	Contact Aligners (MA6, ABM, EV620)	GCA 5X g-line Stepper	GCA AS200 i-line Stepper
Shipley 1800 Series (1805, 1813, 1818, 1827)	+	+	X
AZ nLOF 2000	O	X	+
AZ4903	+	+	X
OiR 620-7i	X	X	+
OiR 897-12i	O	X	+
OiR 908-35i	O	X	+
Ultra-i 123	X	X	+
Shipley 955CM	X	X	+
Shipley SPR 220	+	+	O
Shipley SPR700	O	X	+
Photoneece PWDC-1000	O	O	O
SU-8 2000 (Photosensitive Epoxy)	O	O	O
Brewer XHRi-16 ARC (Anti-Reflective Coating)	X	X	+
CEM 365WS (Contrast Enhancement Material)	X	X	+
CEM 420WS (Contrast Enhancement Material)	X	+	X

+ – Preferred material for tool
O – Acceptable material for tool
X – Unacceptable material for tool

Photoresist Thickness Ranges & Developers

	Thickness Range	Developer
Shipley 1800 Series (1805, 1813, 1818, 1827)	0.4 – 3.5 µm	726 MIF
Shipley 1000 series (1045, 1075)	4 – 12 µm	726 MIF / 421K
AZ4903	7 – 25 µm	726 MIF / 421K
OiR 620-7i	0.5 – 0.9 µm	726 MIF
nLOF 2020 (negative tone**)**	1.7 – 4.5 µm	726 MIF
OiR 908-35i	3 – 5 µm	726 MIF
Ultra-i 123	0.6 – 1.2 µm	726 MIF
Shipley 955CM	0.7 – 1.5 µm	726 MIF
Shipley SPR 220	2.5 – 9 µm	726 MIF
Shipley SPR700	1.1 – 1.5 µm	726 MIF
Photoneece PWDC-1000	5 – 15 µm	726 MIF / 421K
SU-8 2000	1 – 250 µm	SU-8 Developer

Developer Information

Developer	Chemical Base	Normality	Concentration (wt %)
AZ 726 MIF	TMAH w/ surfactant	0.261	2.38
AZ 300 MIF	TMAH	0.261	2.38
MF-321	TMAH w/ surfactant	0.210	1.91
Micro Dev	Alkaline-phosphate	0.60	n/a
MF-312	TMAH	0.54	4.76
AZ 400K	Buffered KOH	0.480	n/a
AZ 421K	KOH	0.210	<1%
MF-319	TMAH w/ surfactant	0.237	2.14
MF-322	TMAH w/ surfactant	0.268	2.4

Image Reversal

The image reversal process was developed to produce a specific resist profile for metal lift-off. Normal exposure of the resist produces a slightly sloped resist profile due to the absorption of the photoresist coupled with the resist bleaching from the top down. Through the image reversal process, this sloped profile is employed to leave the opposite, a resist with an undercut profile.

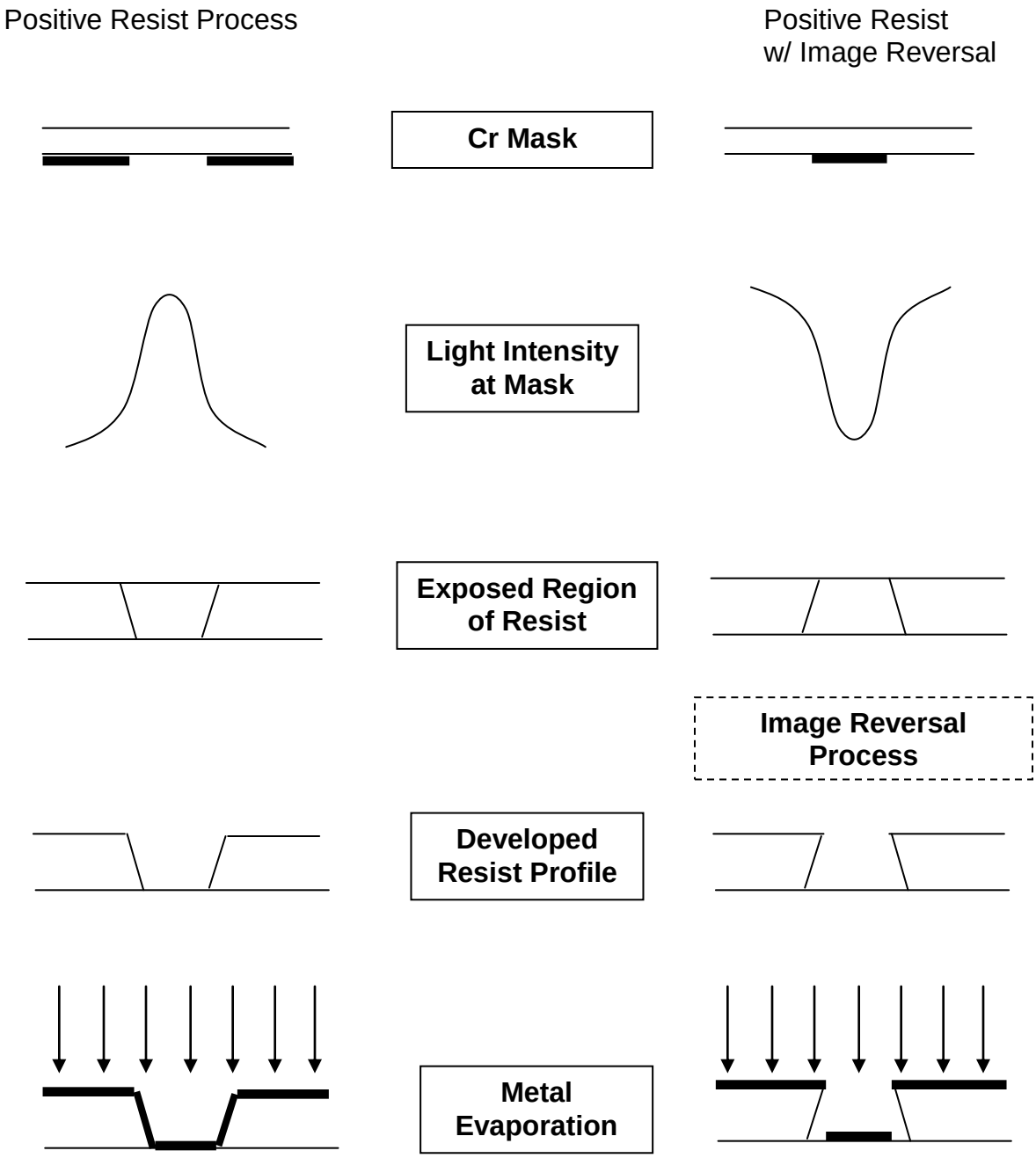

Image Reversal Process

Apply resist primer and resist as normal. Good image reversal results have been achieved with the Shipley 1800 series (1813, 1827…), 220 series (3.0, 4.5, 7.0), and AZ P4903, as well as most i-line resists. Perform resist bake at normal time and temperatures.

Expose resist on tool. Exposure time will vary based on resist, substrate, and coating process used.

Doses for image reversal sometimes run 4X to 5X the normal dose for 1800 series resists. The proper exposure dose for these can be estimated using the following procedure.

1. Run an exposure matrix on the wafer.
2. Develop the wafer using MF321 for 1 minute.
3. The best dose in this matrix should work for image reversal.

Perform ammonia bake in YES oven.

Flood expose wafer for 60 seconds using HTG. Thicker films will require longer flood expose times.

Develop in MF-321 until image has cleared (1 – 3 minutes). Very thick resists may require a stronger developer (300 MIF) to clear in a reasonable time.

Resist Priming

To improve photoresist adhesion to the wafer, wafer priming is usually performed prior to spin coating the resist. The material used is hexamethyldisilazane (HMDS). It can be applied in a vapor or liquid form to the wafer. Vapor priming generally gives the best results but requires using the YES vapor-priming oven for a 30 minute batch cycle. Liquid priming does not give optimum adhesion but is quicker and is adequate for most users' needs.

Vapor Priming

Vapor priming is accomplished by using the YES vapor-priming oven in the photolithography room. It heats the wafers and cycles through several vacuum / N_2 backfill cycles to remove any adsorbed water from the wafer surface. It then fills the chamber with HMDS vapor, which ideally absorbs on the surface in a monolayer. When the process is finished, the cooled wafers may be coated with photoresist. The wafer surface will remain hydrophobic for many days after treatment, but coating as soon as possible is recommended. DO NOT liquid prime after vapor priming. Overpriming will cause very poor adhesion.

Liquid Priming

Liquid priming is accomplished using the P-20 primer available in the photoresist cabinet. P-20 primer consists of 20% HMDS in PGMEA solvent. The wafer is placed in the spinner, the surface is covered with a thin layer of the P-20 dripped onto it, and after a 10 sec delay the liquid is spun off. The wafer can be coated with the photoresist after drying. If the wafer is solvent stripped, the primer should be reapplied before recoating with resist.

PRP Spray Photoresist

PRP Spray Photoresist
From Electrolube
Manufactured for electronic hobbyists to make their own printed circuit boards.

This is a spray can of positive photoresist for covering nonplanar substrates. The thickness is determined by the spray coverage during application. Place the substrate to be sprayed in the spinner bowl. Prime the substrate if desired and then spray the substrate in a back and forth manner without spinning the substrate. Bake the substrate at 50ºC for 20 minutes. Exposure times vary from 5 – 20 seconds depending on thickness and substrate reflectivity. Develop in AZ 421K developer until clear (1 – 3 minutes). The photoresist is best removed using the hot resist strip bath in the back photolithography hood. Resolution of 10 microns on planar substrates has been achieved with this resist.

Polyimide Basics

The CNF stocks the Durimide line of polyimides from Arch Chemicals and Photoneece PWDC-1000 from Dow Corning (Toray).

Durimide	Cured Thickness Range	Adhesion Promoter Required?
Nonphotosensitive Polyimides		
Durimide 284	1.3 – 3 µm	Y
Durimide 285	10 – 20 µm	Y
Photosensitive Polyimides		
Photoneece PWDC-1000	2 - 10 µm	N
Durimide 7005	2 – 5 µm	N
Durimide 7520	11 – 25 µm	N

The adhesion promoter must be mixed prior to use. Make certain to read the information on the preparation and use of the QZ3289 adhesion promoter.

The polyimides can be found in the freezer located in the back chemical storage hallway. They have been premeasured into small resist bottles. Allow them 24 hours to warm up to room temperature before opening the containers. Once thawed out, the material should be used within several weeks and discarded after that time.

Developing Photosensitive Polyimides

The PWDC-1000 polyimide is a positive tone polyimide that is developed using the normal 300MIF developer. It is the easiest to work with and is recommended for most users.

The Durimide photosensitive polyimides are developed using the QZ3501 developer and the QZ3297 rinse. Three containers should be setup: 100% developer, 50/50 developer / rinse, and 100% rinse. The wafers are developed in the 100% developer for the proper time, rinsed in the 50/50 solution for 5 – 10 seconds, and then thoroughly rinsed in the 100% rinse. If the transition rinse is not performed correctly, the developing polyimide will redeposit on the wafer as a white haze. The wafers must be rinsed in the developer again to remove the haze, and then more carefully processed through to the rinse. See staff if you have any questions.