Technical datasheet

AZ® 10XT Series

Thick Positive Tone Photoresists

APPLICATIONS

Thick positive tone photoresists for plating applications featuring improved sidewall profiles, aspect ratios, and photospeed vs. typical thick DNQ type materials.

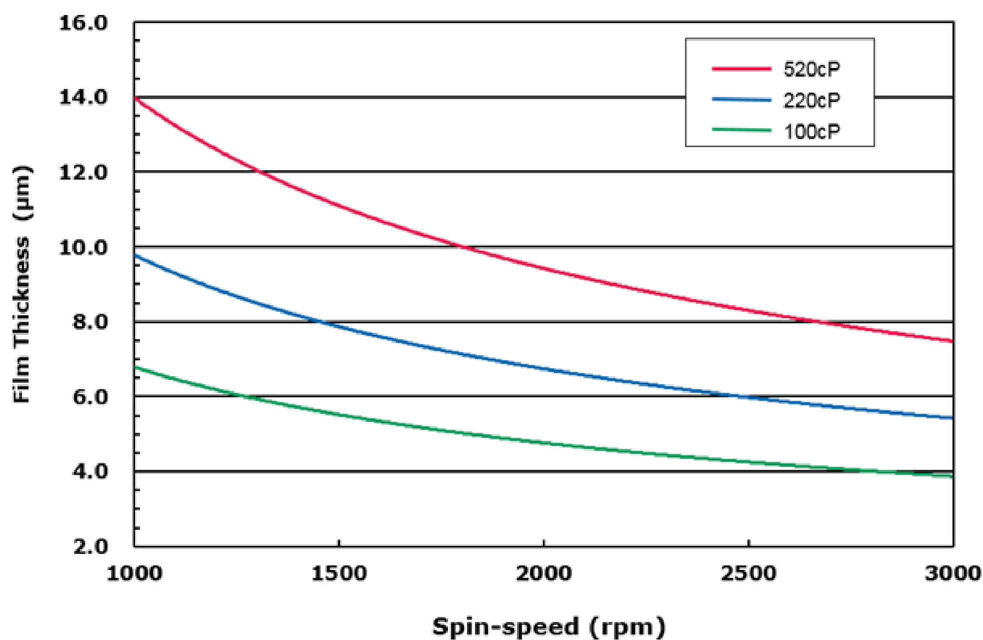
- MIF and IN developer compatible
- No post exposure bake required
- Single coat thicknesses from 4.0 to >20µm

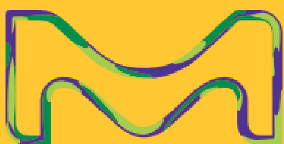
TYPICAL PROCESS

- Soft Bake: 110ºC/120s*
- Rehydration Hold: 30 min.
- Expose: 365nm Recommended Post Expose
- Bake: Optional
- Develop: Puddle, spray or immersion
- Developer Type: IN or MIF

* SB time is film thickness dependent

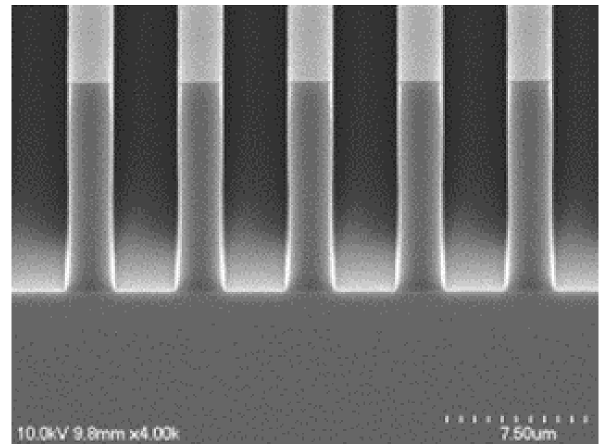
SPIN CURVES (200MM SILICON)





OPTICAL CONSTANTS*

Cauchy A	1.5995
Cauchy B (μm^2)	0.009958
Cauchy C (μm^4)	7.16e-04
n @ 633nm	1.6288
k @ 633nm	0.00015



3.0µm lines in 12µm thick AZ 10XT
Ultratech 1500 Exposure
AZ 400K 1:4 MIF Develop (260s spray)

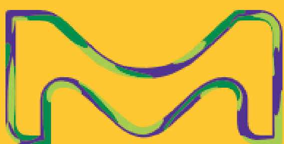
* Unexposed photoresist film

COMPANION PRODUCTS

THINNING/EDGE BEAD REMOVAL
AZ® EBR Solvent or AZ EBR 70/30

DEVELOPERS
AZ 400K Series, AZ 300MIF, AZ 435MIF

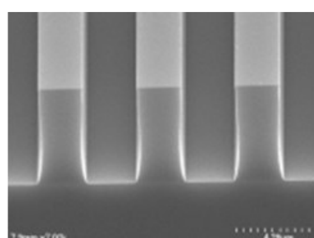
REMOVERS
AZ 300T, AZ 400T



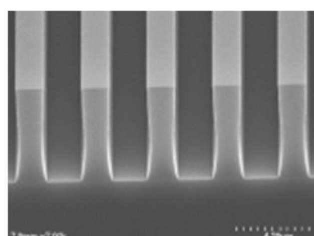
REFERENCE PROCESS (DENSE LINES IN 6µM FILM THICKNESS ON SI)

Process Step	Parameters
Coat	AZ 10XT 220cps, 6µm thick film on bare Si
Soft Bake	110°C, 120 seconds, direct contact hotplate
Post Bake Delay	30 Minutes
Expose	i-line @ 380mJ/cm^2 nominal (0.48NA)
Post Expose Bake	None
Develop	AZ 400K 1:4, 420 second immersion

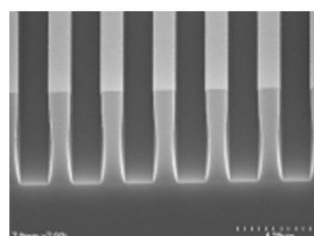
LINEARITY @ 380MJ/CM^2



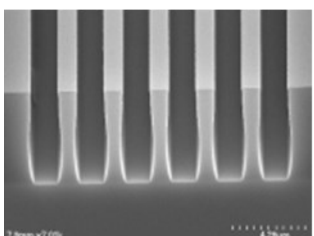
3.0µm



2.0µm

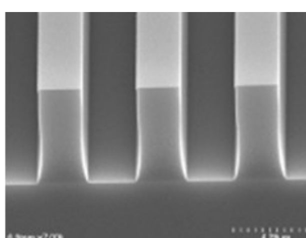


1.6µm

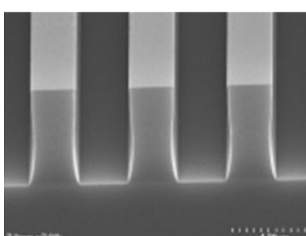


1.4µm

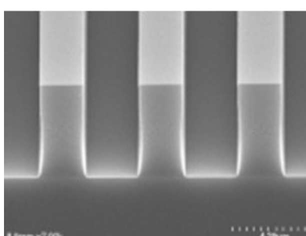
3.0µM LINES THROUGH DOSE



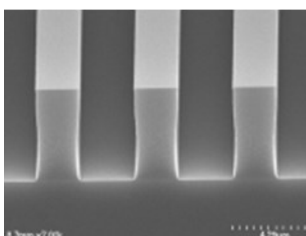
335 mJ/cm^2



365 mJ/cm^2

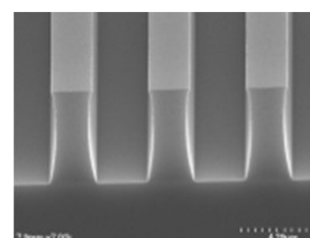


395 mJ/cm^2

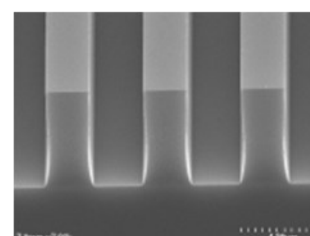


425 mJ/cm^2

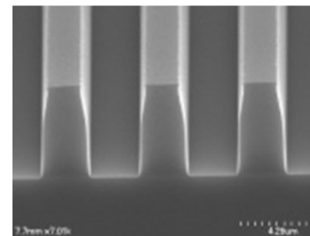
3.0µM LINES DOF @ 380MJ/CM^2



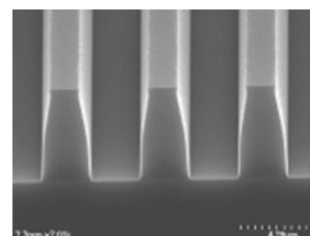
-1.5µm



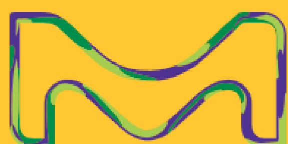
0.0µm



1.0µm



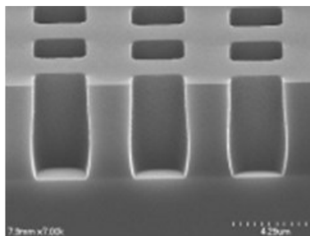
3.0µm

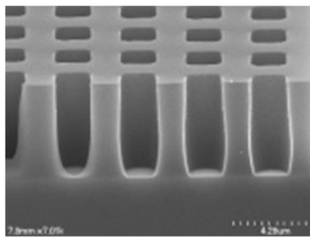


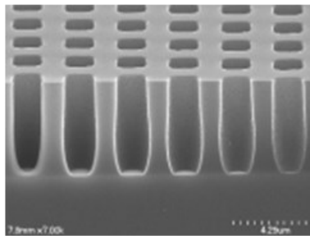
REFERENCE PROCESS (HOLES IN 6.0µM FILM THICKNESS ON SI)

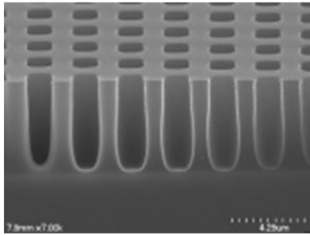
Process Step	Parameters
Coat	AZ 10XT 220cps, 6µm thick film on bare Si
Soft Bake	110°C, 120 seconds, direct contact hotplate
Post Bake Delay	30 Minutes
Expose	i-line @ 380mJ/cm^2 nominal (0.48NA)
Post Expose Bake	None
Develop	AZ 400K 1:4, 420 second immersion

LINEARITY @ 380MJ/CM^2

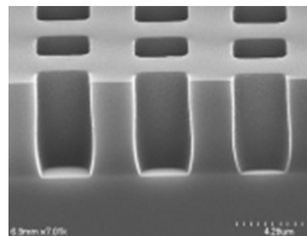

3.0µm

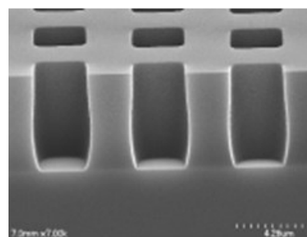

2.0µm

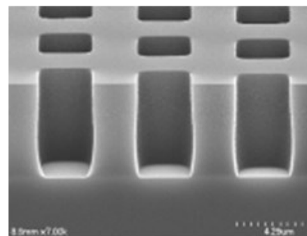

1.6µm

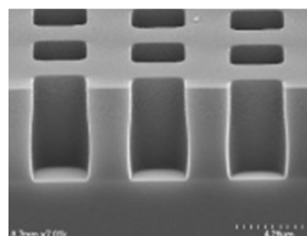

1.4µm

3.0µM HOLES THROUGH DOSE

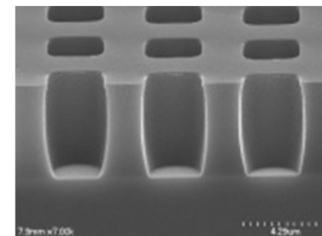

335mJ/cm^2

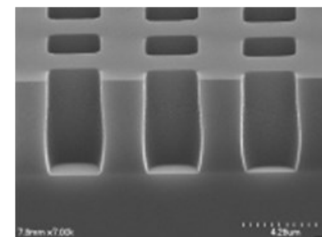

365mJ/cm^2

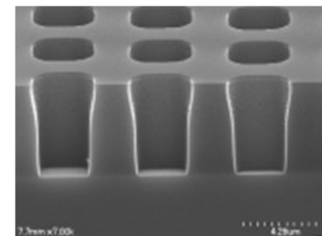

395mJ/cm^2

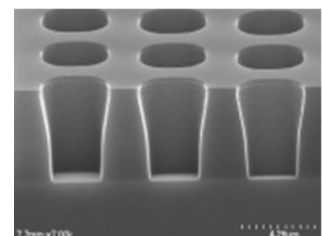

425mJ/cm^2

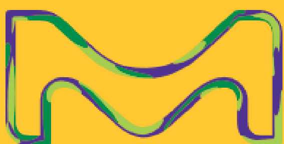
3.0µM HOLES DOF @ 380MJ/CM^2


-1.5µm


0.0µm

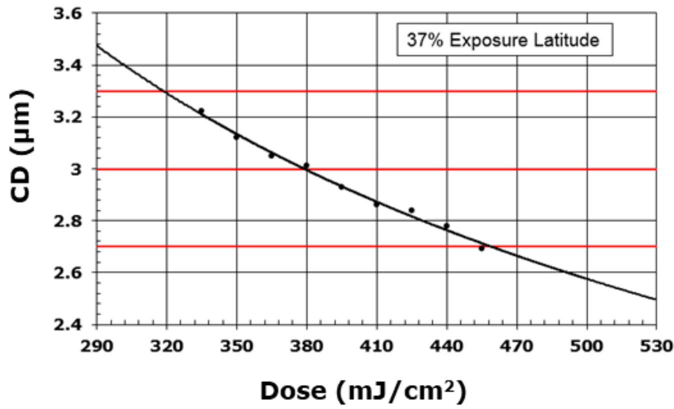

1.5µm

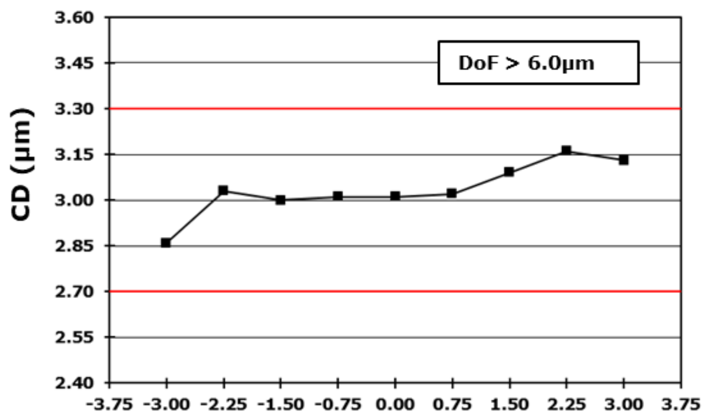

2.25µm

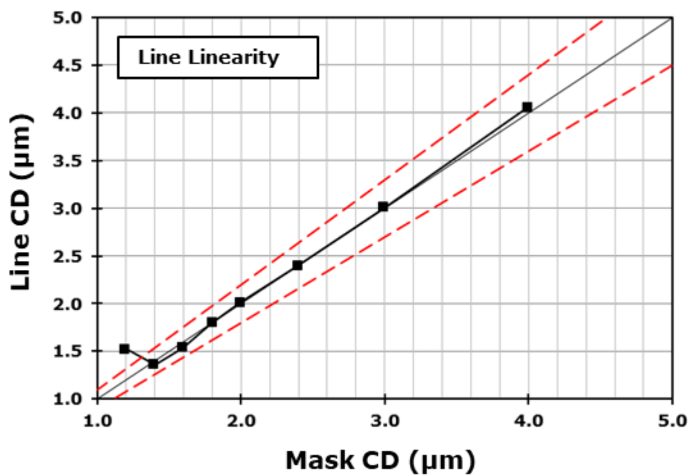


PROCESS WINDOW CURVES FOR 6.0µM FILM THICKNESS @ 0.48NA ON SI

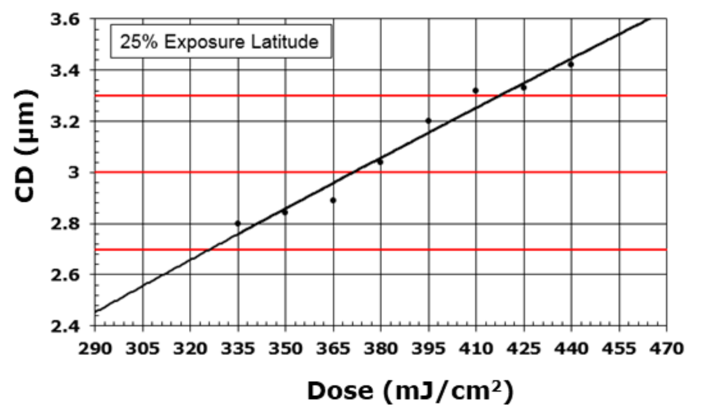
3.0µM DENSE LINES ON SI

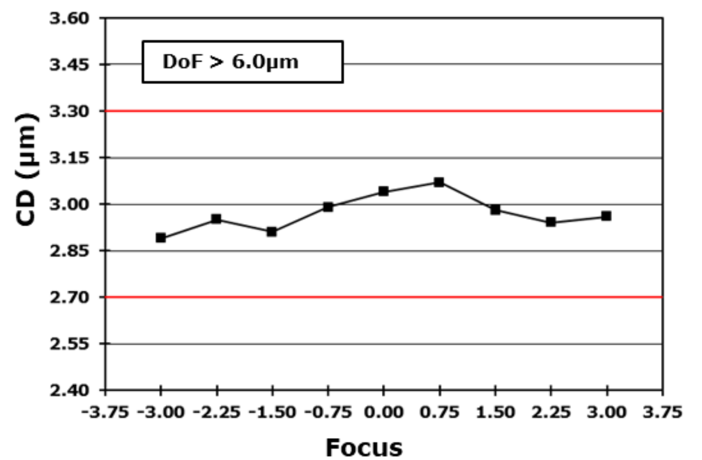


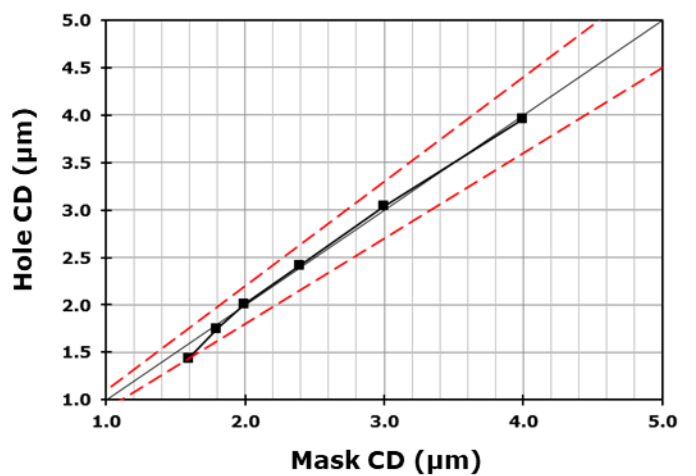


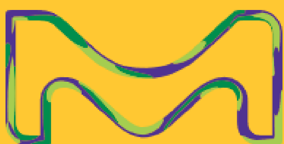


3.0µM 1:1 HOLES ON SI





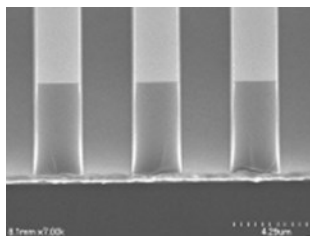




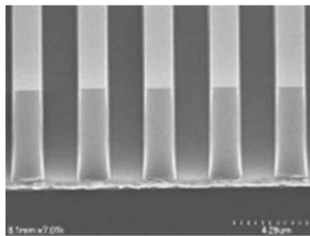
REFERENCE PROCESS (DENSE LINES IN 6µM FILM THICKNESS ON CU)

Process Step	Parameters
Coat	AZ 10XT 220cps, 6µm thick film on Copper
Soft Bake	110°C, 120 seconds, direct contact hotplate
Post Bake Delay	30 Minutes
Expose	i-line @ 455mJ/cm^2 nominal (0.48NA)
Post Expose Bake	None
Develop	AZ 400K 1:4, 420 second immersion

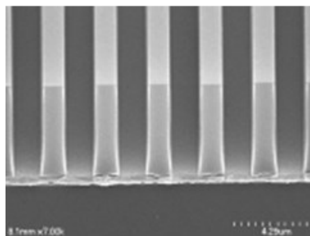
LINEARITY @ 450MJ/CM^2



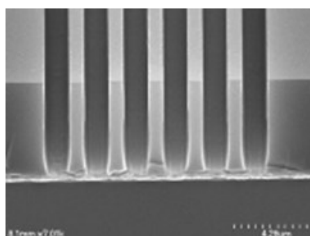
3.0µm



2.0µm

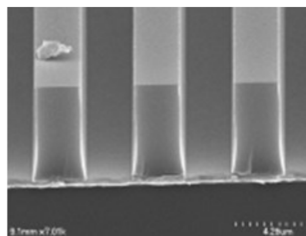


1.6µm

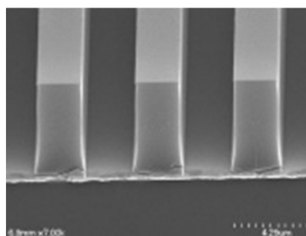


1.4µm

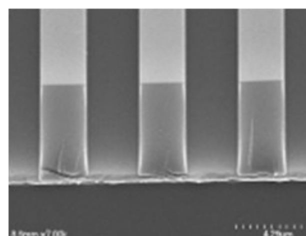
3.0µM LINES THROUGH DOSE



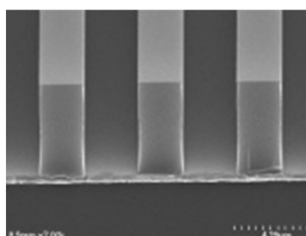
410 mJ/cm^2



440 mJ/cm^2

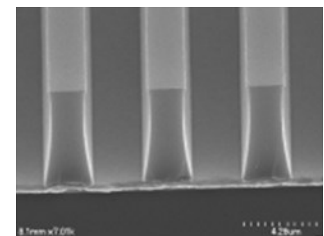


470 mJ/cm^2

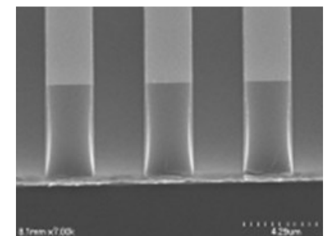


500 mJ/cm^2

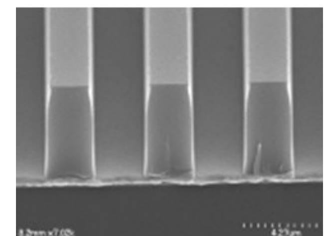
3.0µM LINES DOF @ 450MJ/CM^2



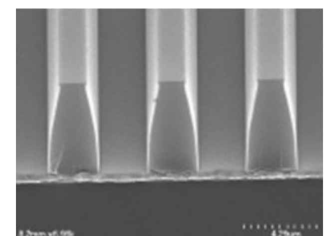
-2.25µm



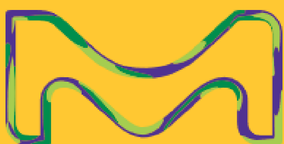
-0.75µm



0.75µm



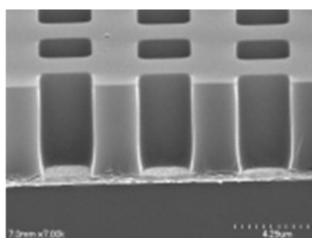
2.25µm

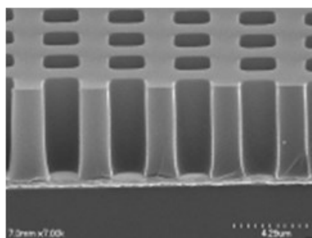


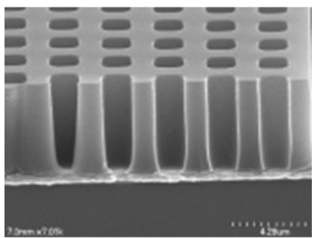
REFERENCE PROCESS (HOLES IN 6.0μM FILM THICKNESS ON CU)

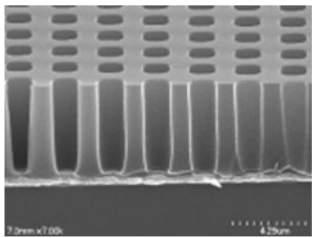
Process Step	Parameters
Coat	AZ 10XT 220cps, 6μm thick film on Copper
Soft Bake	110°C, 120 seconds, direct contact hotplate
Post Bake Delay	30 Minutes
Expose	i-line @ 445mJ/cm^2 nominal (0.48NA)
Post Expose Bake	None
Develop	AZ 400K 1:4, 420 second immersion

LINEARITY @ 440MJ/CM^2

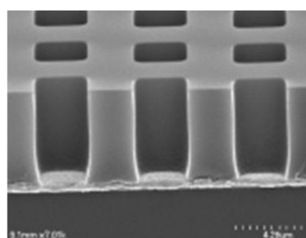

3.0μm

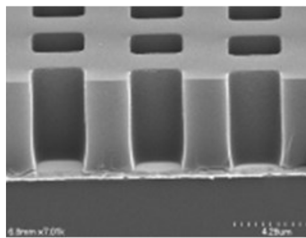

2.0μm

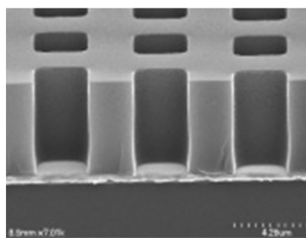

1.6μm

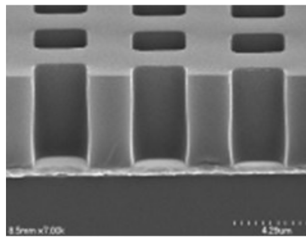

1.4μm

3.0μM HOLES THROUGH DOSE

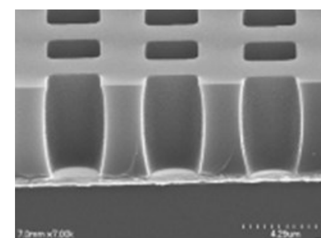

410mJ/cm^2

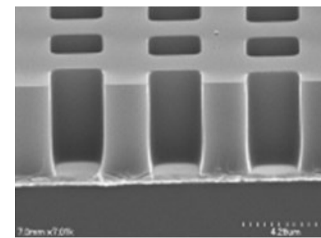

440mJ/cm^2

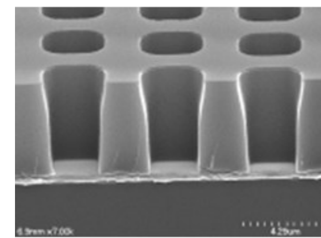

470mJ/cm^2

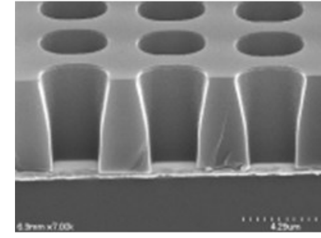

500mJ/cm^2

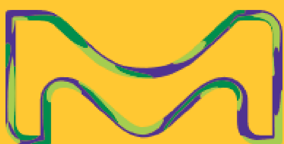
3.0μM HOLES DOF @ 440MJ/CM^2


-1.5μm


0.0μm

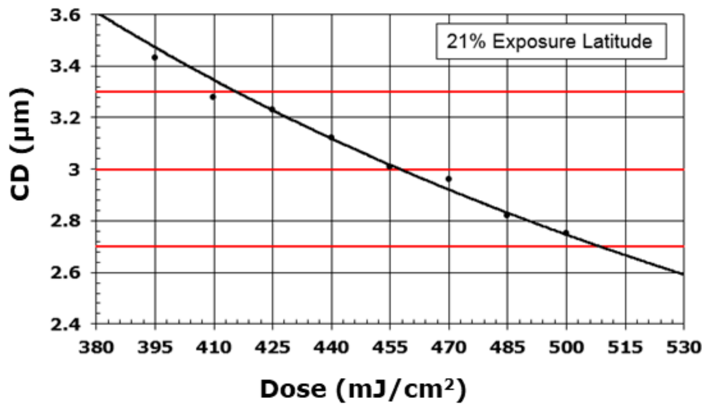

1.5μm

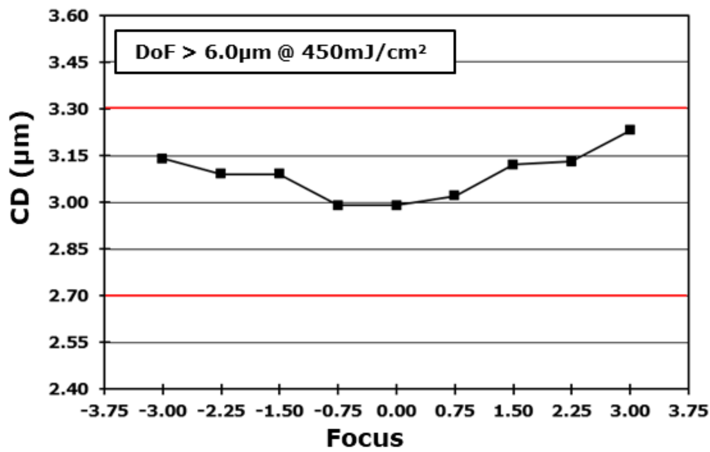

2.25μm

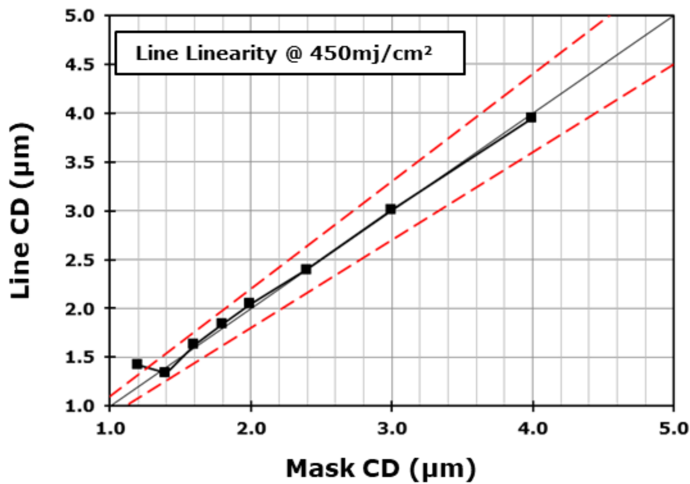


PROCESS WINDOW CURVES FOR 6.0µM FILM THICKNESS @ 0.48NA ON CU

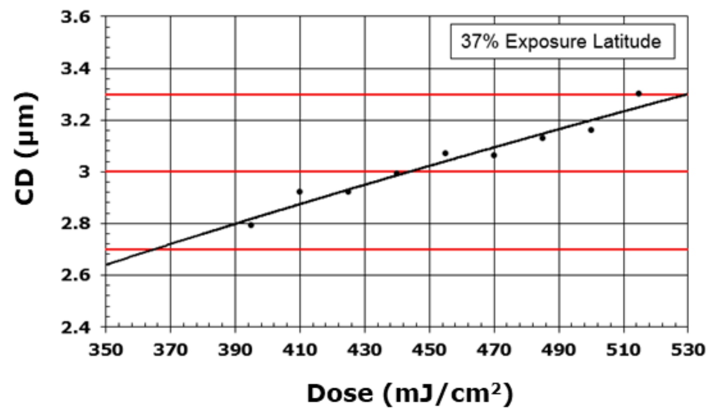
3.0µM DENSE LINES ON CU

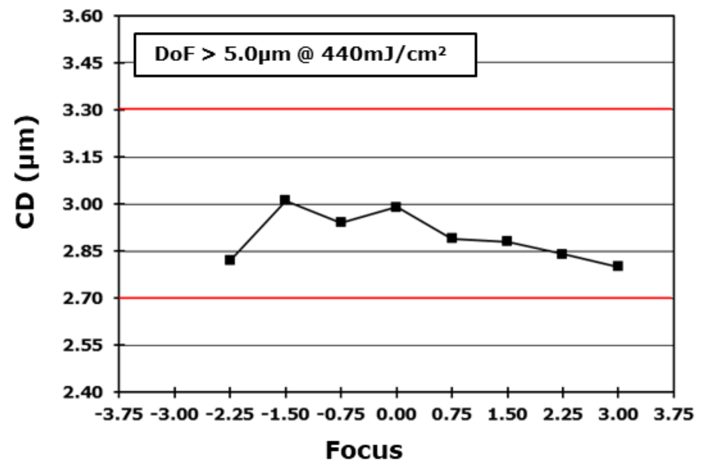


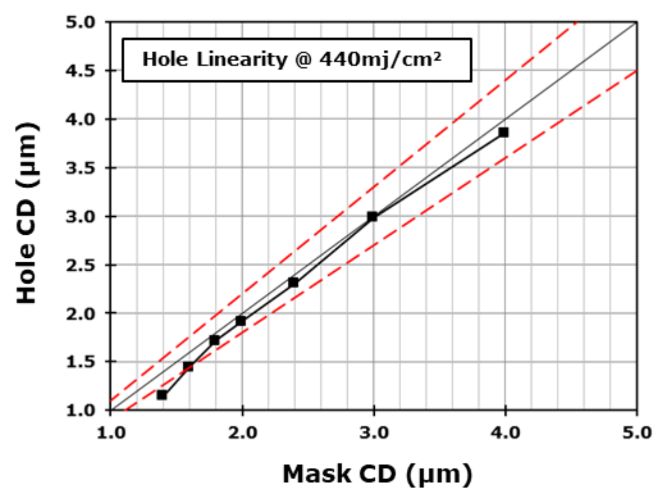


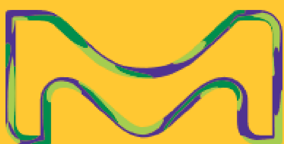


3.0µM 1:1 HOLES ON CU



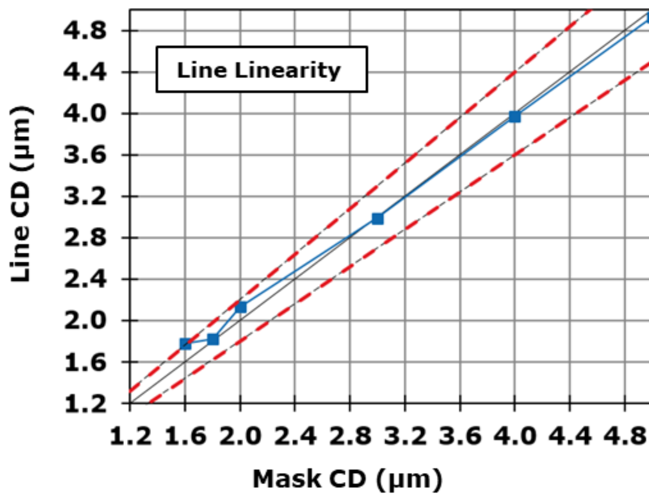


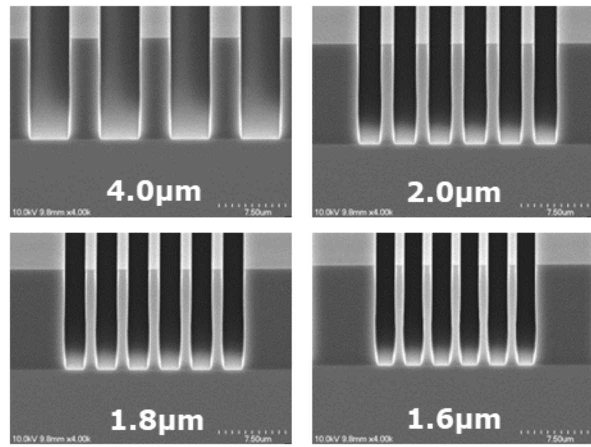


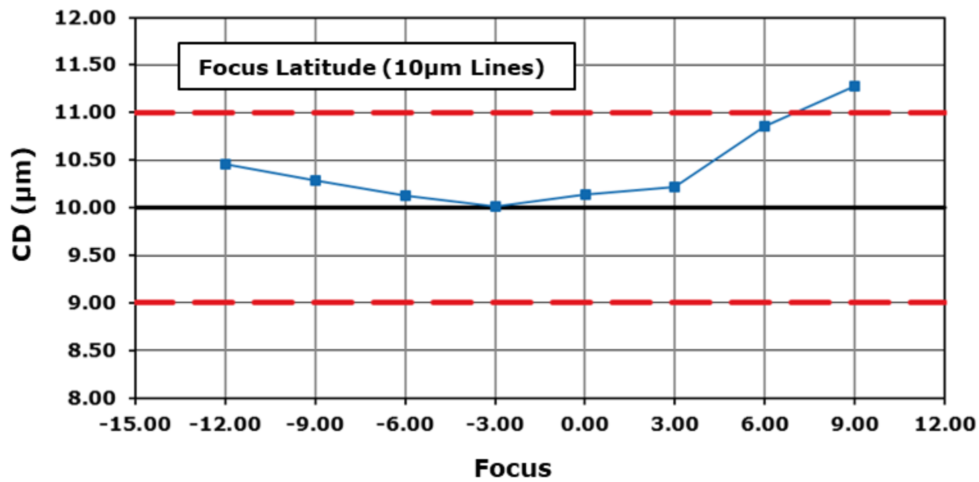


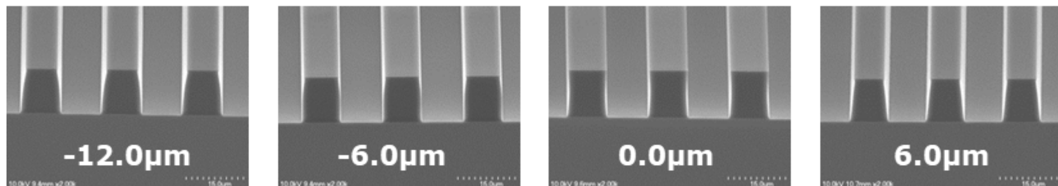
REFERENCE PROCESS (LINES IN 12µM FILM THICKNESS ON SI)

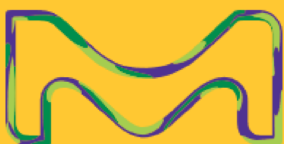
Process Step	Parameters
Coat	AZ 10XT 520cps, 12µm thick film on Si
Soft Bake	110°C, 180 seconds, direct contact hotplate
Post Bake Delay	30 Minutes
Expose	Ultratech 1500 g-h line stepper
Post Expose Bake	None
Develop	AZ 400K 1:4, 260 second spray





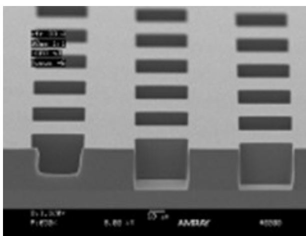


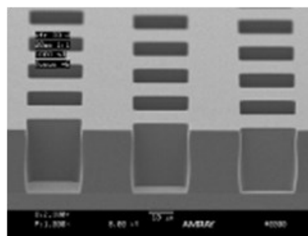


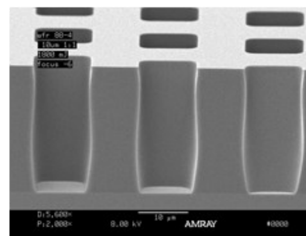


REFERENCE PROCESS (24µM FILM THICKNESS ON SI)

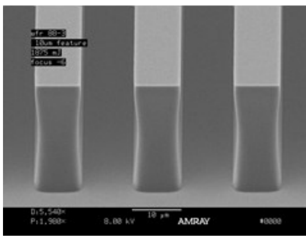
Process Step	Parameters
Coat	AZ 10XT 520cps, 2 x 12µm thick double coat
Soft Bake	110°C-80s (first layer), 115C-180s (second layer)
Post Bake Delay	45 Minutes
Expose	Ultratech 1500 g-h line stepper and Suss MA200 Aligner (20µm gap)
Post Expose Bake	None
Develop	AZ 400K 1:4 and AZ 300MIF

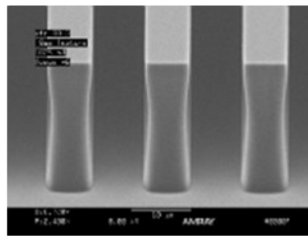

30µm Holes

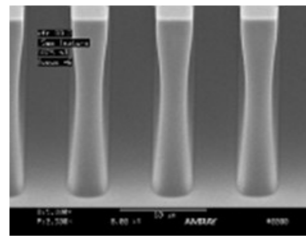

20µm Holes

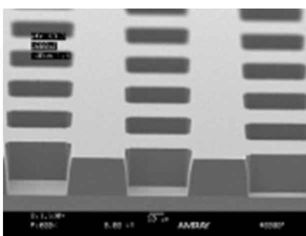

10µm Holes

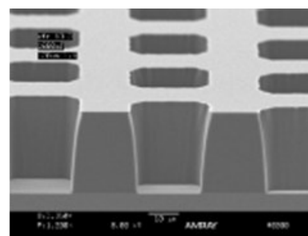
Expose: Ultratech 1500
Dose: 1875 mJ/cm^2
Develop: AZ 400K 1:4 600s

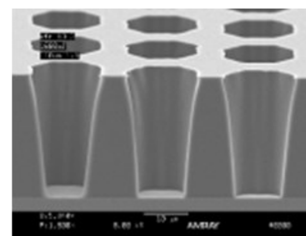

10µm Lines


8.0µm Lines

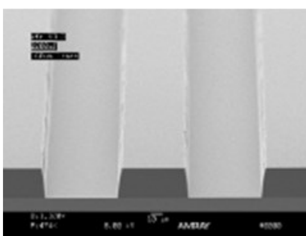

5.0µm Lines

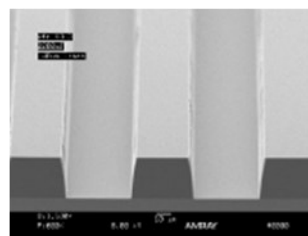

40µm Holes

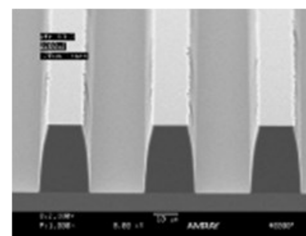

20µm Holes

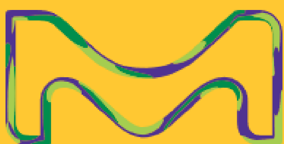

10µm Holes

Expose: Suss MA 200
Dose: 1785 mJ/cm^2
Develop: AZ 300 MIF 720s

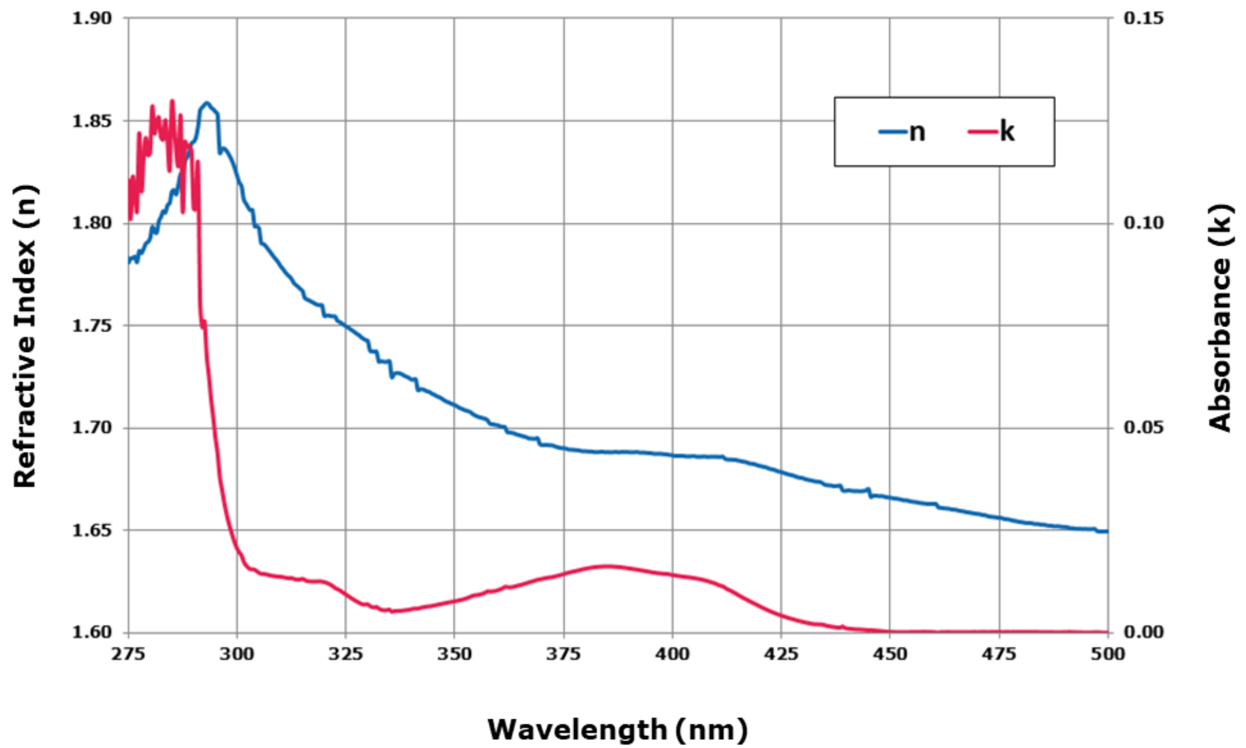

60µm Lines


40µm Lines

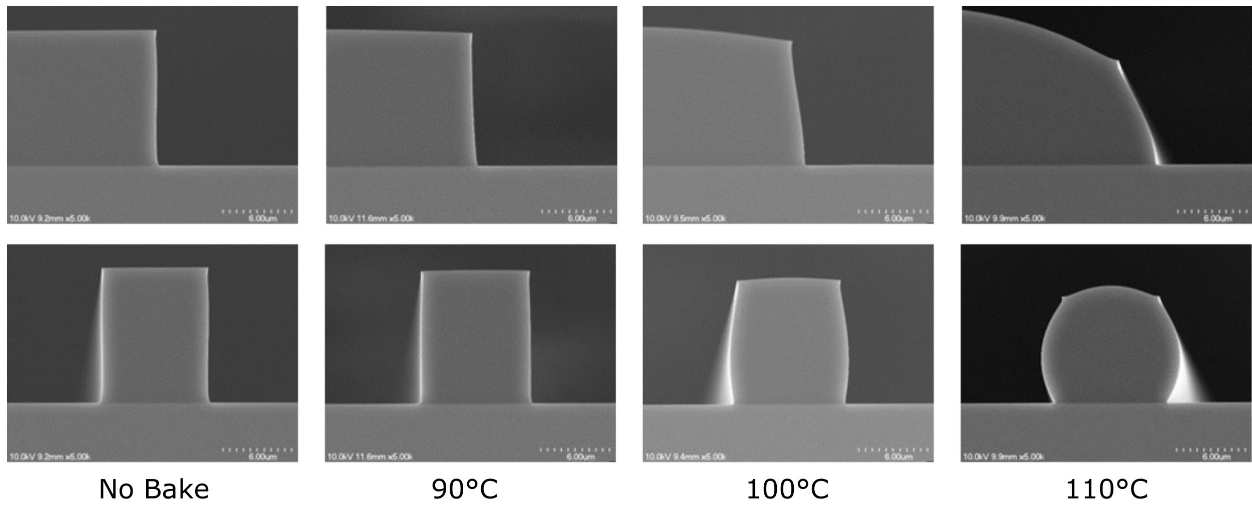

20µm Lines

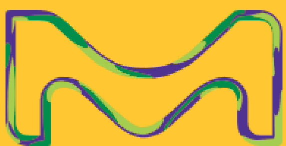


DISPERSION CHARACTERISTICS (UNEXPOSED FILM)



THERMAL FLOW CHARACTERISTICS (LARGE PAD AND 10µM LINE)





PROCESS CONSIDERATIONS

SUBSTRATE PREPARATION

Substrates must be clean, dry, and free of organic residues. Oxide forming substrates (Si, etc.) should be HMDS primed prior to coating AZ 10XT. Contact your Product Representative for detailed information on pre-treating with HMDS.

COATING

Refer to spin curve graphs for general guidelines on setting spin speeds to achieve the desired film thickness. Note: Spin curve graphs assume coat programs that spin 10XT films to equilibrium. Thicker coats may be achieved by reducing the spin time and allowing films to "self level". Consult with your AZ products representative for more information on ultra-thick coating techniques.

SOFT BAKE

Soft bake times and temperatures may be application specific. Process optimization is recommended to ensure optimum pattern profiles and stable lithographic and adhesion performance. Soft bake temperatures for AZ® 10XT should be in the 95°-110°C range. For very thick films, ramped soft bake temperatures may be required in order to avoid bubbles formed by rapid outgassing of solvents.

FILM REHYDRATION

A rehydration delay of 30-60 minutes between soft bake and exposure is required for films >5.0µm thick. Delay time required will vary with film thickness and ambient humidity.

EXPOSURE

AZ 10XT is sensitive to exposure energy in the 365-435nm wavelength range.

POST EXPOSE BAKE

A PEB is optional for AZ 10XT.

DEVELOPING

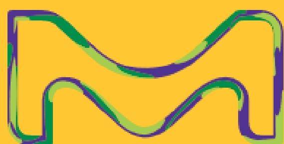
AZ 10XT series photoresists are compatible with MIF (TMAH) or inorganic developers. AZ 435MIF and AZ 400K 1:3 or AZ 400K 1:4 are recommended. Higher normality (less dilute) developers will improve photospeed but may increase CD non-uniformity and dark film loss.

HARD BAKE

Hard baking (post develop baking) improves adhesion in wet etch or plating applications and improves pattern stability in dry etch processes. Hard bake temperatures should be in the 90° to 100°C range to ensure minimal thermal distortion of the pattern.

STRIPPING

AZ 10XT Series resists are compatible with industry standard solvent based removers. AZ Kwik Strip, AZ 300T, or AZ 400T is recommended.



COMPATIBLE MATERIALS

AZ 10XT Series materials are compatible with all commercially available lithography processing equipment. Compatible materials of construction include glass, quartz, PTFE, PFA, stainless steel, HDPE, polypropylene, and ceramic.

HANDLING/DISPOSAL

AZ 10XT Series materials contain PGMEA (1-Methoxy-2-propanol acetate). Refer to the current version of the MSDS and to local regulations for up to date information on safe handling and proper disposal. Wear solvent resistant gloves, protective clothing, and eye/face protection.

AZ 10XT is compatible with drain lines handling similar organic solvent based materials.

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