure is followed by crosslinking bake at 105 °C for 30 minutes (convection oven) or 10 minutes (hot plate). Thicker layers (> 50 µm) require longer times. Crosslinking bake is even possible some days after exposure without loss in sensitivity. The crosslinking temperature can vary in the range of 85-105 °C. Higher bake temperatures decrease sensitivity.

(V.) For development of exposed resist layers the **developer system AR 300-40** (metal ion free) is recommended. Layers up to 10 µm require the lower concentrated developer **AR 300-47** (3 : 2 diluted with $DI\text{-}H_2O$), intensive baked 50 µm-layers require the high concentrated developer **AR 300-44**. Duration of development depends on resist thickness and developer concentration.

Duration of development for a 30µm-layer is about 8 minutes by using the developer AR 300-47. Developed images have to be rinsed in deionized water immediately after developing process.
☞ The profile of the resist pattern of **AR-N 4450-10** (lift-off-application) depends considerably on time of development. A prolonged development increases under cut of sidewalls.

(VI.) For removing cross linked pattern the **Remover AR 600-70, AR 300-72 und AR 300-73** can be used. Hard-baked layers or resists in galvanic pattern can be stripped with the Remover **AR 300-72** (NMP based) or **AR 300-73** (TMAH based). In this cases support of ultra sonic or higher temperatures (up to 60 °C) are recommended. A removing with oxygen plasma is also possible.

4 b. Comparison CAR 44 and SU-8

CAR 44	Resist properties	SU-8
☑	High layer thickness	☑
☑	High resolution	☑
☑	Excellent aspect ratio	☑
☑	High sensitivity at i-line, deep-UV, e-beam, X-Ray	☑
☑	Good sensitivity at g-line	-
☑	Low-stress baking, easy handling without temperature ramps	-
☑	Aqueous-alkaline development	-
☑	Easy to remove	-
Our new development CAR 44 has all advantages of the SU-8, without its shortcomings.		

5. Cleaning and Removal

Substrates and equipments can be cleaned with the **Thinner AR 300-12** or the **Remover AR 600-70**.

6. Waste Water Disposal

Up to 90% of the organic material of used developer and aqueous alkaline remover can be separated by precipitation through pH-adjustment in a range of 9-10. Filtered solutions have to be adjusted to 6.5–8.0 for final waste disposal. Liquid or solid wastes have to be disposed at proper deposit places or by controlled combustion in officially authorized plants.

7. Safety References

Resists and thinner contain organic solvents. Adequate ventilation in the working area is demanded. Avoid direct contact with products and their vapours!
Wear safety goggles and rubber gloves!
Please ask for safety data sheets!

As of Jan. ´07

Temporary Product information for experimental sample

Resist for Spray Coating X AR-P 1250, 1270

1. General description

The experimental samples X AR-P 1250 and 1270 are high sensitive, positive photoresist which contain solvents for fast drying of layers. With a modified surface tension very smooth layers can be produced and a better covering of topologies is reache**d. X AR-P 1250** is especially designed for difficult topologies.
Resists contain the safer solvents methylethylketone and propylene glycol monomethyl ether acetate.

2. Processing

Before handled the resist has to be adapted to the temperature of the working area (recommended is a range of 20 – 25 °C at a relative humidity from 30 to 50%). The resist is applied by spray coating. The quality of coating depends tremendously on the used equipment. Adjustable devise parameters like dispense rate, process speed and distance of spraying are influential for production of layers. Therefore corresponding tests are necessary.
With the use of standard parameter layer thickness' of 6 - 8 µm can be reached with X AR-P 1250 and 1 – 2 µm with X AR-P 1270. Even higher layers can easily be achieved with higher dispense rates or multiple coating.
After coating a bake is recommended either on a hot plate at 85 - 90 °C for 2 – 5 min (layers > 6 µm for 5 min) or 30 min in a convection oven at 85 °C.
For exposure the complete UV range can be used. With layer thickness of 8 µm sensitivity is at 50 mJ/cm². Thus very short term exposure is possible. This benefits the avoiding of reflections during exposure of topological structured wafers.
For development of the resist the **Developer AR 300-35** is recommended: diluted 3 : 1 to 1 : 1. The 1 : 1 dilution is mainly used in cases of very thinly covered edges from etch cavities. Immediately after exposure resist layers have to be rinsed and dried.
Functionality guaranteed for 6 months from date of sale if stored dry at a constant temperature between 10 – 18 °C.

3. Cleaning and Removal

Substrates and equipments can be cleaned with the **Thinner AR 300-12** and the R**emover AR 300-70**.

4. Disposal

Liquid or solid wastes have to be disposed at proper deposit places or by controlled combustion in officially authorized plants.

5. Safety

Resists and thinner contain organic solvents. Adequate ventilation in the working area is demanded. Avoid direct contact with products and their vapours.
Wear safety goggles and rubber gloves!
Please ask for safety data sheets!

As of Jan. ´07

Temporary Product information for experimental sample

Adhesion Increased Positive Resist X AR-P 3100/10

1. General description

The experimental sample X AR-P 3100/10 is a positive working photoresist with notably increased adhesion. The resist contains adhesion promoter and linker. After hardening it can be used for complicated structuring with HF containing etch solutions.
The resist contains the safer-solvent propylene glycol monomethyl ether acetate.

2. Processing

Before handled the resist has to be adapted to the temperature of the working area (recommended is a range of 20 – 25 °C at a relative humidity from 30 to 50%). The resist is spin coated.
A pre-treatment of the substrate with the **adhesion promoter AR 300-80** is highly recommended for HF etching especially for glass or silicon oxide.
With X AR-P 3100/10 layer thickness of 5.0 µm at 4.000 rpm is reached. Such high thickness is useful for high etch resistance.
After coating a bake on a hot plate at 85 - 90 °C for 2 min or 30 min in a convection oven at 85 °C are recommended. Compares to standard resists this resist is less sensitive therefore longer times of exposure are advisable.
The **developer AR 300-26** can be used undiluted for developing exposed resist layers. Developing time should be 60 sec at 21 - 23 °C. Immediately after exposure resist layers have to be rinsed and dried.
Hardening of developed structures at 105 - 115 °C increases stability and adhesion of the mask on the substrate. Higher temperatures should be avoided.
On surfaces with good adhesion like silicon the mask is resistant for hours in 5% HF or HF/isopropanol mixture. With greater etching depth the resist starts to rise at the edges of the structures.
Functionality guaranteed for 6 months from date of sale if stored dry at a constant temperature between 10 - 18 °C.

3. Cleaning and Removal

Substrates and equipments can be cleaned with the **remover AR 600-70** and **AR 300-70**.

4. Disposal

Liquid or solid wastes have to be disposed at proper deposit places or by controlled combustion in officially authorized plants.

5. Safety References

Resists and thinner contain organic solvents. Adequate ventilation in the working area is demanded. Avoid direct contact with products and their vapours.
Wear safety goggles and rubber gloves!
Please ask for safety data sheets!

As of Jan. ´07

Temporary Product information for experimental sample

Thermal Stable Photoresist X AR-P 3220/7

1. General description

The experimental sample X AR-P 3220/7 is a positive, high viscous, thermal stable (up to 150 °C) liquid resist. With unique spin coating layers up to 12 µm can be reached. By using special coating techniques (e. g. closed-chuck-system or gyrset) layer thickness can be doubled.
The resist contains the safer-solvent propylene glycol monomethyl ether acetate.

2. Processing

Before handled the resist has to be adapted to the temperature of the working area (recommended is a range of 20 – 25 °C at a relative humidity from 30 to 50%). The resist is spin coated.
With X AR-P 3220/7 layers of 12 µm at 1.000 rpm and 6 µm at 4.000 rpm can be reached.
Baking on a hot plate at 95 - 105 °C for 5-10 min or in a convection oven at 90 - 100 °C for 30 min are recommended. For layers > 13 µm baking time should be doubled while using temperature ramps (slowly increasing the temperature). To increase thermal and alkaline stability of the structures baking on a hot plate at up to 40 °C for 3 - 5 min is possible. But this will lead to loss in sensitivity.
Previous to exposure the baked substrates should be cooled down to the temperature of the working place. **For pattern wise exposure the spectral range lies between 308 and 450 nm.**
For developing the **developer AR 300-26** is recommended (1 : 2). Higher baking before exposure needs a lower dilution of the developer. The mentioned concentrations are reference values. Exact concentrations have to be adjusted to the specific circumstances like layer thickness, time of development and baking. Immediately after exposure resist layers have to be rinsed and dried.
A post development bake for special applications (up to 150 °C) results in good etching stability with wet chemical and plasma etching processes as well as for alkaline solutions.
Functionality guaranteed for 6 months from date of sale if stored dry at a constant temperature between 10 - 18 °C.

3. Cleaning and Removal

Substrates and equipments can be cleaned with the **remover AR 600-70** and **AR 300-70**. For hardened layers (> 150 °C) the **remover X AR 300-72** should be used.

4. Disposal

Liquid or solid wastes have to be disposed at proper deposit places or by controlled combustion in officially authorized plants.

5. Safety References

Resists and thinner contain organic solvents. Adequate ventilation in the working area is demanded. Avoid direct contact with products and their vapours.
Wear safety goggles and rubber gloves!
Please ask for safety data sheets!

As of Jan. ´07

Photoresist for Deep UV X AR-P 5800/7

1. General description

Experimental sample X AR-P 5800/7 is a positive photoresist with etching stability especially designed for UV ranges from 248 - 265 nm and 300 - 450 nm. Compared to other resists the produced layers show a definitely greater transparency in the mentioned ranges.
The resist is particularly suited for contact exposure. During exposure less nitrogen is formed which improves the quality of pattern.
The resist contains safer solvent propylene glycol monomethyl ether acetate.

2. Processing

Before handled the resist has to be adapted to the temperature of the working area (recommended is a range of 20 – 25 °C at a relative humidity from 30 to 50%). The unexposed resist should be spin coated under yellow safe light.
With X AR-P 5800/7 layers of 550 nm at 4.000 rpm and 1.1 µm at 1.000 rpm can be reached.
Baking should be carried out on a hot plate at 95 - 100 °C for 1 - 2 min or in a convection oven at 90 and 95 °C for 30 min.
To expose wavelength in UV range of 248 to 265 nm can be used as well as mid UV range of 300 to 450 nm.
For development of exposed layers **developer AR 300-35** (diluted 2 : 1 or 1 : 1) or **AR 300-47** diluted 3 : 2) are recommended. Dip development needs 30 sec at 21 - 23 °C while times are shorter with spray coating.
Immediately after exposure resist layers have to be rinsed and dried.
Functionality guaranteed for 6 months from date of sale if stored dry at a constant temperature between 10 - 18 °C.

3. Cleaning and Removal

Substrates and equipments can be cleaned with the **thinner AR 300-12** and the **remover AR 600-70.**

4. Disposal

Liquid or solid wastes have to be disposed at proper deposit places or by controlled combustion in officially authorized plants.

5. Safety References

Resists and thinner contain organic solvents. Adequate ventilation in the working area is demanded. Avoid direct contact with products and their vapours.
Wear safety goggles and rubber gloves!
Please ask for safety data sheets!

As of Jan. ´07

Temporary Product information for experimental sample

Alkaline Stable Photoresist X AR-P 5900/4

1. General description

Experimental sample X AR-P 5900/4 is a positive photoresist especially designed for production of alkaline resistant structures or simply as a protective coating. These layers are stable in 2n NaOH for a long time. Layers are developed aqueous alkaline after pattern wise exposure.
The resist contains safer solvent propylene glycol monomethyl ether acetate.

2. Processing

Before handled the resist has to be adapted to the temperature of the working area (recommended is a range of 20 – 25 °C at a relative humidity of 30 to 50%). The unexposed resist should be spin coated under yellow safe light.
With X AR-P 5900/4 layers of 1.4 µm at 4.000 rpm can be reached.
Baking should be carried out on a hot plate at 100 - 120 °C for 2 min or in a convection oven at 95 to 115 °C for 30 min. With higher temperatures the resist starts to get less sensitive while more alkaline resistant. The mentioned temperatures should not be exceeded because of loss in sensitivity to light. Resist structures can melt if baked at a temperature over 120 °C.
For exposure wavelength in UV range of 308 - 450 nm can be used. Time of exposure depends on layer thickness and baking temperature. Due to the composition of the resist longer times of exposure should be planned for (approximately 4 times as long as resist AR-P 3510).
For developing of exposed resist layers the undiluted **developer AR 300-26** is recommended or at least 1n NaOH. With sufficient exposure layers will be developed upon. Unexposed layers will barely be affected by sodium hydroxide but, depending on the substrate adhesion of the resist can be reduced until structures separate from substrate. Used as protective coating the **X AR-P 5900/4** can be tempered at 130 °C. Higher temperatures will lead to difficulties during removing. Already at 110 °C no erosion can be observed after 2 min in 2n NaOH.
Functionality guaranteed for 6 months from date of sale if stored dry at a constant temperature between 10 – 18 °C.

3. Cleaning and Removal

Substrates and equipments can be cleaned with the **thinner AR 300-12** and the **remover AR 300-70.**

4. Disposal

Liquid or solid wastes have to be disposed at proper deposit places or by controlled combustion in officially authorized plants.

5. Safety References

Resists and thinner contain organic solvents. Adequate ventilation in the working area is demanded. Avoid direct contact with products and their vapours.
Wear safety goggles and rubber gloves!
Please ask for safety data sheets!

As of Jan. ´07

Temporary Product information for experimental sample

Protective Coating X AR-PC 5000/19 and X AR-PC 5000/30

1. General description

The X AR-PC 5000/19 and 5000/30 are adhesion enlarged KOH-resistant protective coatings. The X AR-PC 5000/30 has a lower resist thickness and is dark dyed additional.
The resist is used on back side of wafers to avoid mechanical damages and as reliable protection of the structures against etching processes. Resist is offered as well for acid as for alkaline media (up to 40% KOH). The adhesion of resists on the substrate is of decisive importance for good results. The generated layer is non light sensitive (> 300 nm) and thermo stable up to 190 °C.
The protective coatings are based on polymers of methyl methacrylate, dissolved in chlorobenzene. The **X AR-PC 5000/30** contains dyes additional.

2. Parameters

Properties / Resist	**X AR-PC**	**5000/19**	**5000/30**
Solids content	%	14	9,5
Resist thickness by 1000 rpm Resist thickness by 4000 rpm Semitec CPS 20, uncovered Chuck, 2" Si-Wafer	**µm**	**2.0** 4.0	**1.0** 2.0
Flash point	°C	28	
Filtration	µm	0.45	
Storage	°C	10 - 18	
Guarantee from date of sale	months	6	

3. Process chemicals

Thinner	AR	600-01
Adhesions promoter	AR	300-80
Remover	AR	300-70

4. Processing

A pre-treatment of substrates with **adhesion promoter AR 300-80** is recommended for increasing the adhesion (☞ process description AR 300-80).
Before handled the resist has to be adapted to the temperature of the working area (recommended is a range of 20 – 25 °C at a relative humidity from 30 to 50%). The resist can be processed under normal light (yellow safe light is not necessary) by means of spin coating. Spin rotation between 800 - 2000 rpm are possible but to protect the edges as well as to avoid "candy floss effect" a spin rotation of 1000 rpm is advisable.
Coated substrates should be prebaked on a hot plate under usual conditions (2 minutes at 150 °C) or in convection oven at a temperature of 150 °C for 60 minutes. In most cases a bake at 100 °C will be enough. But baking temperatures up to 190 °C are possible.
The etching process takes place in 40% KOH at 80 °C.
The protective coating is not attacked by KOH. Problems during etching process will only be caused by insufficient adhesion. By a pre-treatment of the surface with **addition promoter AR-P 300-80** the time of protection can be extended up to 8 hours.
The **Remover AR 300-70** can be used for removing. For lower baked layers the AR 600-70 is sufficient. The process of removing needs some minutes.
Removing by oxygen plasma is also possible.

5. Cleaning and Removal

Substrates and equipments can be cleaned with the **Thinner AR 600-01** or the **Remover AR 600-70**. Hard-baked layers can be stripped with the **Remover AR 300-70.** Very hard-baked layers (plasma processing or UV-stabilization) need a treatment with oxidizing acids or oxygen plasma.

6. Waste Water Disposal

Up to 90% of the organic material of used developer and aqueous alkaline remover can be separated by precipitation through pH-adjustment in a range of 9-10. Filtered solutions have to be adjusted to 6.5–8.0 for final waste disposal. Liquid or solid wastes have to be disposed at proper deposit places or by controlled combustion in officially authorized plants.

7. Safety References

Resists and thinner contain organic solvents. Adequate ventilation in the working area is demanded. Avoid direct contact with products and their vapours.
Wear safety goggles and rubber gloves!
Please ask for safety data sheets!

As of Jan. 07

Thinner AR 300-12

for the resist series 3000, 4000, 5000, 7000

1. General description

The Thinner AR 300-12 is colourless mixtures of organic solvents mainly intended to set the film thickness of corresponding resists.
Additionally they are perfectly suitable to remove resists from the edges of wafers and for cleaning equipments if those were not heated over 120 °C. Baked layers (>180 °C) need a remover (☞ Remover AR 600-70, 300-70 ...).
The Thinner AR 300-12 is a safer solvent.

2. Properties

Thinner	**AR**	**300-12**
Density (20 °C)	g/cm³	0.97
Refractive index (20 °C)		1.402
Water content max.	%	0.1
Surface tension	mN/m	27
Non-volatile matter max.	ppm	50
Flash point	°C	42
Grade of filtration	µm	0.2
intended for thinning the AR-resist series		3000, 4000, 5000, 7000
suitable for removal of the resist lip		all photoresists

3. Storage

Kept in sealed original containers and stored at a temperature between 10 – 22 °C the use of the developer is guaranteed for 6 month from date of sale.

4. Safety Information

Liquid or solid wastes have to be disposed at proper deposit places or by controlled combustion in officially authorized plants. The thinner is a mixtures of 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 Jan. ´07

Developer AR 300-26 and AR 300-35

1. General description

The Developers AR 300-26 and 300-35 are colourless, concentrated aqueous alkaline solutions designed to be used with the Resists series AR-P 3000 to AR-P 5300 in micro lithographic processes.
All developers can be used by immersion and puddle development. Additionally the **Developer AR 300-26** is suitable for spray development.
The **Developer AR 300-26** is used as buffered system with high activity for developing resist films over 5 µm if high contrast, steep edges and short time of development are needed. As a developer concentrate it can be diluted with deonized water according to the requirements of pattern generation and their tolerance. Undiluted it is needed for the development of experimental samples **X AR-P 5100** and **X AR-P 5900**.
The **Developer AR 300-35** is a buffered system with wide range of process parameters. The **AR 300-35** can be used undiluted for development of resist thickness from 3 to 6 µm. In other cases the developer concentrate can be diluted with deionized water according to requirements of pattern generation (see table next side).
The Developer AR 300-35 in a dilution of 2 : 1 is perfectly suitable for developing resist systems **AR-P 3000, 3120 - 3170, 3500, 4000 and 5300** .
The constant processing quality is guaranteed by controlling normality as well as sensitometry of test resists.

2. Parameters

Developer	**AR**	**300-26**	**300-35**
Normality	N	1.10	0.33
Density (20 °C)	g/cm³	1.06	1.02
Grade of filtration	µm	0.2	0.2

3. Recommendations for Dilution

Type of Resist	**Developer AR 300-26**				**Developer AR 300-35**			
AR-P / AR-U	**AR 300-26** Volume parts	**DI-H2O** Volume parts	Concentr. of develo-per [%]	Nor-mality N	**AR 300-35** Volume parts	**DI-H2O** Volume parts	Concentr. of develo-per [%]	Nor-mality N
3110	**1**	**1.5**	40.0	0.44	**pure**		100	0.33
3120 - 3170	**1**	**3**	25.0	0.28	**5**	**1**	83.3	0.27
3210 (new)	**1**	**3**	25.0	0.28	**pure**		100	0.33
3220, 3250	**1**	**1**	50.0	0.17	**pure**		100	0.33
3500	**1**	**5**	16.7	0.18	**1**	**1**	50.0	0.17
3700, 3800	**1**	**3**	25.0	0.28	**4**	**1**	80.0	0.26
4000	**1**	**4**	20.0	0.22	**4**	**1**	80.0	0.26
5350	**1**	**5**	16.7	0.18	**1**	**1**	50.0	0.17

4. Processing

All developers can be used for immersion and puddle development. The **Developer AR 300-26** can additionally be used for spray development. For development temperatures between 21 – 23 °C (± 0.5 °C) are recommended.
The optimum time of development depends on resist type as well as thickness, exposure, bake and method of development. Perfect times for 2 µm layers are 20 – 60 seconds for immersion. The time should not exceed 120 seconds with constant agitation. For spray development times should be adequately reduced.
Higher concentrated solutions cause higher light sensitivity of the resist-developer system. Therefore exposure energy can be minimized and the development time reduced so that a high productivity is possible.
Depending on type of resist a more diluted solution leads to higher contrast and decreases resist thickness loss of unexposed areas and partly exposed limited areas even with longer development times. In this case the required exposure energy has to be necessarily increased. This highly selective method guarantees high resolution with minimum tolerance. In general a more diluted developer and longer times of development lead to higher contrast.
Developed images have to be rinsed in deionized water immediately after developing process until all adhering development residues are completely removed. Afterwards substrates have to be spin-dried or dry-blown.
The effectiveness of a developing bath is limited by throughput and by absorption of carbon dioxide from air.

5. Storage

Kept in sealed original containers and stored at a temperature between 10 – 22 °C the use of the developer is guaranteed for 6 month from date of sale.
That does not apply to opened containers; these should be closed air-tight after opening and used as soon as possible

6. Safety References

Avoid contact with the developer. Solutions of developer are alkaline caustic liquids that attack the skin. Wear chemical goggles, protective gloves !
Please ask for safety data sheets!

As of Jan. ´07

Developer AR 300-40 (metal ion free)

1. General description

Developer series AR 300-40 include developers with different normality that meets the high requirements of micro lithographic technology in semiconductor industry. The use of metal ion free developers will eliminate the possibility of metal ion contamination. They are aqueous basic solutions and show excellent netting properties and they develop residue free.
The separate Developers are adjusted to the different AR-Resist series 3000 - 5000 and 7000. The compatibility is explained in the next page.
Constant processing quality is guaranteed by controlling normality as well as sensitometry of test resists.

2. Properties

Developer	**AR**	**300-44**	**300-46**	**300-47**	**300-475**
Normality	N	0.26	0.24	0.20	0.17
Specific gravity at 20 °C	g/cm³	0.99			
Surface tension $_{max.}$	mN/m	32			
Metal ion content $_{max.}$	ppm	1			
Grade of filtration	µm	0.2			

3. Instructions for Processing

The **developers** of the series **AR 300-40** are process chemicals ready for use. If dilutions are necessary, it should be carried out very carefully (with scales), because even smallest variations in normality cause great differences in the development rate (☞ table).
The developers can be used for immersion, spray and puddle development at temperatures between 21 - 23 °C. The temperature is to be controlled in intervals of ± 0.5 °C.
Most suitable developing time depends on type and thickness on the resist as well as on the radiation dose and the processing. By using immersion development, for example, a developing time between 20 - 60 seconds is applicable but should not exceed 120 seconds. With spray development the time should be adequately reduced.

4. Compatibility

Type of developer	**300-44**	**300-46**	**300-47**	**300-475**
Resist **AR-P** **AR-N** **AR-U**	**4400-50** *	**3110, 3700, 3800, 7700, 4400-25**	**3100, 3500, 3700, 3800, 4000, 4240, 5350, 7400, 4400-10, 4450-10, 5400/3510, 7500, 7700**	**4340** **X7700/30**
processing: **high speed** **high contrast**	**x** (high speed)	**x** (high speed)	**x** (high contrast)	**x** (high speed)

* The developer AR 300-44 is also compatible with positive photoresists from other producers as for example Shipley and Tokyo Ohka Kogyo.

More concentrated solutions cause a high light sensitivity of the resist-developer system. Therefore high productivity is possible by minimizing the exposure energy and reducing the development time.
Depending on type of resist a more diluted solution leads to higher contrast and decreases resist thickness loss of unexposed areas and partly exposed limited areas even with longer development times. In this case the required exposure energy has to be necessarily increased. This highly selective method guarantees high resolution with minimum tolerance. In general a more diluted developer and longer times of development lead to higher contrast.
Developed images have to be rinsed in deionized water immediately after developing process until all adhering development residues are completely removed. Afterwards substrates have to be spin-dried or dry-blown.
The effectiveness of a developing bath is limited by throughput and by absorption of carbon dioxide from air.
If it is necessary to dilute the metal ion free developer it is recommended to adjust the desired normality directly before use by means of a defined dilution of a stronger developer.

4. Storage

Kept in sealed original containers and stored at a temperature between 10 – 22 °C the use of the developer is guaranteed for 6 month from date of sale.
That does not apply to opened containers; these should be closed air-tight after opening and used as soon as possible

5. Safety References

Avoid contact with the developer. Solutions of developer are alkaline caustic liquids that attack the skin. Wear chemical goggles, protective gloves !
Please ask for safety data sheets!

As of Jan. ´07

Remover AR 600-70 and AR 300-70, 300-72, 300-73

Stripping of resist layers

1. General description

The **Remover AR 600-70** and **AR 300-70, 300-72 and 300-73** are colourless clear solutions for stripping resists based on methyl methacrylate / methacrylic acid (E-Beam Resist) as well as diazo-naphthoquinone / novolac (common positive photoresist).
All Removers are suitable for unbaked as well as baked resists. The **Remover AR 600-70** is the usual standard version. The **Remover AR 300-70** is used for special applications such as stripping of higher baked e-beam resists and metal vapour deposited resists in lift-off process (for example the lift-off resist AR-P 5350). The new developed **Remover AR 300-72** and **300-73** are created for the new resist systems **CAR 44** and **AR-P 5400**. Additionally **AR 300-72** removes thin and very strong adhesive resist layers. Further applications are under way. The remover **AR 300- 70** and **300-72** contain organic solvents, the **AR 300-73** is an aqueous-alkaline remover. These four removers do not contain phenol or halogen; they are metal ion free and mixable with water.

2. Properties

Remover	AR	600-70	300-70	300-72	300-73
Density (20 °C)	g/cm³	0.79	1.03		
Non-volatile matter max.	%	0.002	0.005	0.005	0.005
Flash point	°C	-16	97	98	-
Filtration	µm	0.2			
Suitable as AR Remover for AR Photoresists					
unbaked or prebaked time for removal, 1.5 µm; 25 °C	s	suitable 5	suitable 5	suitable 5	suitable 5
Baked at 150 - 170 °C (postbake) time for removal, 1.5 µm; 25 °C	s	suitable 30	suitable 15	suitable 15	suitable 20
Baked at 180 - 210 °C (postbake) time for removal, 1.5 µm; 50 °C	s	not suitable -	not suitable -	suitable 120	not suitable -
Suitable as AR Remover for AR E-Beam Resists					
Unbaked or Prebaked (PMMA, Copol.) time for removal, 0.5-1.5 µm 25 °C	s	suitable 10	suitable 20	suitable 20	suitable 10 only Cop.
Baked at 150-190 °C (post bake, PMMA) time for removal, 0.5-1.5 µm 25 °C	min	suitable 2	suitable 10	suitable 10	suitable 2 only Cop.
Baked at 190-210 °C (post bake, Copol.) time for removal, 0.5-1.5 µm 25 °C	min	Fit for certain duties only 15	Fit for certain duties only 20	Fit for certain duties only 15	Fit for certain duties only 10 (Cop.)

3. Instruction for Processing

Owing to very different processing technologies these introductions are only of exemplary character. It is recommended to test the remover in the given context.

Resist coatings can be removed by immersion in the **Remover AR 600-70** or the **Remover AR 300-70** (puddle, dip). Stripping rate depends on previous heat treatment, thickness of resist layer and temperature of the remover. Unbaked resists are stripped in a few seconds, baked coatings require minutes (☞ table, the times are only examples!). To reduce the stripping time it is possible to heat the removers AR 300-70, 300-72 and 300-73 up to 60 °C.
The **Remover AR 600-70**, **AR 300-70, 300-72** and **300-73** can be rinsed either with deionized water, clean remover or with a suitable thinner according to the used technology.
In cases of hard-baked or cured resist coatings the use of oxidizing acids or oxygen plasma stripping is recommended.

4. Storage

Kept in sealed original containers and stored at a temperature between 10 – 22 °C the use of the remover is guaranteed for 6 month from date of sale.
That does not apply to opened containers; these should be closed air-tight after opening and used as soon as possible.

5. Safety References

The **Remover AR 300-70, 300-72** and **AR 600-70** are mixtures of organic solvents. Adequate ventilation in the working area is demanded. Avoid direct contact with products and their vapours. Avoid contact with the remover **AR 300-73.** Solutions of this remover are alkaline caustic liquids that attack the skin. Wear chemical goggles and protective gloves.
Please ask for safety data sheets!

As of Jan. ´07

Adhesion promoters for resists AR 300-80 and HMDS

1. General description

The adhesion promoters AR 300-80 and HMDS can be used for improving the adhesion of photo- and e-beam resists. The promoter **AR 300-80** contains a silicon organic compound diphenyl-silandiole dissolved in a mixture of safer solvent propylene glycol methyl ether acetate. The well known HMDS consists only of hexamethyldisilizane. The coating takes place by evaporation.
The **AR 300-80** is a fine, simple and cheap alternative to the HMDS. In most cases it generates better adhesion for known critical substrate surfaces (e.g. metals, SiO_2 or GaAs) than HMDS.

2. Instructions for Processing

AR 300-80

The AR 300-80 has a very simple application. Normal spin coating can be used for deposition (1,000-6,000 rpm). The thickness of diphenylsilandiole depends on speed of rotation. We recommend high speed of rotation (low concentration of diphenylsilandiole, 4,000-6,000 rpm). A too high concentration can decrease the adhesion.
Coated substrates should be prebaked on hot plate (2 min) or in convection oven (25 min) at a temperature of 180 °C. The bake generates a very smooth and thin layer (< 30 nm).
Photoresists or protective coatings can be spin coated after substrates are cooled down.

HMDS

HMDS can evaporate by room temperature or by temperatures up to 160 °C.
The vapour forms a monomolecular layer (< 5 nm). The substrate can be used for coating without a following bake. The application of HMDS needs the corresponding equipment.

3. Storage

Stability of adhesion promoters is limited by absorption of atmospheric humidity. Therefore storage in open bottles is to be avoided. Complete functionality of adhesion promoters is guaranteed for 6 months from date of sale if kept in sealed original containers and stored dry at a constant temperature between 10 - 22 °C.

4. Safety Information

Liquid wastes have to be disposed at proper deposit places or by controlled combustion in officially authorized plants. The adhesion promoters are mixtures of organic solvents. Take care for good ventilation in the working area and avoid contact with the products and their vapours! Wear chemical goggles and protective gloves.
Please ask for safety data sheets!

As of Jan. ´07