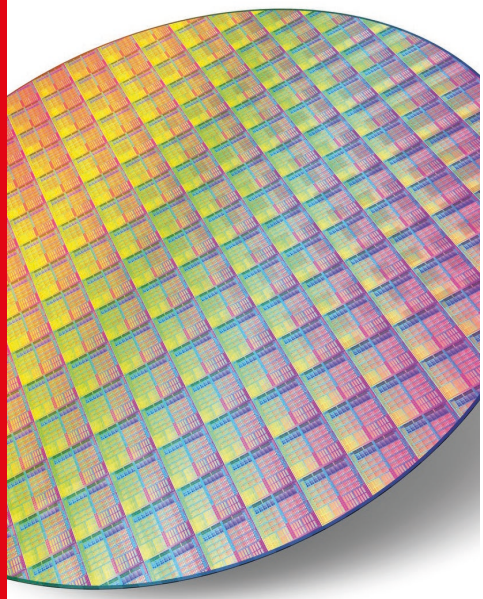
micro resist technology

Distribution
DuPont Electronic Imaging Products



official distributor

⇨ **g-line • i-line • DUV - Resists**

⇨ **BARC Materials**

⇨ **Lift-off Resist**

DUPONT™ Electronic Imaging

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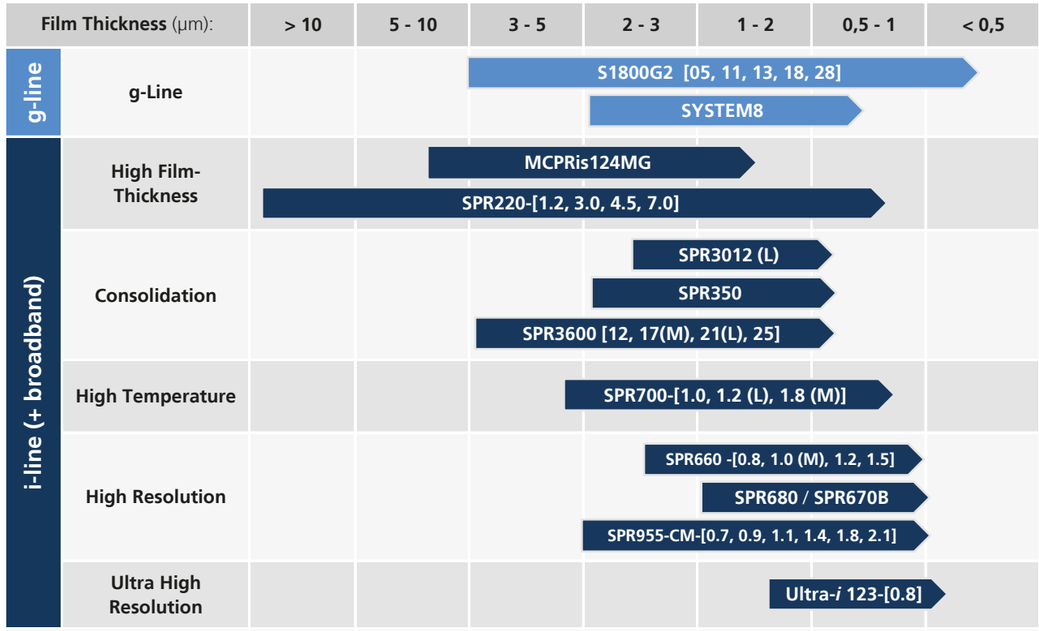
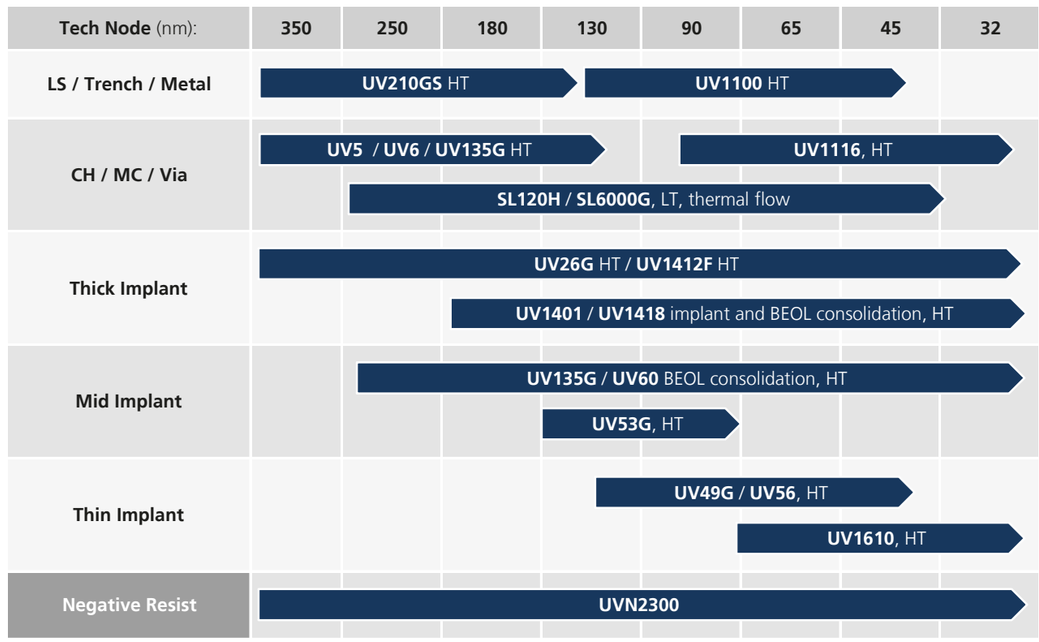
DuPont g-Line, i-Line and DUV Products

g-Line and i-Line Products – Overview vs. Film Thickness



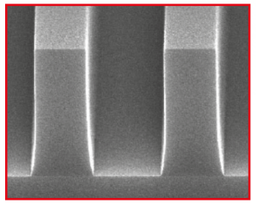
available dilutions shown in […] after brand name
dyed versions (L) = low, (M) = medium dye content as option

DUV Products – Overview vs. Technical Node

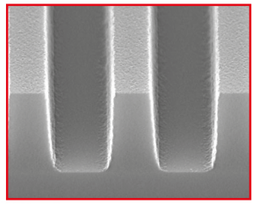


Resist Series S1800 G2

MICROPOSIT S1800 G2 series photoresists are positive photoresist systems engineered to satisfy the microelectronics industry's requirements for IC device fabrication. The system has been engineered using a toxicologically safer alternative casting solvent to the ethylene glycol derived ether acetates.



4 µm Ft/ 2 µm L/S 310 mJ

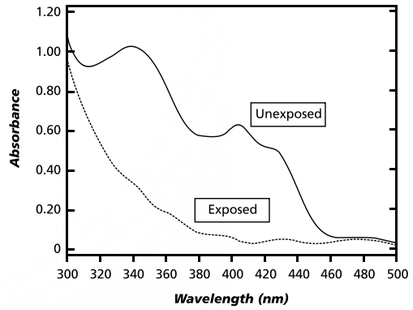


1.3 µm Ft/ 0.8 µm L/S 180 mJ

Advantages

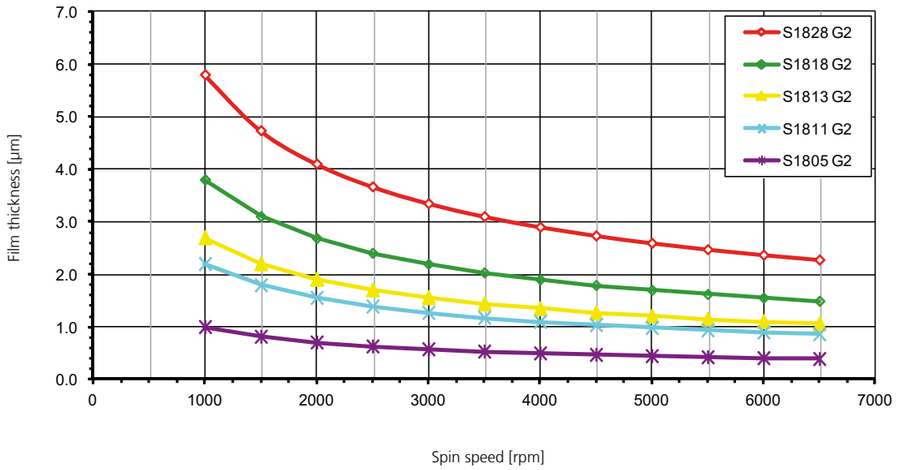
- Optimized for **g-line & i-line exposure**
- Effective for broadband exposure
- Excellent adhesion (improved with SP)
- PFOS / PFOA – free
- Optimized for use with MF-319 metal-ion-free developer family
- Compatible with metal-ion-bearing developers

Absorbance Curve S1800G2



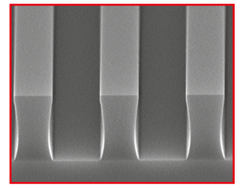
Available products of this resist series

Resist	S1828 G2	S1818 G2 (SP16)	S1813 G2 (SP15)	S1811 G2	S1805G2
Film thickness @ 4000 rpm	2.8 µm	1.8 µm	1.3 µm	1.1 µm	0.5 µm
Viscosity / cSt	88.5	39.4	25	15	5.3
Dose (Broadband) mJ/cm²	300	200	160	140	100

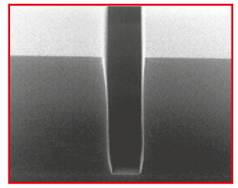


Resist Series SPR220

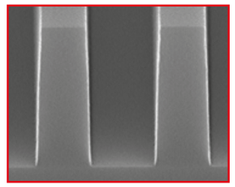
MEGAPOSIT SPR220 i-line photoresist is an optimized general purpose, multi-wavelength resist designed to cover a wide range of film thicknesses, 1-30 µm, with a single-coat process. MEGAPOSIT SPR220 photoresist also has excellent adhesion and plating characteristics, which make it ideal for such thick film applications as MEMS and bump process.

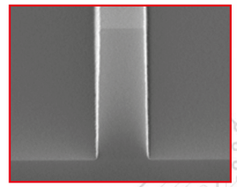


8 µm Ft/ 5 µm L/S 310 mJ



4.3 µm Ft/ 0.8 µm L/S 440 mJ

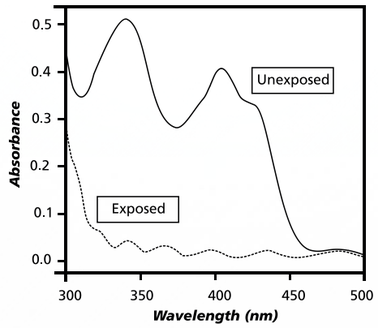


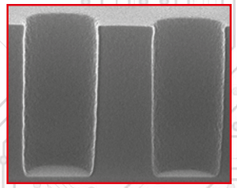


Advantages

- Broadband, g-line and i-line capable
- >10µm film thickness in a single coat with good uniformity
- Excellent wet and dry etch adhesion
- Au; Cu and Ni/Fe plating without cracking
- MIF and MIB developer compatible

Absorbance Curve SPR220

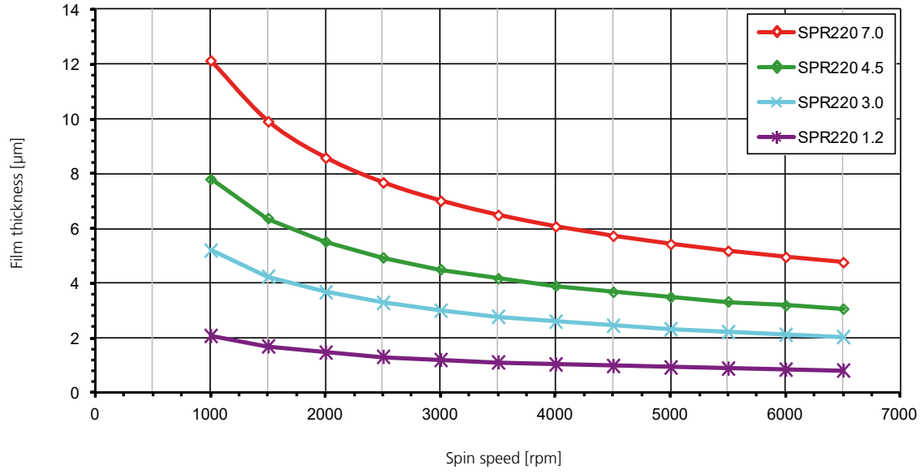




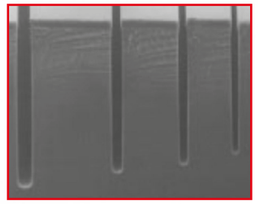
3.0 µm Ft/ 1.0 µm CH 220 mJ

Available products of this resist series

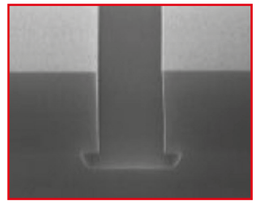
Resist	SPR220-7.0	SPR220-4.5	SPR220-3.0	SPR220-1.2
Film thickness @ 3000 rpm	7.0 µm	4.5 µm	3.0 µm	1.2 µm
Viscosity / cSt	390	123	49	11.5
Dose (i-line) mJ/cm²	470	380	310	160



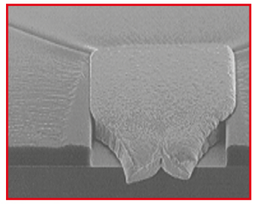
Resist Series SPR220 – Thick Application



Etch trenches (Bosch Process)
4 to 10 µm features
(up to 100 µm deep)



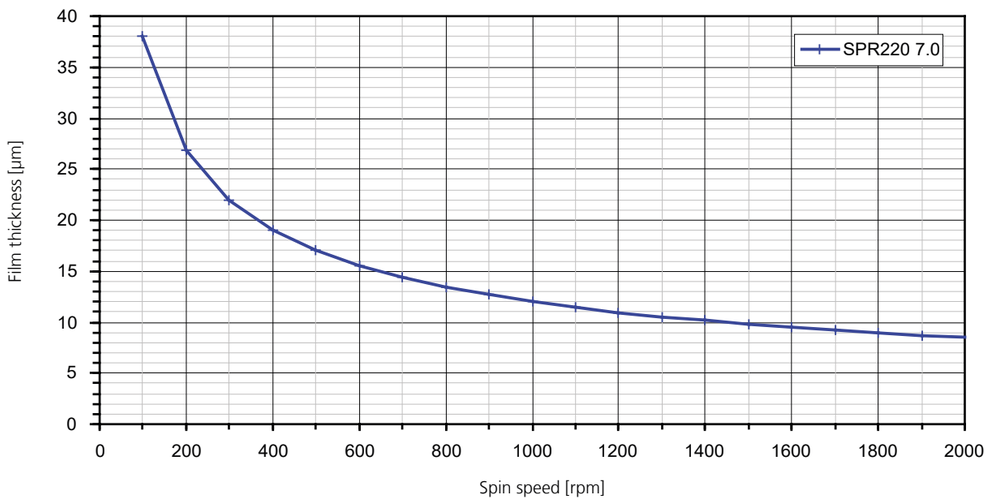
Wet wafer etch (1:5 HF 5 min)
2 µm features



40 µm SPR220 over-plate with Au

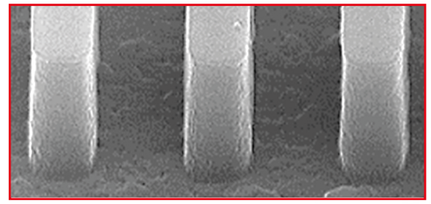
Recommended Process Conditions		
	1.1 µm to 4.0 µm Thickness	*4.0 µm to 10.0 µm Thickness*
Softbake: Expose: PEB: Developer:	115°C/ 90 sec. Contact hotplate ASML PAS 5500/ 200 i-Line (0.48 NA, 0.50 σ) 115°C/ 90 sec. Contact hotplate MF™- 24 A @ 21°C, 60 sec. single spray puddle	30 sec. step down to 115°C/ 90 sec. Contact hotplate ASML PAS 5500/ 200 i-Line (0.48 NA, 0.50 σ) 115°C/ 90 sec. Contact hotplate MF™- 24 A @ 21°C, 60 sec. single spray puddle

Film Thickness at Low Spin Speeds



Resist Series SPR350

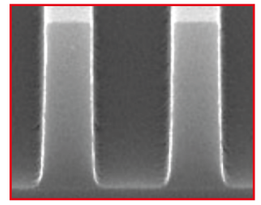
MEGAPOSIT SPRSPR350 is an advanced mid-critical photoresist, designed to give high throughput. SPR350 is developed as a multi-wavelength all purpose photoresist ideal for mix and match application. The SPR350 product family can be used for line/ space and contact hole application on a variety of substrates, including silicon, silicon-dioxide, nitride (SiN) and reflective polysilicon/ metal substrates.



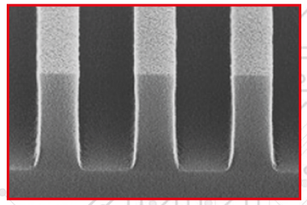
2 µm Ft / 0,8 µm L/S
210 mJ

Advantages

- Broadband, g-Line and i-Line capable
- PFOS – free
- Excellent resolution and profile for L/S and CH
- Excellent wet and dry etch adhesion
- High throughput mid-critical photoresist
- Very good process latitude



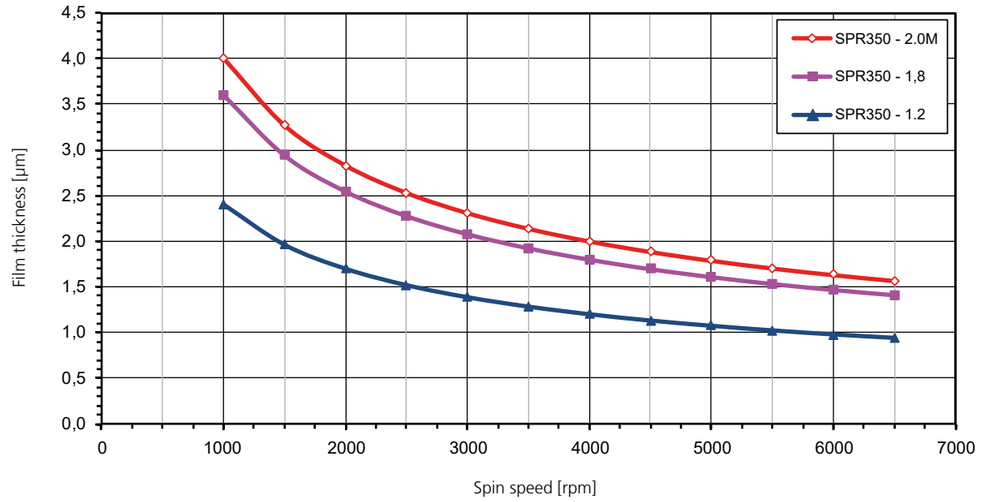
1.8 µm Ft / 0,6 µm L/S
109 mJ



1.07µm Ft / 500 nm L/S
67 mJ

Available products of this resist series

Resist	SPR350-2.0(M)	SPR350-1.8	SPR350-1.2
Film thickness @ 3000 rpm	2.31 µm	2.08 µm	1.38 µm
Viscosity / cSt	36	30.5	16.3
Dose (i-line) mJ/cm²	210	109	67



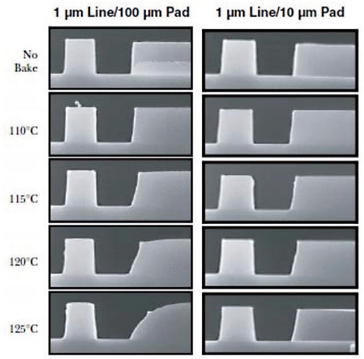
Resist Series SPR3012 / 3600

MEGAPOSIT SPR3012/3600 series photoresists are positive photoresists engineered for i-line, g-line and broadband application while providing high throughput and excellent lithographic performance.

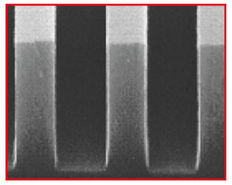
Advantages

MEGAPOSIT SPR 3012 :
- excellent adhesion
- L-dyed version for improved CD control over topography

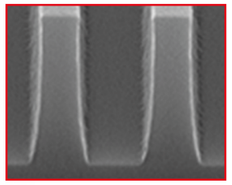
MEGAPOSIT SPR 3600 :
- extremely high throughput process
- high thermal / etch resistance
- dyed version for improved CD control over topography



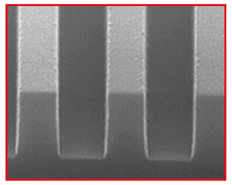
SPR3600



1.07 µm FT / 600 µm L/S
85 mJ SPR3612

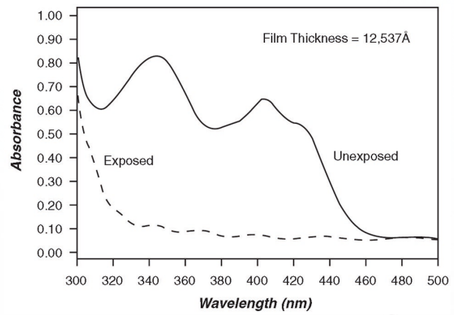


1.75 µm FT / 600 nm L/S
155 mJ SPR3617M



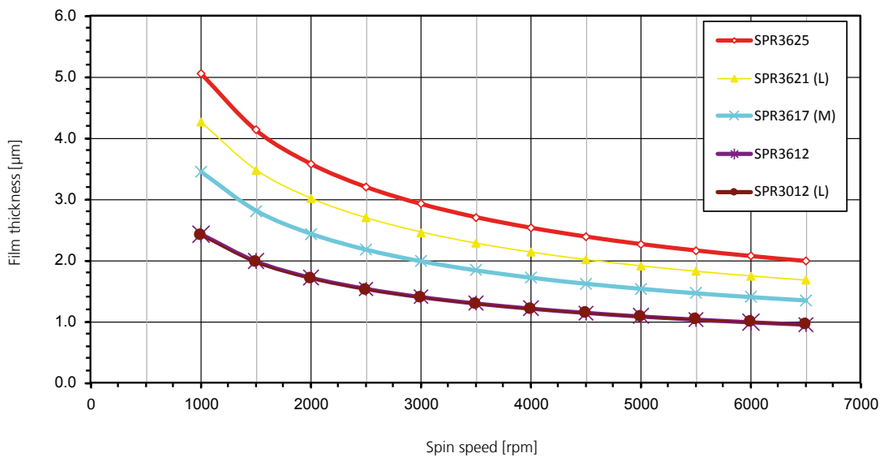
1.17µm FT / 700 nm L/S
204 mJ SPR3012

Absorbance Curve SPR3012



Available products of this resist series

Resist	SPR3625	SPR3621 (L)	SPR3617 (M)	SPR3612	SPR3012 (L)
Film thickness @ 3000 rpm	2.5 µm	2.2 µm	1.7 µm	1.2 µm	1.18 µm
Viscosity / cSt	59.7	45.3	31.5	18.3	24.3
Dose (i-line) mJ/cm²	140	110	150 (M) 90	80	200

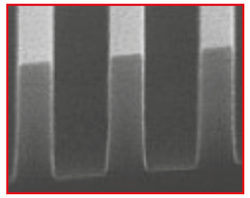


Resist Series SPR700

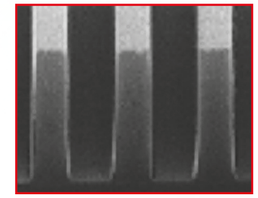
MEGAPOSIT SPR700 series photoresists are positive multiwavelength photoresists that are optimized to provide robust process latitudes and high throughput with excellent thermal stability. SPR700 resists are compatible across a wide variety of developer families. This versatility makes SPR700 photoresists ideal for a number of applications, especially mix and match lithography.

Advantages

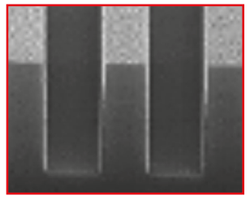
- Multiwavelength (i-line, g-line and broadband)
- Compatible across a wide variety of developer families (0.26N, 0.24N, 0.21N)
- Excellent process latitudes and robust process
- Thermal stability greater than or equal to 135°C
- High throughput for stepper and developer process
- Excellent DOF



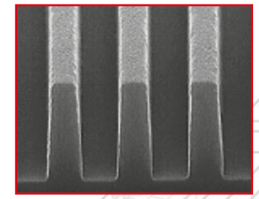
1.8 µm FT/ 0.6 µm L/S 270 mJ (1.8M)



2.2 µm FT/ 0.6 µm L/S 197 mJ

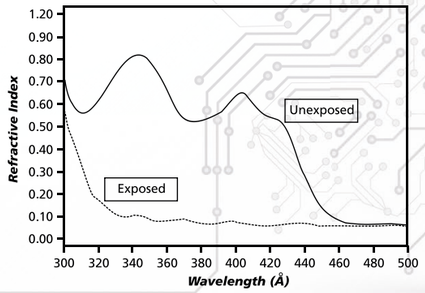


1.2 µm FT/ 0.5 µm L/S 134 mJ



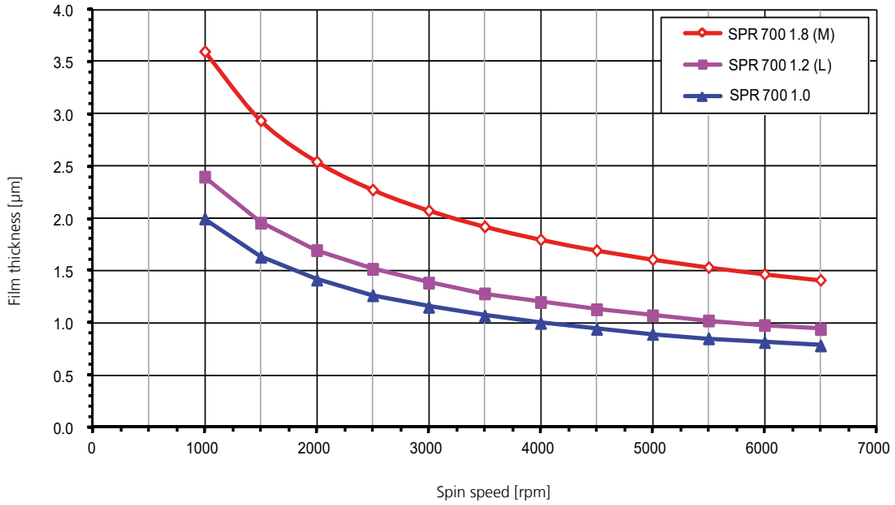
0.968 µm FT/ 350 nm L/S 135 mJ

Absorbance Curve SPR700



Available products of this resist series

Resist	SPR700-1.8 (M)	SPR700-1.8	SPR700-1.2 (L)	SPR700-1.2	SPR700-1.0
Film thickness @ 4000 rpm	1.8 µm	1.8 µm	1.2 µm	1.2 µm	1.0 µm
Viscosity / cSt	35.1	35.1	18.3	18.3	14.1
Dose (i-line) mJ/cm²	270	190	160	140	130

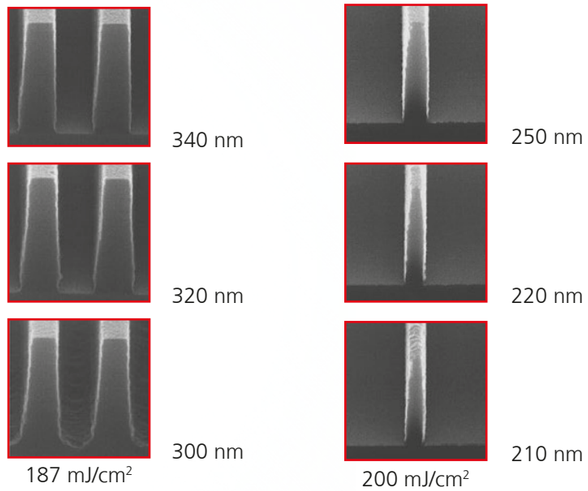


Resist Series SPR660

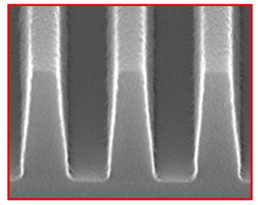
SPR660 series is an advanced i-line photoresist designed for processing 0.350 micron features and larger. SPR660 performs in both line / space and contact hole application and on a variety of substrates, including silicon dioxide, titanium nitride, and organic anti-reflectant coatings. The SPR660 product family includes a range of undyed dilutions as well dye loadings for improved processing over reflective surface.

Advantages

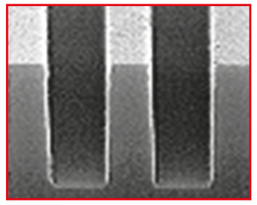
- Linear resolution
  - 0.325 µm over silicon substrate
  - < 0.300 µm over anti-reflectant
- Wide process latitudes
  - DoF 1.5 µm for 0.4 µm lines / spaces
  - DoF 1.2 µm for 0.4 µm contact holes
- Compatible with 0.24N and 0.26N developer
- 12 month shelf life



SPR660 – 1.0 (1.08 µm FT)



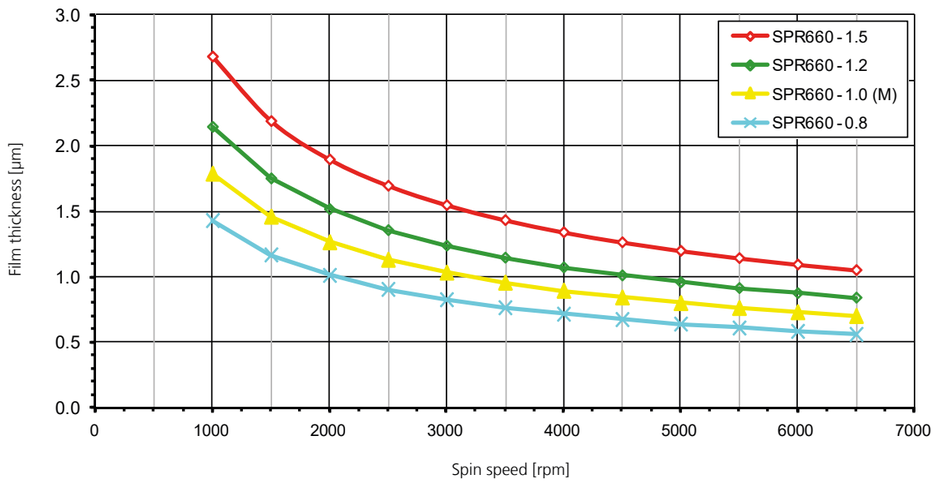
SPR660 1.0M, 0.977 µm FT/ 0.35µm L/S, 202 mJ



0.97 µm FT/ 350 nm L/S,163 mJ

Available products of this resist series

Resist	SPR660-1.5	SPR660-1.2	SPR660-1.0 (M)	SPR660-0.8
Film thickness @ 3200 rpm	1.5 µm	1.2 µm	1.0 µm	0.8 µm
Viscosity / cSt	17.6	13.06	10.4	8
Dose (i-line) mJ/cm²	250	210	205	150



Resist Series SPR955-CM

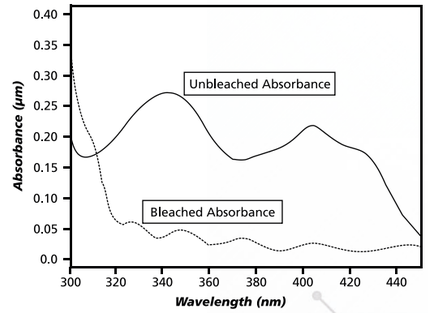
MEGAPOSIT SPR955-CM series photoresist is a general purpose, high-throughput, i-line photoresist for **0.35 µm** front-end and back-end applications. SPR955-CM is optimized for anti-reflective (organic and inorganic) coating.

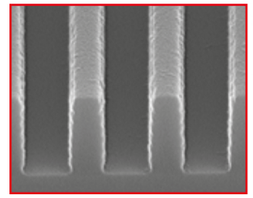
Advantages

350 nm Design Rules

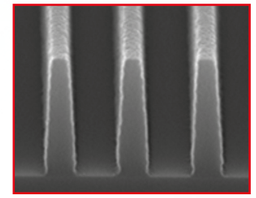
- Dense lines/spaces and isolated lines on polysilicon
- Dense lines/spaces in high-aspect ratio film on TiN
- Contact holes on oxide
- Isolated spaces (trenches)

Absorbance Curve SPR955-CM

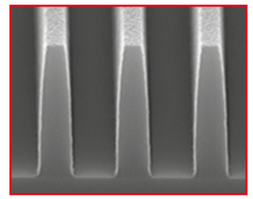




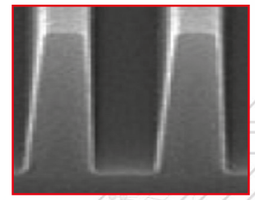
0.76 µm FT/ 350 nm L/S 160 mJ



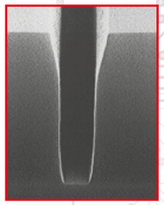
1.08 µm FT/ 280 nm L/S 170 mJ



1.5 µm FT/ 0.4 µm L/S 197 mJ



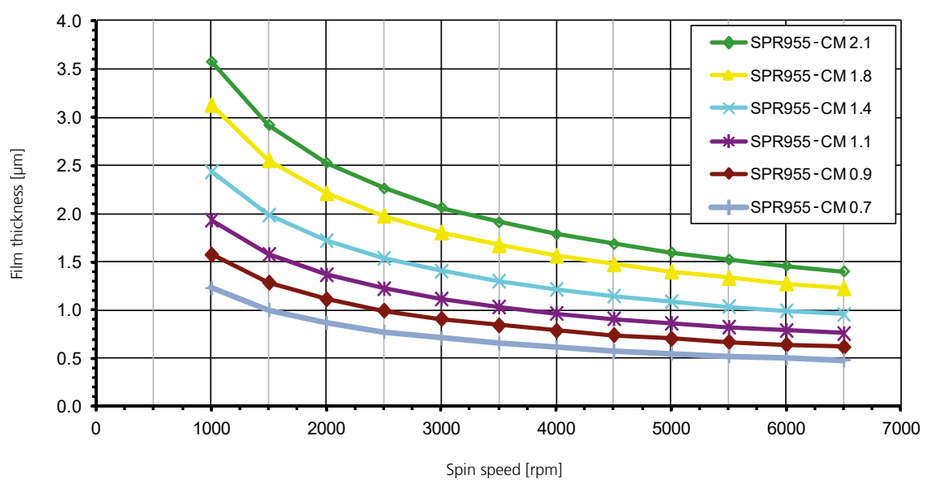
1.8 µm FT/ 450 nm L/S 205 mJ



5.0 µm FT/ 0.8 µm L/S 800 mJ

Available products of this resist series

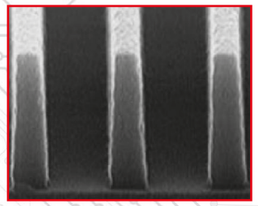
Resist	SPR955-CM-2.1	SPR955-CM-1.8	SPR955-CM-1.4	SPR955-CM-1.1	SPR955-CM-0.9	SPR955-CM-0.7
Film thickness @ 3000 rpm	2.1 µm	1.8 µm	1.4 µm	1.1 µm	0.9 µm	0.7 µm
Viscosity / cSt	34.3	28.6	19	14.3	11.2 µm	8.5
Dose (i-line) mJ/cm²	238	210	197	173	165	157



Resist Series Ultra-i™123

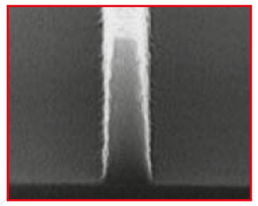
Ultra-*i*™123 is an advanced, general purpose, 0.25 µm critical i-line photoresist with extendibility to 0.23 µm and below. Ultra-*i* ™123 is optimized for antireflective coating.

230 nm 1:1.5 L/S



225 mJ/cm²

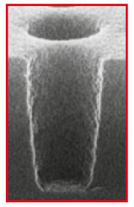
230 nm isolated lines



235 mJ/cm²

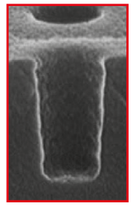
ARL: 1.500 Å XHRi over Si
FT: 7.620 Å
EXP: 0.60 NA, 0.75σ

300 nm 1.1 contact hole



535 mJ/cm²
FT: 8.650 Å over BPSG
EXP: 0.57 NA, 0.85σ

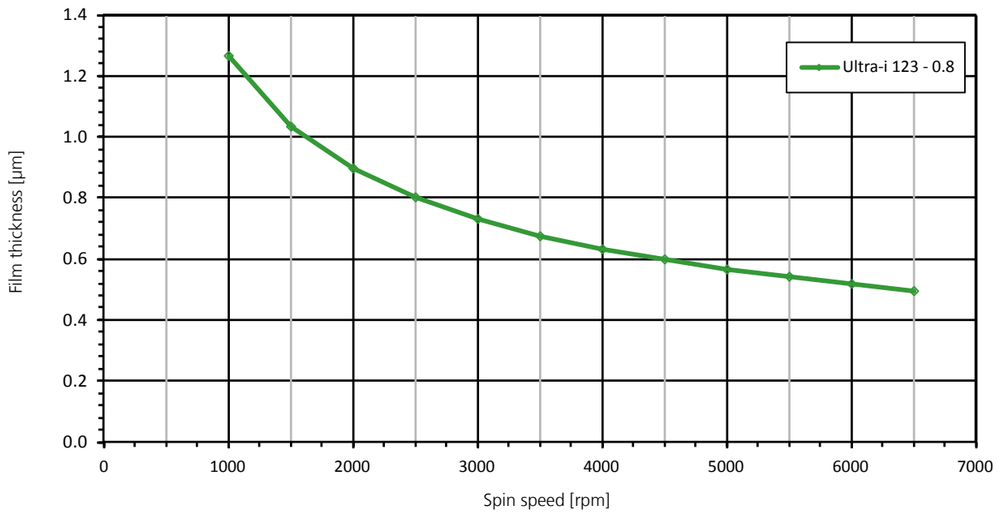
250 nm wafer, 350 nm mask



345 mJ/cm²
FT: 7.480 Å over BPSG
EXP: 0.57 NA, 0.85σ

Available products of this resist series

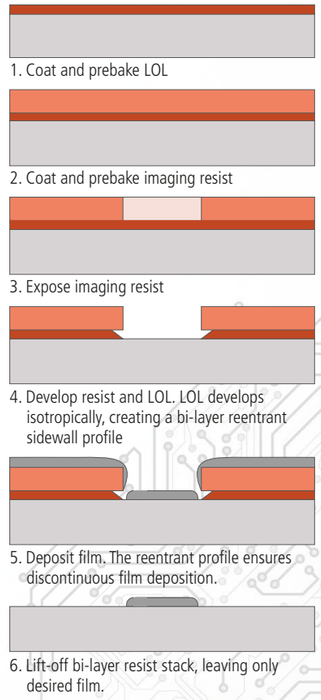
Resist	Ultra-*i*™123-0.8
Film thickness @ 2500 rpm	0.8 µm
Viscosity / cSt	6.6
Dose (i-line) mJ/cm²	250



MICROPOSIT LOL 2000 For Bi-Layer Lift-Off Processes

Microposit LOL 2000 lift-off layer is an enhanced dissolution rate, dyed PMGI (polymethylglutarimide) solution used for lift-off processes requiring tight CD control, such as GMR thin film head, GaAs, and other leading-edge semiconductor applications. The LOL bilayer lift-off process is suitable for applications where a thin layer of metal is sputtered or evaporated in an additive process. CD variation due to etch bias inherent in substractive processes is eliminated, resulting in superior metal line width control. Attack on the substrates by an etchant is eliminated.

LOL 2000 on Si at 200 °C/ 5 min. with 5.0 micron SPR950

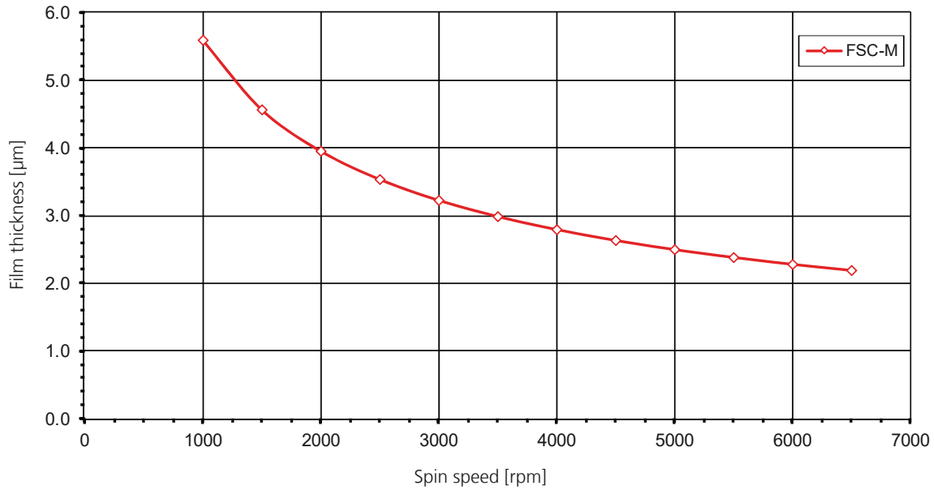


1. Coat and prebake LOL
2. Coat and prebake imaging resist
3. Expose imaging resist
4. Develop resist and LOL. LOL develops isotropically, creating a bi-layer reentrant sidewall profile
5. Deposit film. The reentrant profile ensures discontinuous film deposition.
6. Lift-off bi-layer resist stack, leaving only desired film.

MICROPOSIT FSC – PROTECTIVE SURFACE COATING

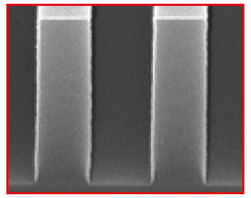
MICROPOSIT FSC series surface coating is a non-imagable coating formulated as a protective coat for use during chemical or mechanical processes in microelectronic fabrication. The system has been formulated with a single solvent. It does not contain xylene, acetone, or cellosolve acetate.

- FSC-M: 2.4 to 5.6 µm for front-side protection during back lapping 0.2 µm filtration

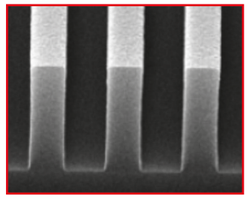


Resist Series UV26G

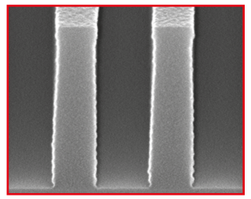
UV26G is a positive DUV photoresist developed for deep implant applications. The low viscosity of UV26G allows for reduced dispense volume and improved coating. Uniformity for films ranging from 0.7 µm to 2.5 µm. UV26G is the long term "green" replacement of UV26.



2.5 µm Ft / 800 nm L/S 25 mJ



1.8 µm Ft / 600 nm L/S 21 mJ



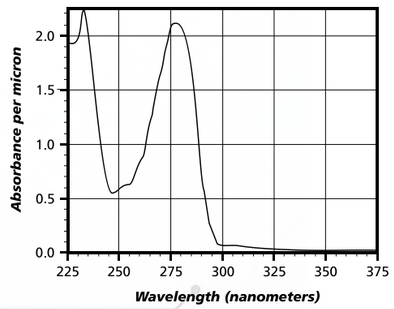
1.4 µm Ft / 380 nm L/S 19 mJ

Features

Sizing Energy⇨DoF⇨Resolution

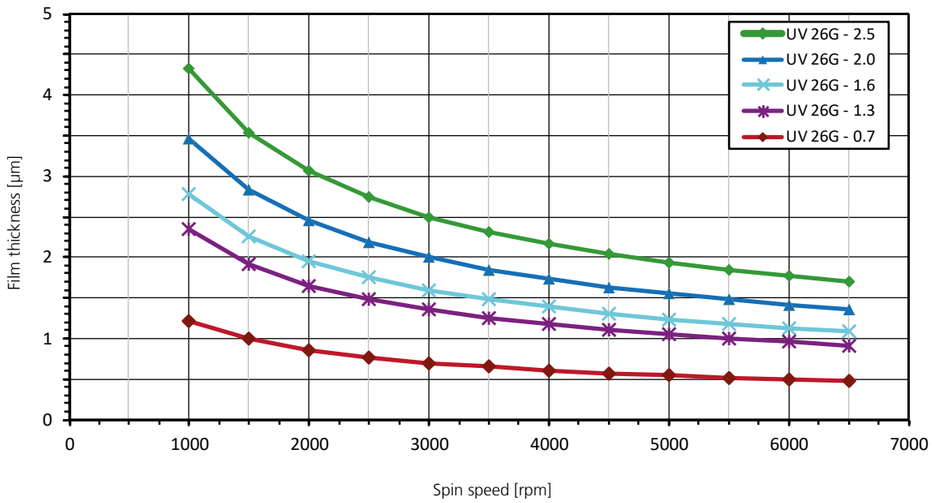
- 16.5 mJ/cm² for 350 nm 1:1 lines/spaces at 1.1 µm FT ⇨0.80 µm DoF⇨Resolution 240 nm
- 18.5 mJ/cm² for 450 nm 1:1 trenches at 1.8 µm FT ⇨1.35 µm DoF⇨Resolution 280 nm
- 20.5 mJ/cm² for 600 nm 1:1 lines/spaces at 2.5 µm FT ⇨1.0 µm DoF⇨Resolution 500 nm

Absorbance Curve UV26G



Available products of this resist series

Resist	UV26G 2.5	UV26G 2.0	UV26G 1.6	UV26G 1.3	UV26G 0.78
Film thickness @ 3000 rpm	2.5 µm	2.0 µm	1.6 µm	1.3 µm	0.78 µm
Viscosity / cSt	85	60	44	31	15.7
Dose (mJ/cm² for L/S)	27	25	22	20	15

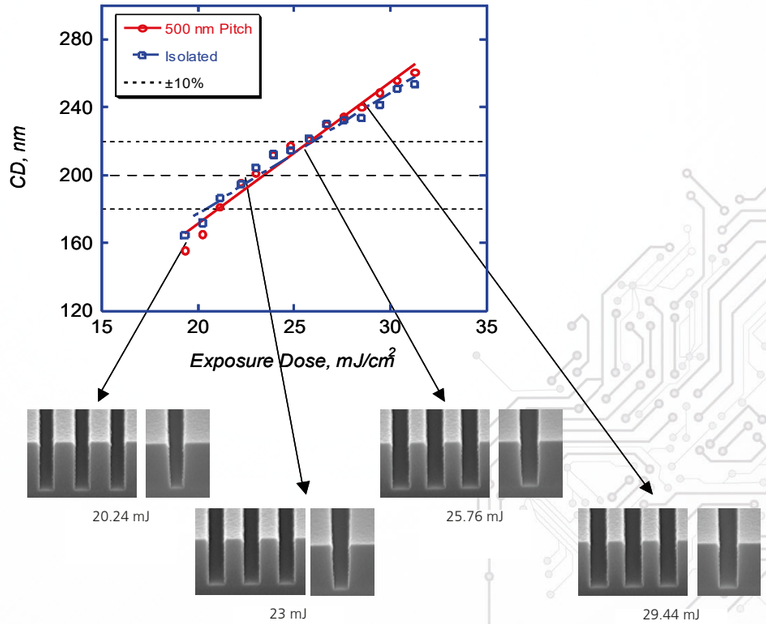


Resist Series UV60

UV60 is a positive DUV photoresist designed for consolidation of implant, metal contact hole and via applications for 200 nm features. UV60 works well on reflective substrates.

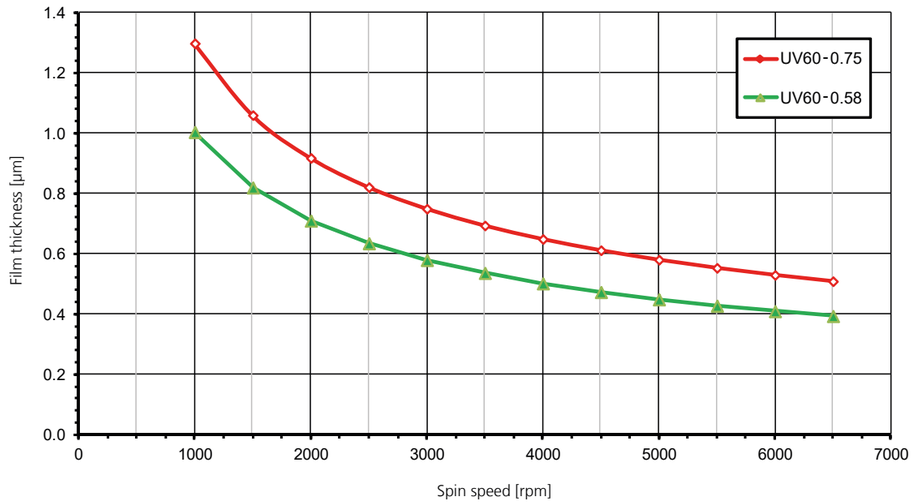
Advantages

- DoF > 0.5 µm for 200 nm 1:1.25 trenches
- Excellent resolution
- Good exposure latitude
- Vertical profiles



Available products of this resist series

Resist	UV60-0.58	UV60-0.75
Film thickness @ 3000 rpm	580 nm	750 nm
Viscosity / cSt	9.7	12.7
Dose (mJ/cm² for L/S)	22	24

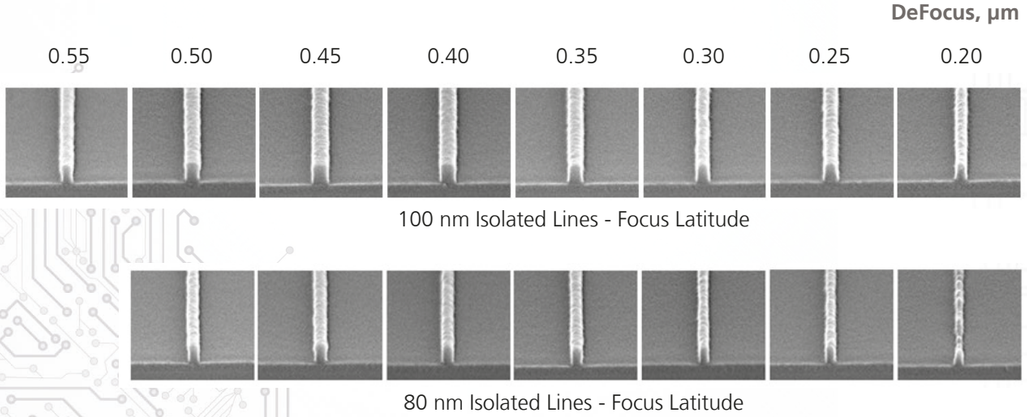


Resist Series UV1100

UV1100 is a high temperature, positive DUV resist . UV1100 features excellent resolution and wide process windows for metal and trench application. UV1100 works well on organic anti-reflectant for hard mask processes and is especially suited for metal trench application.

Advantages

- Low through-pitch bias
- Excellent etch resistance
- Minimal SB/PEB sensitivity
- Good process window
- Good resolution

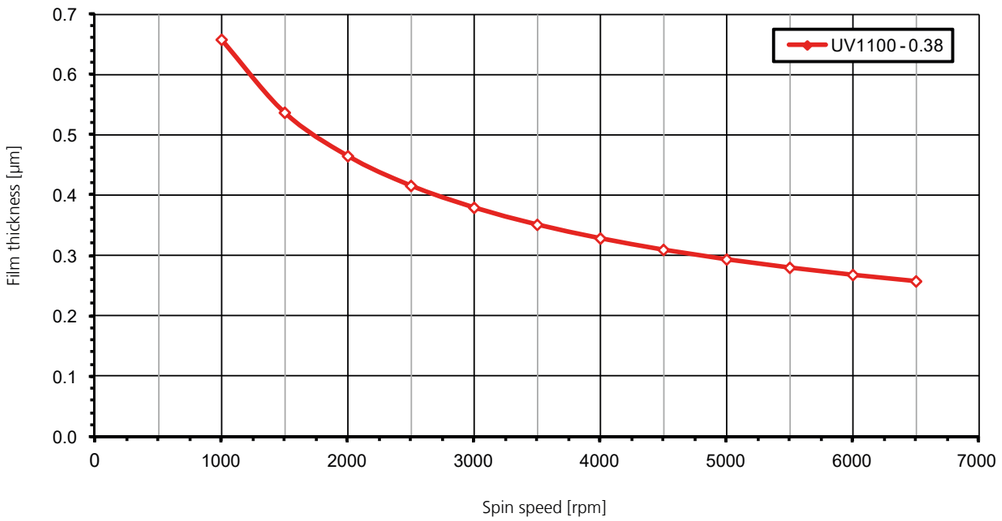


100 nm Isolated Lines - Focus Latitude

80 nm Isolated Lines - Focus Latitude

Available products of this resist series

Resist	UV1100-0.38
Film thickness @ 3000 rpm	380 nm
Viscosity / cP	5.9
Dose (for 100nm iso-Line)	43 mJ/cm²

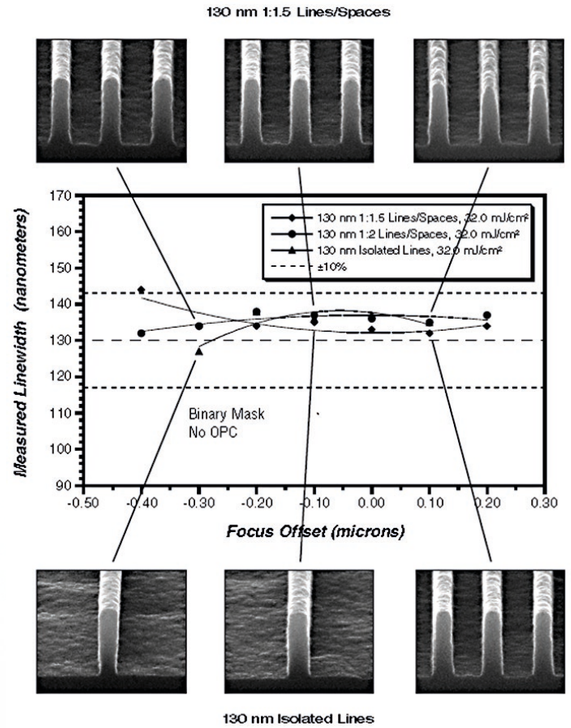


Resist Series UV135G

UV135G is a low temperature, positive DUV resist with features excellent resolution and wide process windows for gate application.

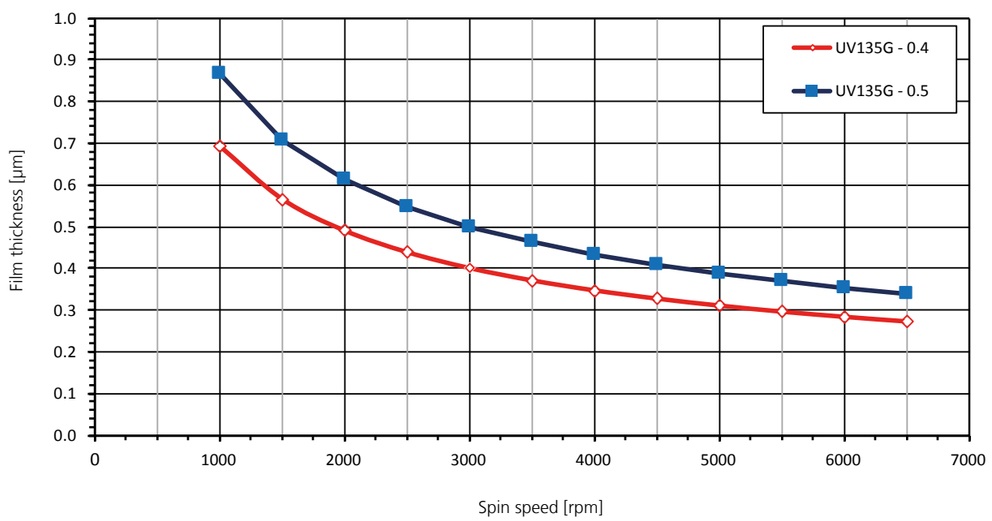
Advantages

- Low iso-dense bias
- maximum isolated film retention to < 110nm
- Compatible with phase shift mask (PSM) and optical proximetry corretion (OPC) assist features to enlarge process window
- Good resolution



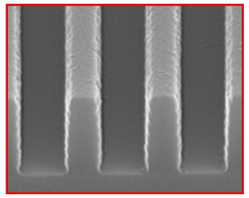
Available products of this resist series

Resist	UV135G - 0.5	UV135G - 0.4
Film thickness @ 3000 rpm	500 nm	400 nm
Viscosity / cP	12.4	10
Dose (mJ/cm² for L/S)	43	34

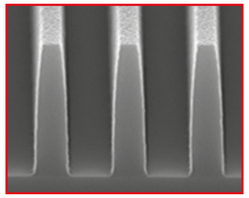


Resist Series UV5 and UV6

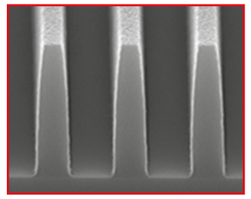
UV5 and UV6 are positive DUV photo resist to provide vertical profile imaging of isolated and semi dense features for device production design rules down to 150 nm. These resists are ideally suited for use with AR2™ Antireflectant and a variety of inorganic substrates. UV5 has a slightly higher photo speed. Both are optimized for 0.26N developer.



756nm Ft / 270nm L/S



460 nm Ft / 180nm L/S



705 nm Ft / 250nm L/S

Features

Sizing Energy ⇨ DoF ⇨Resolution

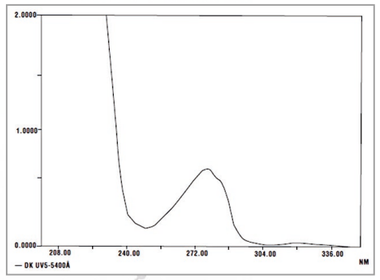
UV5

- 10 – 20 mJ for iso; semi-dense line and contact holes
- 1.2 µm DoF for 180 nm semi-dense lines
- 0.8 µm DoF for 180 nm iso lines
- 0.8 µm DoF for 250 nm contact holes
- 150 nm resolutionfor L/S and 200 nm for CH

UV6

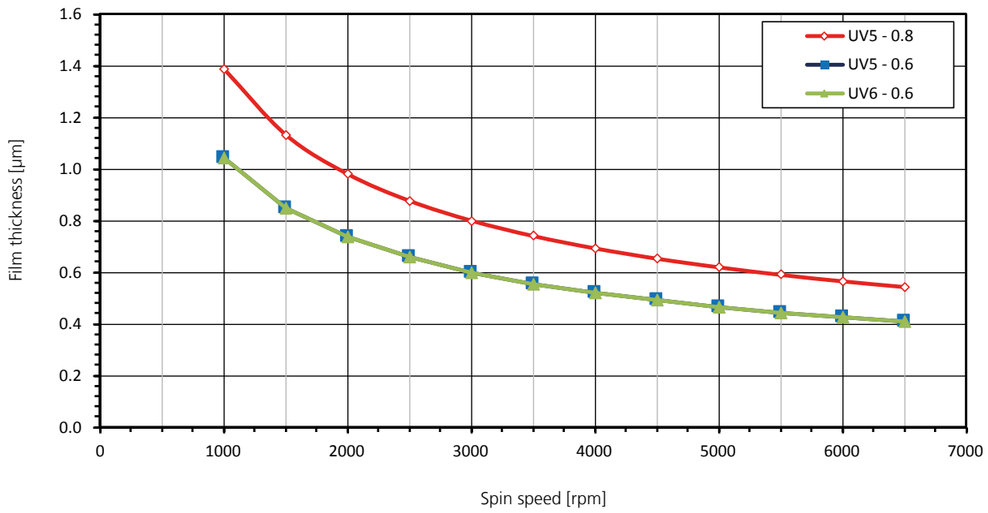
- 18 - 28 mJ for line / spaces
- 25 - 40 mJ for contact holes
- 1.0 µm DoF for 200nm line / spaces
- 0.8 µm DoF for contact holes
- 200 nm resolution for L/S and CH

Absorbance Curve UV5 / UV6



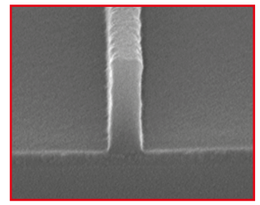
Available products of this resist series

Resist	UV5 - 0.8	UV5 - 0.6	UV6 - 0.6
Film thickness @ 3000 rpm	800 nm	600 nm	600 nm
Viscosity / cSt	21.6	15.25	15.3
Dose (mJ/cm² for L/S)	16	14	26

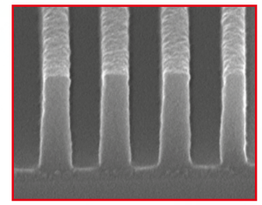


Resist Series UV210GS

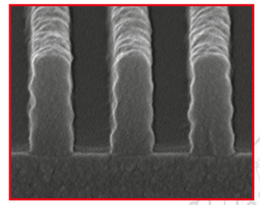
UV210GS is a multipurpose resist that can be utilized for gate, phase shift mask contact holes and trench applications in 180 – 130 nm CD range.



500 nm Ft/ 180 nm L/S



500 nm Ft/ 180 nm L/S



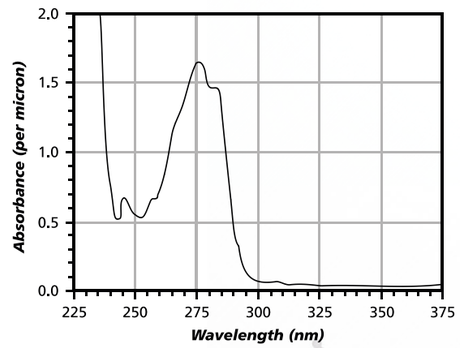
315 nm Ft/ 130 nm/ 220 nm L/S

Features

Sizing Energy⇨DoF⇨Resolution

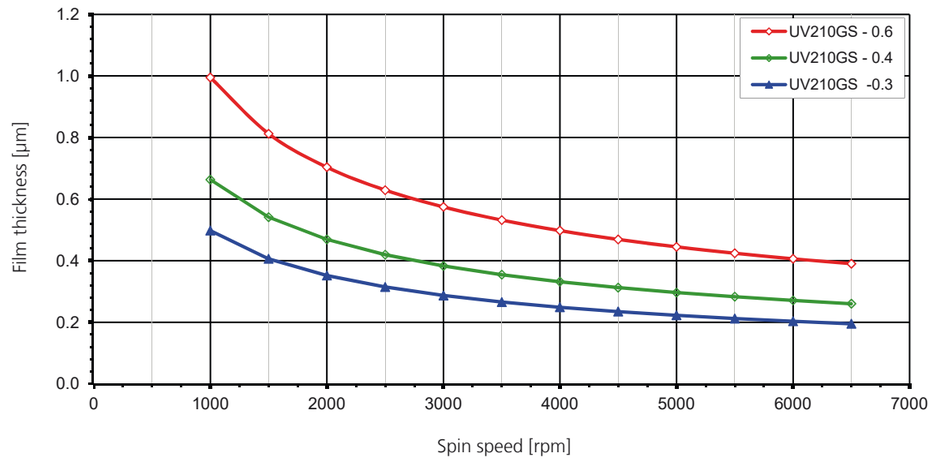
- 28 mJ/cm² for 130 nm 1:1.5 lines / spaces
  ⇨1.0 µm DoF⇨Resolution 130 nm
- 33 mJ/cm² for 180 nm 1:1 trenches
  ⇨0.8 µm DoF⇨Resolution 160 nm
- 60 mJ/cm² for 180 nm 1:1 contact holes
  ⇨0.7 µm DoF⇨Resolution 150 nm (70 nm Bias)

Absorbance Curve UV210GS



Available products of this resist series

Resist	UV210GS-0.6	UV210GS-0.4	UV210GS-0.3
Film thickness @ 2750 rpm	600 nm	400 nm	300 nm
Viscosity / cSt	13.83	10.07	7.52
Dose (mJ/cm² for L/S)	30	28	26



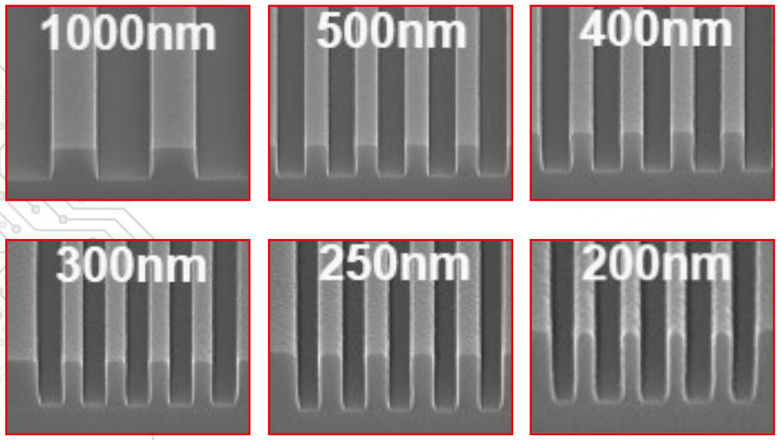
Resist Series UVN2300

UVN2300 is a negative PFOS-free photoresist for DUV applications. This resist is targeted for fast throughput device production rules down to 150 nm. Nested lines/spaces, isolated lines, posts, and contacts can be resolved with wide process windows. Minimal PEB sensitivity, insensitivity to airborne contaminants, and superior metal etch resistance are only some of the properties UVN2300 offers.

Features

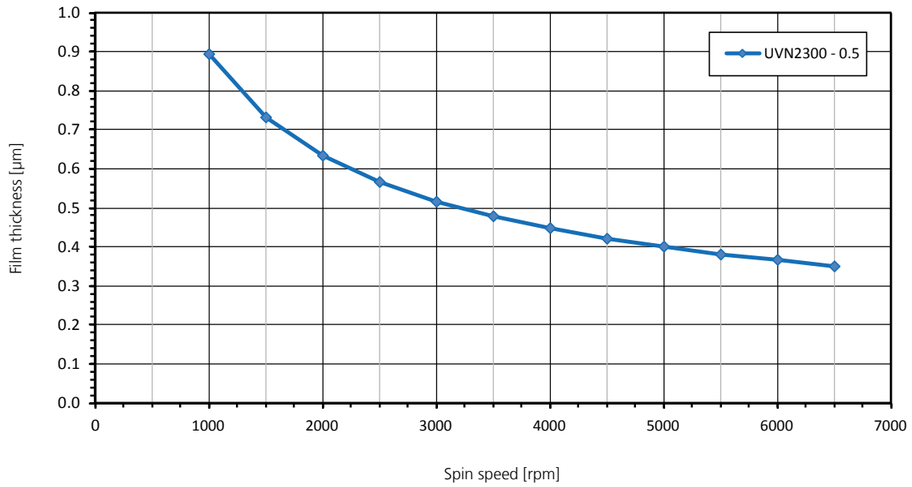
Sizing Energy
- 10.0 – 100 mJ for lines and spaces

Depth of Focus
- 1.3 µm DoF for 300 nm semi trench
- 1.6 µm DoF for 300 nm 1:1 trenches
- 0.90 µm DoF for 180 nm 1:1 lines/spaces
- 0.80 µm DoF for 150 nm 1:1 lines/spaces
- 0.45 µm DoF for 180 nm 1:1 CH



Available products of this resist series

Resist	UVN2300-0.5
Film thickness @ 3200 rpm	500 nm
Viscosity / cSt	4.77
Dose (mJ/cm² for L/S)	20



XR-1541 E-Beam Resist

DuPont™ XR-1541 E-Beam Resists are comprised of hydrogen silsesquioxane (HSQ) resin in a carrier solvent of methylisobutylketone (MIBK). It functions as a negative tone electron- beam resist with capability to define features as small as 6 nm. These resists are processed to high purity semiconductor grade (<10 ppb trace metals). They are available in compositions of resin in carrier solvent to produce thin films ranging in thickness of 30 to 180 nm in a single coat. Customized compositions are available upon request. Formulation with a volatile methyl siloxane (VMS) fluid blend carrier solvent is also available upon request as a customized formulation. The volatile methyl siloxane blend carrier solvent is exempt from federal and state regulations covering volatile organic compounds (VOC). High purity semiconductor grade MIBK and siloxane rinse solvents are available from DuPont as companion products. The line rinse solvents conform to the same purity specifications as the XR-1541 resist products.

Processing/Curing
Variable energy electron beam lithography allows control of the electron penetration depth in HSQ from below 35 nm to greater than 175 nm with a single exposure tool with beam energies from 200 eV to 100 keV. Optimal doses depend upon beam energy, desired resolution, and film thickness, but area doses from 400 to 700 µC/cm2 are typical and dependent on thickness. A 350 °C post exposure bake in N2 enhances the contrast properties of the film. Films can then be developed in a standard aqueous base developer (0.26 N TMAH).

Shelf life, Storage and Packaging: 6 months from date of manufact. at 4°C, 125 ml and 250 ml bottle

Features & Benefits
- E-beam patternable
- Negative tone
- Etch resistance
- High purity
- Direct write
- Thin films
- High resolution
- Excellent line edge roughness
- Aqueous development (0.26N TMAH)

Available products

Type	XR-1541-002	XR-1541-004	XR-1541-006
Spin-On film thickness / nm	30 - 60	55 - 115	v85 - 180
solvent	MIBK	MIBK	MIBK
custom solvent (option)	VMS	VMS	VMS

Specifications

Property	Unit	Result
Minimal feature size	nm	6
Shelf life at 4°C	month	6
Edge definition	nm	3.3
Refractive index	-	1.41
Trace metal impurities	ppb	<10
Spin-on film thickness - 2%	nm	30 - 60
Spin-on film thickness - 4%	nm	55 - 115
Spin-on film thickness - 6%	nm	85 - 180

Developers

Metal Ion Free (MIF) TMAH based and **Metal Ion Bearing (MIB)** NaOH based aqueous developers are either supplied as ready to use solutions or as concentrates for dilution at the customer site.

	Developer	Surfactant	Normality	Bath make-up	Compatibility	
					g + i-Line resists	DUV resists
MIF	MEGAPOSIT **MF-21A**	yes	0.21	ready to use		
MIF	MEGAPOSIT **MF-24A**	yes	0.24	ready to use		
MIF	MEGAPOSIT **MF-26A**	yes	0.26	ready to use		
MIF	MICROPOSIT **MF-CD-26**	none	0.26	ready to use		
MIF	MICROPOSIT **MF-319**	yes	0.237	ready to use		
MIF	MICROPOSIT **MF-320**	yes	0.255	ready to use		
MIF	MICROPOSIT **MF-321**	yes	0.210	ready to use		
MIF	MICROPOSIT **MF-322**	yes	0.268	ready to use		
MIB	MICROPOSIT **351**	none	1.39	concentrate		
MIB	MICROPOSIT **354**	none	0.31	ready to use		
MIB	MICROPOSIT **303A**	none	1.70	concentrate		
MIB	MICROPOSIT **Developer***	none	0.60	concentrate		

***** lowest attack on aluminum

optimal | possible | not recommended

248 nm Bottom-Anti-Reflectance-Coatings (BARC) - non developable

Property	Attributes	Product		
		AR3GSF	**AR10L**	**AR14**
Film Thickness	1st-minimum-thickness for bare silicon [nm]	60	60	60
	thickness range [nm]	50-150	40-120	60-150
Bulk Etch Rates	relative to UV6 resist	1.2	1.3	1.3
	relative to AR2/AR3 (legacy BARC)	1.0	1.0	1.0
Coating	conformal	yes	yes	
	planar & via fill			yes
Resist Compatibility	ESCAP resists	yes	yes	yes
	Acetal/Hybrid		yes	partly
Opt. Constants at 248nm	n	1,46	1,45	1,45
	k	0,47	0,45	0,45
Surfactant		none	included	included
Available Dilutions		AR3GSF-600 AR3GSF-900	AR10L-400 AR10L-600 AR10L-690 AR10L-700	AR14-600 AR14-900 AR14-1200 AR14-1500

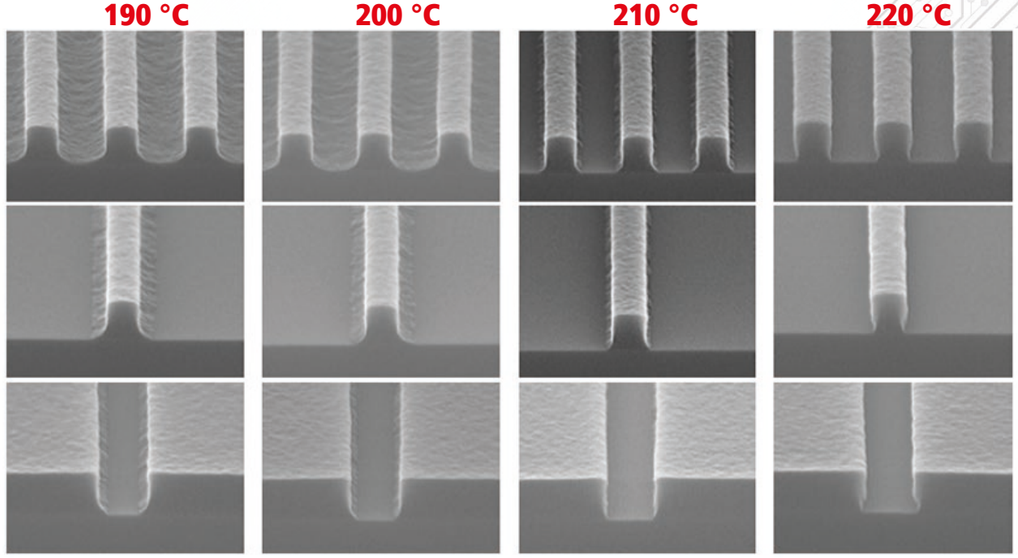
AR602 Developable Anti-reflectant

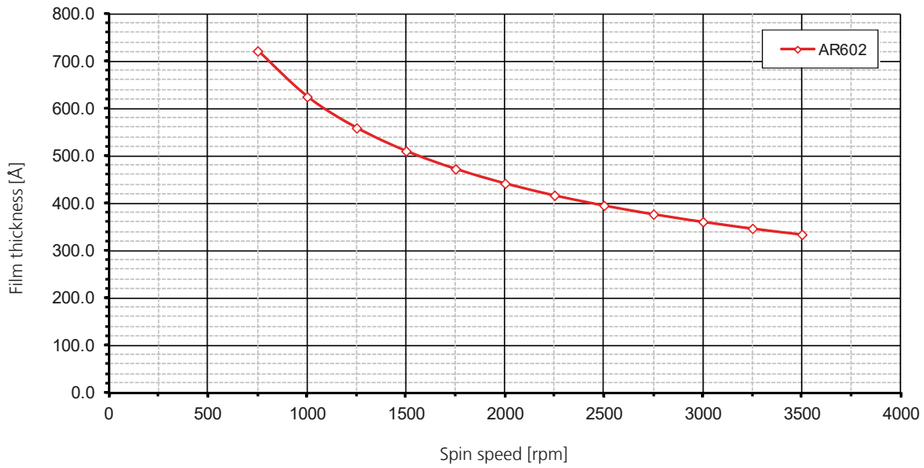
AR602 is a developable organic bottom anti-reflectant for use in both KrF and ArF application. AR602 is designed for improved performance of critical implant layers while minimizing the negative effects of other implant solution. AR602 has excellent reflection control and improves profile and CDU concerns of a traditional top anti-reflectant-coating.

Advantages

- Optical density at 248 nm: 7.5 μm^{-1} and at 193: 10.4 μm^{-1}
- First minimum thickness at 520Å over reflective substrates
- Tuneable dissolution rate with cure temperature
- Product dilution targeted at 510Å
- Compatible with many common EBR solvents
- Excellent CD and profile control

Cure Temperature vs. Dissolution Rate





Advanced Removers

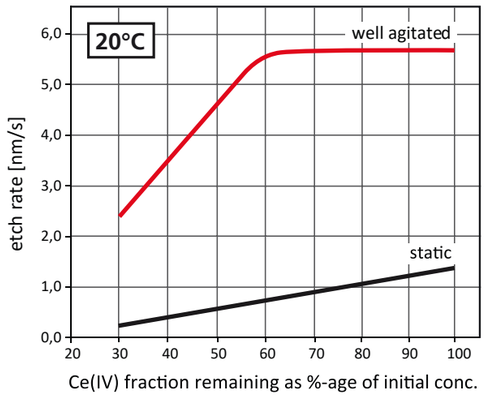
EC Solvent	EC Solvent 11	Remover 1165
Edge bead remover	Edge bead remover	General purpose NMP based
Remover 1112A	**SVC-14**	**PRX-505 Remover**
General purpose NMP free	General purpose NMP free	Polymer remover aluminium, single wafer processing

micro resist technology

CHROME ETCHANT 18

Chrome Etchant 18 is designed for use in microlithographic applications where high reproducibility and tight dimensional control are required. The ready-to-use solution, which is based on acidic cerium-(IV) salt, is compatible with standard positive and negative tone resist systems.
The principle application is in thin-film technology like micro optics, optical gratings and thin film circuitry. It is also commonly used in mask manufacturing for etching bright or anti-reflective chromium thin-films on maskblanks. Besides etching chromium, it can also be used to etch chrome-nickel alloys, silver, copper, molybdenum and tungsten films.
The initial etch rate strongly depends on the mode of agitation: if the specimen is properly agitated or the solution well mixed, an etch rate of about **300 - 420 nm/min** can be obtained at 20°C. Without agitation or fluid convection, the rate is on the order of **60 nm/min**.
During the dissolution of chromium, Ce(IV)-ions are converted to Ce(III) and therefore the etch rate drops with the number of substrates processed. This results in a gradual decrease of the rate as shown in the figure.

Mode of use	immersion or spray
Temperature range	20 – 40°C (typically)
Cr etch rate at 20°C	300 – 420 nm/min agitated 60 – 120 nm/min static
Ce(IV)-content	43 g/L
Total acidity	2 mol/L
Filtration	0,45 µ
Etch capacity per Liter (theoret. maximum)	5.3 g Cr or 7.5 m² @ 100 nm FT
High etch rates with	Cr, Cu, Ag, V
Compatible resists	positive and negative tone



Approximate etch rate in nm/s vs. fraction of Ce(IV) left, for strictly static or well agitated conditions at a temperature of 20°C. The data corresponds to etching a 250 nm chromium film on glass. The reaction is strongly limited by diffusion/mass-transfer to and from the surface which is why agitation speeds up the reaction significantly.

FOx™-1x and FOx™-2x flowable oxides

DuPont™ FOx™ Flowable Oxide is a flowable, inorganic polymer that is designed to meet industry demands for improved dielectric materials. A single layer FOx™ Flowable Oxide may be used as a direct replacement for low temperature chemical vapor deposition (CVD) and spin on glass (SOG) processes which require an etch-back. It planarises locally the underlying topography; improving step coverage of PECVD dielectric layer and enabling the dry metal etch, so that residues are eliminated. These materials are semiconductor grade. They are available in several versions to produce a range of thicknesses up to 0.95µm with a single coat.

DuPont™ FOx™ is available in several versions, to enable a range of thicknesses up to 0.95 µm with a single coat. FOx™-1x Flowable Oxide uses methyl isobutyl ketone (MIBK) and FOx™-2x uses a blend of siloxanes as its carrier solvent.

Processing
After spin coating, hot plates are used to remove solvent and to melt and flow the film, providing superior smoothing and gap fill. Subsequently, the film is cured at 400°C in a standard quartz furnace after which the material is ready for the next processing step.

Shelf life, Storage and Packaging: 6 months at 4°C, 1000 ml bottle

Applications
- Semiconductors:
  - Interlevel dielectric material in multilevel metal integrated circuit designs
  - Can be used to improve step coverage of a PECVD layer, such as the primary passivation layer
  - Transparent bonding material for high temperature applications
- Non-electronic applications: submicron gapfill capability and smoothing of surfaces

Features & Benefits
- Carbon free inorganic polymer hydrogen silsesquioxane, HSQ)
- Semiconductor grade
- Local planarization capability
- Surface smoothing
- Excellent gap fill
- Low dielectric constant
- No etch-back
- Highly transparent, even in the UV
- Convertible to SiO_2

Available products

Type	FOx™-15	FOx™-16	FOx™-24	FOx™-25
Spin-On film thickness / nm	350-700	450-950	350-610	480-801
solvent	MIBK	MIBK	siloxane blend	siloxane blend

Specifications

Property	Unit	Result
Uniformity	%	<1
Refractive index (SiH% dependent)	-	1.38-1.43
Gapfill capability (aspect ratio dependent)	nm	3
Planarization	-	local
Maximum crack free (SiH% dependent)	nm	1200
Modulus (SiH% dependent)	GPa	2-8
Hardness (SiH% dependent)	GPa	0.6-0.8
Density (cured)	g/cm³	1.4-1.5
Tensile stress (after cure)	ppm/°C	70-90
UV transmissivity (210-320 nm)	%	>92
Coefficient of thermal expansion	ppm/°C	20
Dielectric constant (SiH dependent)	-	2.8-3.0
Field breakdown	MV/cm	8
Particle Count ≥ 0.2 µm	#/mL	<250
Particle Count ≥ 0.5 µm	#/mL	<30
Metals (solution)	ppb	<10

Dielectric Materials

Dupont offers two lines of spin-on dielectric materials specifically designed for a wide range of advanced packaging applications. CYCLOTENE™ Advanced Electronic Resins are high-purity polymer solutions that are either dry-etch or photoimagable (i-line or broadband, positive or negative tone); both are formulated as high-solids, low-viscosity solutions. Curing is based on bisbenzocyclobutene (BCB) chemistry.

INTERVIA™ Photodielectrics are negative tone, epoxy-based chemically amplified permanent resists designed for use on wafers and organic/inorganic substrates. Typical applications include wafer-level CSPs, solder dam applications and device top-coat protection. INTERVIA™ can be developed using aq. TMAH solution.

DIELECTRIC	Description	Film Thickn. (µm)	Mode of use	Cure temp.	Tone	Viscosity (cSt @ 25°C)	Side wall slope	Supporting Ancillary Products	Package size	Shipping conditions	Storage conditions
DRY ETCH CYCLOTENE™ Advanced Electronics BCB Resin (spin-on, thermal cure)											
CYCLOTENE™ 3022-35	Redistribution and/or protection dielectric, dry etch product offering	1.0 - 2.4	Track based Application, Spin-on, Dry-etch Pattern (non Photo formulation)	200 – 250°C (<100ppm O2)	NA	14	NA	• Adhesion Promoter AP3000 • Rinse T1100	0.8 kg (amber glass) 3.5 kg (amber glass)	Room temp.	Room temp.
CYCLOTENE™ 3022-46		2.4 - 5.8				52			0.8 kg (amber glass) 3.5 kg (amber glass)		
CYCLOTENE™ 3022-57		5.7 - 15.6				258			0.8 kg (amber glass) 3.5 kg (HDPE)		
CYCLOTENE™ 3022-63		9.5 - 26.0				870			0.8 kg (amber glass) 3.5 kg (HDPE)		
CYCLOTENE™ 3501 DRY-ETCH grade (formerly XUS 35077 type 2)		0.8 - 2.0				formulation type dependent			0.8 kg (amber glass) 3.5 kg (HDPE)		
PHOTO Defined CYCLOTENE™ Advanced Electronics BCB Resin (spin-on, i-Line & broadb., solvent developed)											
CYCLOTENE™ 4022-25	Redistribution and/or protection Dielectric, Photo defined Solvent developed product.	0.8 - 1.8	Track based Application, Spin-on, Photo Pattern Solvent Develop Puddle and dip capable, Requires Fluorine/O2 Plasma descum	200 – 250°C (< 100ppm O2)	(–)	36	45°	• Adhesion Promoter AP3000 • Developer DS2100 (puddle) • Developer DS3000 (tank) • Rinse T1100 • Primary Stripper A	0.8 kg (amber glass)	Dry Ice package	Cold storage: -15 to -25°C (freezer)
CYCLOTENE™ 4022-35		2.5 - 5.0			(–)	192			0.9 kg (amber glass)		
CYCLOTENE™ 4022-40		3.5 - 7.5			(–)	350			0.9 kg (amber glass)		
CYCLOTENE™ 4022-46		7.0 - 14.0			(–)	110			0.9 kg (amber glass)		
CYCLOTENE™ 4026.50 PHOTO grade (formerly: XUS 35078 type 3)		15.0 - 25.0			(–)	formulation type dependent			0.9 kg (amber glass)		
PHOTO Defined CYCLOTENE™ Advanced Electronics BCB Resin (spin-on, i-line & broadb., aqueous developed)											
CYCLOTENE™ P6001	Redistribution and/or protection dielectric photo defined spin on material for high resolution applications.	0.5 - 0.6	Track based application, spin-on, photo pattern aqueous Develop, fluorine/O2 plasma descum optional	200 – 250°C (< 100ppm O2)	(+)	6	65-70°	• Adhesion promoter AP9000S • PGMEA based remover • MICROPOSIT MF-CD-26 TMAH developer (see page 22)	0.8 kg (amber glass) 3.5 kg (amber glass)	Cold storage: (target: -15°C)	Dry Ice p ackage
CYCLOTENE™ 6505		3.5 - 7.5			(+)	190			1 QT (amber glass) 1 USG (amber glass)		
PHOTO Defined InterVia™ Epoxy Resin (spin-on, i-Line & broadb., aqueous developed)											
INTERVIA™ 8023-2	Redistribution and/or protection Dielectric Photo defined spin on material.	4.0 - 8.0	Track based application, spin-on, photo pattern aqueous puddle develop, O2 plasma descum	175 – 225°C (< 100ppm O2 optional, air cure capable)	(–)	200	75-80°	• MICROPOSIT MF-CD-26 TMAH developer • INTERVIA Adh Pro - Cleaner , - Predip , - Treatment (optional for Cu-surfaces)	1.0 kg (Plastic)	Blue Ice package	Cold storage (target 4°C)
INTERVIA™ 8023-10		8.5 - 15.0			(–)	1000					

Ancillary Products for Dielectric Materials

Product	Description	Mode of Use	Packaging
Removers			
Primary Stripper A	Remover for rework of CYCLOTENE™ 4000 prior to cure (aromatic and aliphatic hydrocarbons, sulfonic acid derivative)	Tank (soak) with proper ventilation required	4 kg (amber glass)
Adhesion Promoter			
AP3000	Spin-on adhes. promoter (solvent: PGME)	Track based, spin on application with applied thermal step	3.5 kg (amber glass) 4 x 3.5 kg
AP9000S			
Developers			
DS2100	Organic, aliphatic solvent for track **puddle develop** of Cyclotene	Track dispense on puddle develop tool	3.24 kg (amber glass) 4 x 3.24 kg
DS3000	Organic, aromatic solvent for **dip develop** process of Cyclotene	Dip develop process with proper ventilation	3.24 kg (amber glass) 4 x 3.24 kg
Track Solvents			
Rinse T1100	Organic, aromatic solvent for rinsing, supporting spin coat application	Track dispense pressurized feed line	3.24 kg (amber glass) 4 x 3.24 kg

Metallization Solutions

Product	Description
INTERVIA™ Copper Plating Solutions	• Multiple acid copper electroplating process for all wafer level packaging applications • Processes tailored to meet the most exacting uniformity and plating speed requirements • Selection of inorganic make-up solutions with varying levels of copper sulfate, sulfuric acid and chloride ions ensures optimal throwing power and performance • Consult with a Dow Electronic Material technical specialist for specific recommendations
INTERVIA™ Cu 8540 Electroplating Copper	• A 0.2–2.0 µm/min. copper electroplating bath for pattern plating, studs, via filling and redistribution conductors on wafer substrates • Produces semi-bright uniform deposits • Operates with DC power supply only
INTERVIA™ 9000 Electroplating Copper	• Designed for Cu pillar and redistribution layer plating applications • Three-component system able to achieve a finely tuned deposit morphology across a wide variety of feature sizes • Capable of high plating rate for maximizing wafer through-put • Tunable pillar shapes while maintaining co-planarity performance – Within-die (WID) uniformity: <5% – Within-wafer (WIW) uniformity: <10% • High plating speed up to 4 µm/min for pillar application • Highly pure Cu deposits with <20 ppm C, N, O, H, S, Cl impurities • Void-free integration with NIKAL™ BP Nickel and SOLDERON™ BP Tin-Silver chemistries
INTERLINK™ 9200 Copper	• Designed for through-silicon via (TSV) plating with rapid via-filling speeds and low wafer overburden • Three-component organic additive system with a wide dosing window to enable process robustness • Short plating times of <20 min for 5x50 µm TSV or <60 min for 10x100 µm TSV • Highly pure deposits with <20 ppm C, N, O, S, Cl- impurities • Long bath life & stable plating performance for greater than 40 Ahr/L with no change in deposit quality
SOLDERON™ BP IN 1000 Indium	• Designed for solder plating processes used in advanced WLP for emerging temperaturesensitive applications • 180°C reflow temperature, which is much lower than 260°C reflow for SnAg • Capable of both C4 bumping and copper pillar capping across a range of features sizes • Macro and micro void-free performance after multiple reflows • Stable and consistent performance over thermal and electrolytic aging
SOLDERON™ BP TS 6000 Tin-Silver	• Designed for C4, Cu pillar capping, and micro bump applications • Suitable for both in-via and mushroom depositions • Capable of plating speeds ranging from 2 to 9+ µm/min from a single formulation • Robust macro- and micro-void-free reflow performance
SOLDERON™ BP SN6000 Tin	• Uses same components as HVM-proven SOLDERON BP TS6000 Tin-Silver • Capable of multiple feature sizes for copper pillar capping applications • Simple operation and wide process window • High plating speed up to 7 µm/min.
NIKAL™ BP NIckel	• Matte to semi-bright, low-porosity nickel electroplating bath using a sulfamate electrolyte • Deposits have high ductility, excellent solderability (when protected by a suitable precious metal layer) and serves as an excellent barrier to copper diffusion • Deposit stress and ductility easily controlled through pH adjustments to plating bath • Boric acid-free option available

micro resist technology GmbH – high-service distributor in Europe

We are leaders in the development, production and sale of innovative photoresists, polymers, photopolymers and ancillaries for micro- and nanostructuring processes used in key technologies of today and growth markets of tomorrow. Our products are used for example in microsystems technology, microelectronics, optoelectronics, micro- and nanophotonics, micro- and nanotechnology as well as the life sciences.

The portfolio of in-house manufactured products is complemented by the strategic sales of associated products that are manufactured by our international partners. Here we act as a high-service distributor and offer European medium-sized companies a wide range of complementary specialty chemicals from a single source, which can be used for both established and innovative production and manufacturing processes.
Customers of all kinds appreciate our core competence in dealing with photoresists, polymers and photopolymers as well as the comprehensive technological advice with a holistic view of the lithographic interaction of material and process by the company's scientists - one of the essential criteria for our success. As a reliable and experienced partner, we also offer product-related lithographic services.

micro resist technology puts a high priority on the consistent implementation of quality management methods and is successfully certified according to the standards: ISO 9001:2015 and to ISO 14001:2015.

micro resist technology's products are:

- Polymers for Nanoimprint Lithography
- (Hybrid Polymers) (ORMOCER®s) for micro-optical applications
- Photoresists for Deep-UV and Electron-beam Lithography
- Photoresists and Photopolymers for UV, Laser and X-ray Lithography
- Customer Services

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Imprint

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Glossary

Wavelengths: i-line: 365 nm, g-line: 436 nm, broadband: i + h + g-line = 365 nm + 405 nm + 436 nm
L, M: Resist with Low and Medium dye content to reduce interference effects on reflective substrates
ESCAP: Environmentally Stable Chemically Amplified Photoresist
DoF: Depth of Field/Focus
□: partial coherence factor
NA: Numerical Aperture
CD: Critical Dimension
mix and match: combined e-beam and optical lithography
BEOL: Back End Of Line
FT: Film Thickness
EBR: Edge Bead Removal
PEB: Post Exposure Bake
via: a conductive passage through an insulating layer
MC: Metal Contact
L/S: Lines and Spaces
CH: Contact Hole

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