AZ 6600 Series

General-Purpose Photoresists

Clariant

GENERAL INFORMATION

This series of positive photoresists belongs to the group of ADVANCED PHOTORESISTS. It represents the latest state of the art photoresist series for wet- and dry-etching applications. It is designed for broadband UV4 exposure like projection printers and Ultratech steppers. It may be used on g- or h-line steppers as well providing excellent process latitude. On i-line steppers these resists are extremely fast (only 50 mJ/cm² exposure dose) causing reduced process latitude.
AZ 6600-series gives optimum process latitude at an isofocal bias of 0.2 µm, however zero-bias can be obtained at slightly reduced focus latitude. This lithographic performance was one issue when this series was designed. The background for this is that - especially in Europe - still a lot of semiconductor manufacturers are making discrete semiconductors and bipolar IC's (linear and digital) which for historical reasons have design rules > 1µm. For this kind of processes masks with litho-bias do already exist. Considering this situation we felt it worth do develop a new state-of the-art "general purpose resist". During the last two decades AZ 111-, AZ 1300-, AZ 1400- and AZ 1500-series resists have been the workhorses in this field. They all have certain properties which make them suitable for one or several layers. As a result thereof at least two different types were used. With AZ 6600-series there now is available a single resist family for all applications.
When designing these resists in 1992 we focused on following properties to be a must: **safer solvent**, **excellent adhesion** for wet-etch, **high thermal stability** for dry-etch, compatible with modern **MIF (metal ion free) developers** and **high process latitude**. Our experience of more than 20 years in developing and manufacturing of positive photoresists gave us the basis to achieve this goal.

Adhesion
is a very critical, but important parameter for wet-etching. First of all it requires a clean and dry surface. This generally is provided by subjecting the freshly prepared or dehydrated (bake at > 200°C) surface to a priming step with HMDS. By this procedure a hydrophobic surface is generated which prevents absorption of moisture for several days and which is ideally suited for the resist. Unfortunately HMDS is not very effective for aluminium, here a pretreatment with fuming nitric acid is recommended, which optionally may be followed by a HMDS treatment. If prepared in that way AZ 6600 will show excellent adhesion on all surfaces used in semiconductor manufacturing. Meanwhile these resists have proven in several production lines their superior adhesion in wet-etch including aluminium resulting in less undercut, better etch profiles and solving the mouse bite problems.

Thermal stability
is required for modern dry-etch equipment where the resist is subjected to reasonably high temperatures. A general solution is to perform a deep-UV hardening cycle before plasma etch. This of course is time consuming (cycle time 2 - 3 min.) and requires special equipment. In many cases it is sufficient to apply a postbake of 130 - 140°C, however the resist should maintain its profile to hit CD's after etch. AZ 6600 does withstand a 130°C bake on a hotplate and up to 140°C in an oven without major degradation of its profile. This is 20°C more than AZ 1500HS-series and often makes a DUV-cure obsolete.

Lithographic performance
is of importance for wide process windows. Our experience from developing sub micron resists also helped us to implement a good process latitude into AZ 6600. On a 0.35 NA g-line stepper 1.0 µm features can be printed with 20% exposure margin and 4 µm focus latitude (10% CD tolerance). Like any modern photoresist they are compatible with MIF developers, for best uniformity and fast wetting **AZ 726 MIF** is recommended. Especially for use on aluminium the dyed type **AZ 6618-2DG** is available to suppress reflective notching and to improve focus latitude.

PHYSICAL and CHEMICAL PROPERTIES

	AZ 6612	AZ 6615	AZ 6618-2DG	AZ 6624	AZ 6632
Solids content [%]	26.5	29.0	30.1	32.0	35.0
Viscosity [cSt at 25°C]	19.0	27.7	34.3	58.5	82.0
Absorptivity [l/g*cm] at 398nm	1.20	1.29	1.52	1.42	1.52
Solvent	methoxy-propyl-acetate (PGMEA)				
Max. water content [%]	0.50				
Spectral sensitivity	310 - 440 nm				
Coating characteristic	striation free				
Filtration [µm absolute]	0.1			0.1	0.2
Na, K, Cu, Fe-content	≤ 1 ppm				

FILM THICKNESS [µm] as FUNCTION of SPIN SPEED (characteristically)

spin speed [rpm]	2000	3000	**4000**	5000	6000
AZ 6612	1.70	1.39	**1.20**	1.07	0.98
AZ 6615	2.12	1.73	**1.50**	1.34	1.22
AZ 6618-2DG	2.55	2.08	**1.80**	1.61	1.47
AZ 6624	3.39	2.77	**2.40**	2.15	1.96
AZ 6632	4.53	3.70	**3.20**	2.86	2.61

PROCESSING GUIDELINES

Dilution and edge bead removal	AZ EBR Solvent
Prebake	110°C, 50s, hotplate
Exposure	broadband, g- and h-line
PEB	not required, optional with monochromatic exposure
Development	AZ 726 MIF, stream-puddle, 30 - 50s
Postbake	125°C, 50s hotplate or 30 min. oven
Removal	AZ 100 Remover, conc.

HANDLING ADVISES

Consult the **Material Safety Data Sheets** provided by us or your local agent!
This AZ Photoresists are made up with our patented safer solvent PGMEA. They are **flammable liquids** and should be kept away from oxidants, sparks and open flames.
Protect from light and heat and store in sealed original containers between 0°C and 25°C, exceeding this range to -5°C or +30°C for 1 week does not adversely affect the properties.
Shelf life is limited and depends on the resist series. The **expiration date** is printed on the label of every bottle below the batch number and coded as **[year/Month/day]**.
AZ Photoresists are compatible with most commercially available wafer processing equipment. **Recommended materials** include PTFE, stainless steel and high-density poly-ethylene and -propylene.

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