825 Positive Photoresist

Positive Working Photoresist Systems for the Semiconductor Industry

DESCRIPTION

Arch Chemicals 825 is a positive photoresist which offers excellent processing latitude and high thermal stability. Arch Chemicals 825 is a single-solvent resist which contains ethyl 3-ethoxypropionate as the solvent.

Catalog No.	898470
Solids Content	31.03 - 3.0%
Viscosity	33.5 - 36.5 cSt
Water Content	<0.5%
Nominal Film Thickness	1.25µm
Total Metal Content	500 ppb total

FEATURES

Arch Chemicals 825 is a production viable system for broadband, g-line, and i-line exposure tools. It exhibits excellent photospeed when used with either TMAH or Na^+ based developers. The thermal stability of Arch Chemicals 825 equals or exceeds products currently available for production use. Arch Chemicals 825 displays process latitude capable of sustaining 0.8 production processes (g-line).

Ethyl 3-ethoxypropionate, the single solvent in Arch 825 is a "safer solvent." Arch 825 contains no cellosolve acetate. Arch 825 is an excellent replacement for Arch 820 and other EGMEA containing resists.

BENEFITS

- Excellent photospeed allows greater production throughout on all types of exposure equipment.
- Thermal stability characteristics (>130°C) provide superior plasma etch resistance in harsh environments, even without DUV stabilization.
- Solvent formulation permits a safer workplace environment.
- Excellent process latitude without the necessity of a post-exposure bake.
- Single-solvent system allows for outstanding coating uniformity, resulting in improved CD control.
- Low trace metal levels help maintain high yields.

PROCESSING

Substrate Preparation:

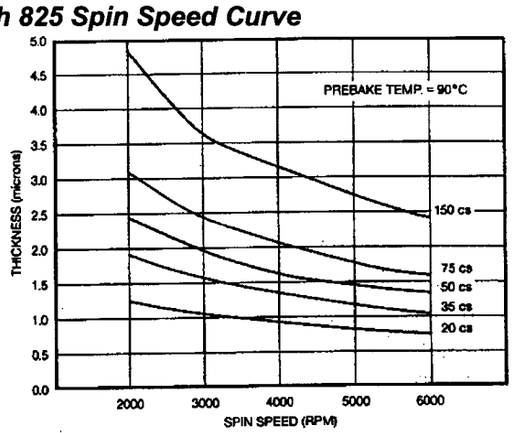
For optimal process consistency and adhesion, substrates should be appropriately treated. Dehydration baking and use of HMDS vapor prime methods will ensure a repeatable, optimized process.

RESIST COATING

Arch 825 can be coated using typical methods. For maximum uniformity, the following coat process is recommended:

1. Dynamic Dispense @ 700 - 1000 rpm
2. Spread for 1- 2 seconds at same time as step 1
3. Ramp at 10 krpm/sec to final spin speed of 3- 6K rpm
4. Spin for 25 - 35 seconds

Arch 825 Spin Speed Curve



PREBAKE

Processing recommendations for convection oven and hotplate prebake are listed below:

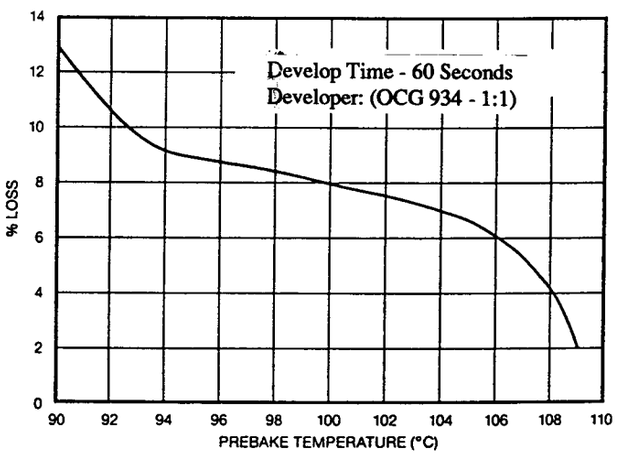
Convection Oven with Forced Air

100-110°C for 15 - 30 minutes

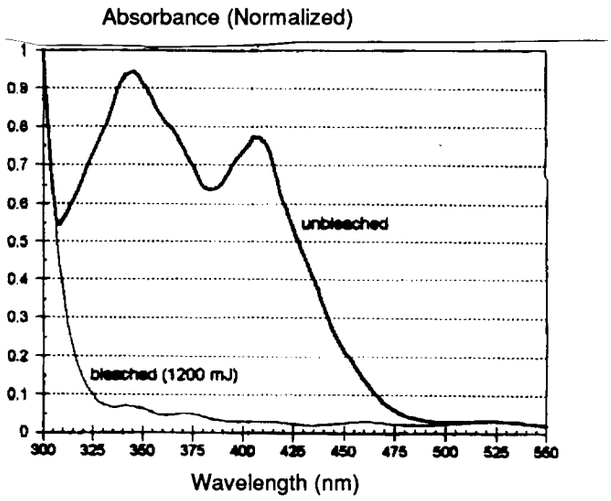
Hotplate

105-115°C for 45 - 60 seconds

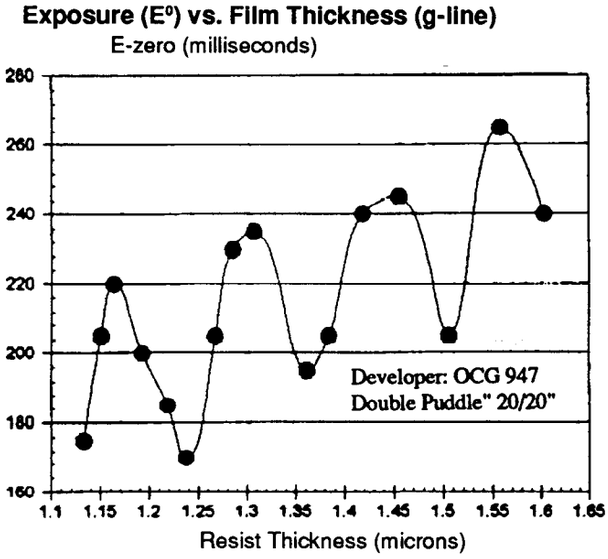
Film Thickness Loss vs Prebake Temperature



Absorbance Characteristics



Exposure (E⁰) vs. Film Thickness (g-line)



Exposure

OCG 825 is compatible with exposure tools which utilize radiation in the range of 320-436 nanometers. Exposure energies are highly dependent on the processing parameters in use, and must be determined for each individual process. However, some typical exposure conditions for various tools are shown below:

SVG Micralign 340 HT Projection Mask Aligner

Resist Thickness.....1.2 µm (on SiO_2)
Scan Speed..... 500 - 600
Aperture..... 1
Slit Width.....1 mm

SVG Micralign 660 Projection Mask Aligner

Resist Thickness.....1.2 µm (on SiO_2)
Energy.....40 - 60 mJ/cm2 (UV-4)

Ultratech 1000 1:1 Stepper (g-line)

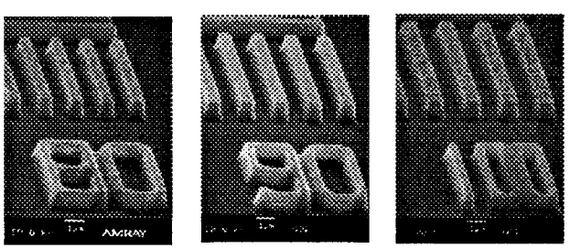
Resist Thickness.....1.2 µm (on SiO_2)
Exposure.....250 - 270 msecs

GCA 6300 5:1 Stepper (g-line)

Resist Thickness.....1.2 µm (on SiO_2)
Exposure.....230 - 290 msecs

Canon 0.43, 5x
Resist Thickness.....1.2 µm (on SiO_2)
Exposure.....120 mJ/cm²

Typical g-line stepper images
Substrate: Silicon
Film: 1.2µm resist thickness
Prebake: 85°C, 60 seconds, hotplate
Exposure: Canon, 0.43 NA, 5x, 120 mJ/cm2
PEB: 95°C, 60 seconds, hotplate
Develop: HPRD 428 (60:40), 80 second immersion

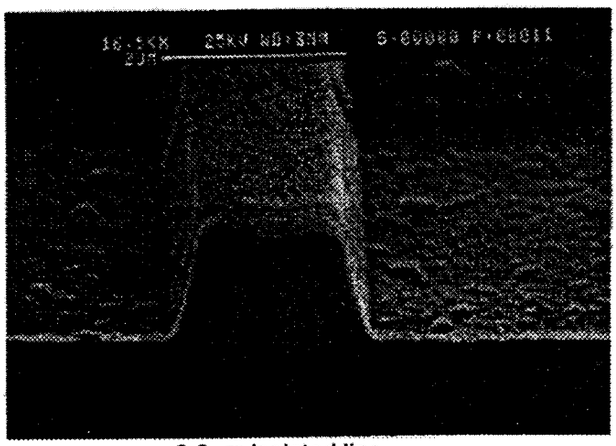


0.8µm l/s pairs 0.9µm l/s pairs 1.0µm l/s pairs

Typical SVG Micralign 600 images

Substrate: Polysilicon
Film: 1.2µm resist thickness
Prebake: 110°C, 45 seconds, hotplate
Exposure: SVG 600 HT, aperture 2, 70 mJ/cm2

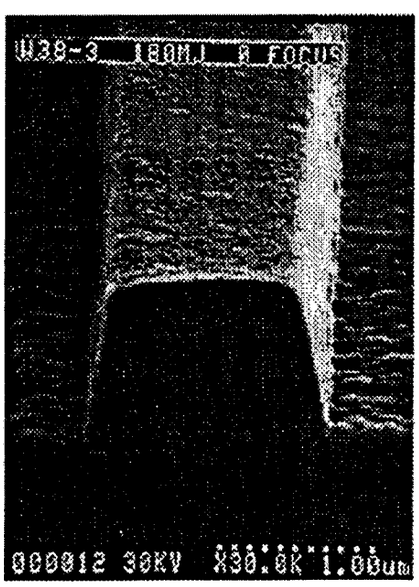
Develop: Na^+ based developer, 45 second immersion



2.0µm isolated line

Typical Ultratech stepper images

Substrate: Polysilicon
Film: 1.2µm resist thickness
Prebake: 85°C, 60 seconds, hotplate
Exposure: Ultratech 1100, 1x, 0.34 NA, 180 mJ/cm²
PEB: 95°C, 60 seconds, hotplate
Develop: OCG 934 (3:2), 30/30 sec. double puddle



1.6µm isolated line

DEVELOPMENT

To develop Arch 825 after exposure via any of the above methods, process according to the following guidelines:

Spray Puddle Process:

(Use OCG 934 (3:2) developer at 21 ± 1°C)

1. Spray 4 seconds while spinning at 200 rpm
2. Puddle static time: 20 - 25 seconds
3. Replenish spray 3 seconds at 200 rpm
4. Overlay 2 - 3 seconds (developer/DI water)
5. Rinse 15 - 20 seconds with DI water
6. Spin dry

Immersion Process:

(Use OCG 934 (3:2) developer at 21 ± 1°C)

1. Immerse for 60 seconds with continuous agitation
2. Rinse with DI water
3. Dry

Use of a nitrogen blanket is recommended to prolong bath life of the developer and maintain consistent activity.

Other developer dilutions may be used. At higher developer concentrations, changes in the prebake time or temperature may be necessary to minimize the unexposed resist loss during development. For higher contrast, more dilute developers may require longer develop times or increased exposure doses. Arch 825 is also compatible with other development processes.

POSTBAKE & ETCH PERFORMANCE

Recommended postbake processes for convection oven and hotplate are shown below:

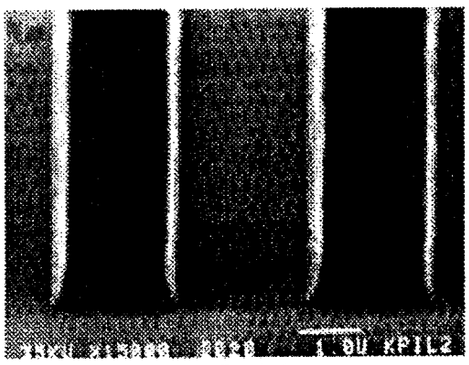
Convection oven with forced air:
130° - 140°C for 30 minutes

Hotplate Oven:
140° - 150°C for 60 seconds

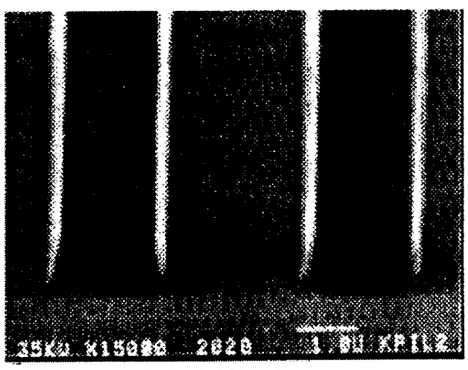
Postbaking will generally remove remaining solvents and increase resistance to plasma and wet etching without causing perceptible image changes. At temperatures above 150°C, critical dimensions may not be affected, but other image structure changes, such as top rounding may result. These changes are most noticeable in thicker coatings and at the edges of larger resist fields. Post treatment using DUV flood exposure of similar processes will further enhance high temperature stability.

Thermal stability of Arch 825

Coat: 1.2µm resist film
Softbake: 110°C, 45 seconds, hotplate
Expose: Micralign 240
Develop: Na^+ based developer, immersion, 60 seconds at 20°C



No Postbake



Convection Bake (130°C, 30 minutes)

STRIPPING

Arch 825 can be removed with all standard wet or dry techniques. Due to its high thermal stability, it is effectively stripped even from wafers that have been subjected to harsh dry etch and ion implant processes.

Material Properties:

Water Content (by weight).... <0.5%
Refractive Index..... 1.64 (dry film, 450nm)
Solvent..... ethyl 3-ethoxypropionate (EEP)
Filtration..... 0.2 µm

STORAGE: Store only in original container in a dry area at 10 - 21°C (50 - 70°F). Do not store in direct sunlight. For maximum shelf life, store at 10°C (50°F).

HANDLE WITH CARE: Photochemically reactive. Consult the appropriate material Safety Data Sheet for current specific handling and safety information.

CAUTION: Combustible. Keep away from heat and flame. Contents may develop pressure on prolonged exposure to heat. Store in cool place. Keep containers closed.

PRODUCT STEWARDSHIP:

Our focus on ***Product Stewardship*** begins in the workplace where our employees hold to the very highest standards of health, safety and environmental quality. We also have a commitment to our customers, suppliers and distributors to help them meet the same standards. ***Product Stewardship*** means that we work closely with you so that you can safely and properly handle, use, recycle and/or dispose of our products.

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Please refer to the Material Safety Data Sheet (MSDS) for complete information on Storage and Handling, Toxicological Properties, Personal Protection, First Aid, Spill and Leak Procedures, and Waste Disposal. To order an MSDS, call your nearest Arch Chemicals sales office or the MSDS Control Group at (800) 511-MSDS (6737). Before using or handling this product, the MSDS should be thoroughly reviewed.