



SHIPLEY

MICROPOSIT[®] MF[®]-319 DEVELOPER

MICROPOSIT MF-319 DEVELOPER is designed for high resolution semiconductor device fabrication. It has been specifically formulated for use with MICROPOSIT S1400[®] and S1800[®] SERIES PHOTO RESISTS, and is recommended where it is desirable to avoid a potential source of metal ion contamination. Although MICROPOSIT MF-319 DEVELOPER can be used in the immersion and batch spray modes, ideal use is in spray and puddle processing on inline high resolution track equipment.

Ideal for Spray and Puddle Processing

- Low volume usage per wafer layer processed
- Reduced dependence on nozzle(s) positioning
- Ease of process development

Very Low Unexposed Resist Loss

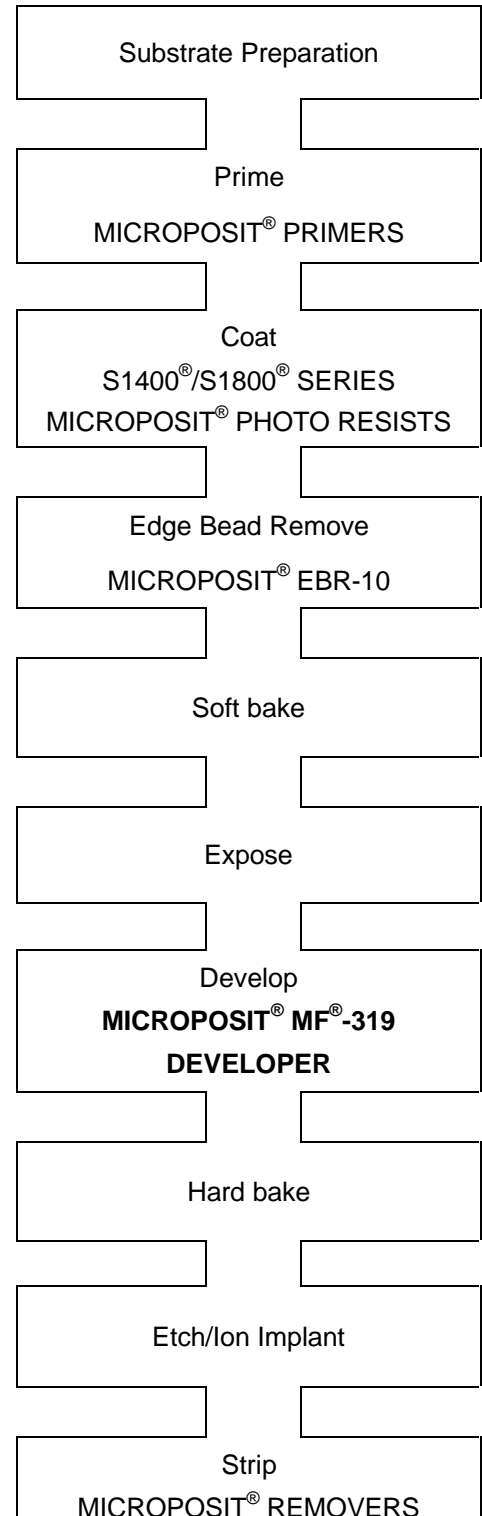
- Outstanding edge acuity
- High differential solubility
- Improved resist profiles

Clean Efficient Development

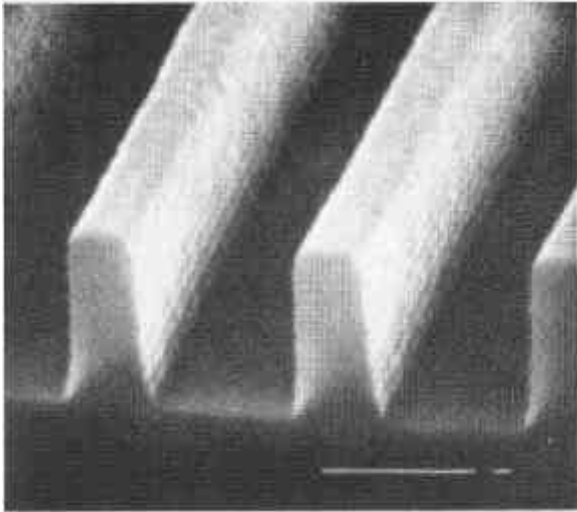
- No scumming
- Excellent resolution
- Wide process latitude
- Good exposure throughput

Lot to Lot Consistency

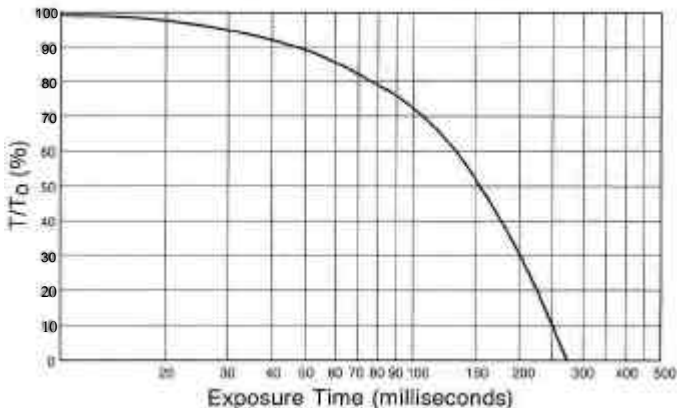
- Tight product specifications
- Complete systems functional testing
- Statistical quality control



MICROPOSIT MF-319 DEVELOPER



1.23 μm thick MICROPOSIT S1400-27 PHOTO RESIST was developed using MICROPOSIT MF-319 DEVELOPER on a Solitec developer track where the ultrasonic spray time was for 22 seconds. The resulting line/space patterns shown are 0.61 μm photoresist structures (0.8 μm nominal) separated by 0.99 μm spaces. The coating process consisted of using an Eaton 6000 system, spinning at 5600 rpm, and hotplate softbaking at 110°C for 45 seconds. Exposure at 436nm for 0.175 seconds was on a GCA 8500 DSW stepper equipped with a 0.35 numerical aperture lens.



The above S1400-27/MF-319 contrast curve was generated using 1.23 μm ($\pm 0.01\mu\text{m}$) thickness of resist. Single puddle development on a GCA Wafertrac 1000 was used where the total active development was for 40 seconds at 20°C. The hotplate softbake was at 110°C for 45 seconds on a GCA Wafertrac 1000. Exposure mode was open frame at 436nm on a GCA6300 DSW stepper equipped with a Maximus 1000 illuminator, a 350W mercury lamp and a 0.30 numerical aperture lens. The coherence σ was equal to 0.5.

Instructions for Use

I. Bath Make-up

MICROPOSIT MF-319 DEVELOPER is supplied as a ready to use solution.

II. Temperature

Recommended operation is between 15° and 20°C to $\pm 1^\circ\text{C}$. Photospeed does decrease as temperature increases although contrast and unexposed loss remains basically constant. The rate of change of this decreasing photospeed has been found to be approximately 2% to 3% per °C.

III. Time

Immersion: 40-60 seconds

Spray and puddle: Varies with equipment. Consult your Shipley Technical Sales Representative.

Longer development times permit the use of shorter exposure times. Shorter development times minimize developer attack on the unexposed photoresist. We recommend keeping the development time constant and adjusting the exposure time as necessary to meet critical dimension requirements.

IV. Agitation

Immersion: Keep agitation mild and consistent.

Spray and puddle: Contact your Shipley Technical Sales Representative.

V. Rinse

Immersion: A deionized water rinse is recommended using a cascade/overflow setup with rinsing continuing until a desired resistivity is reached.

Spray and puddle: An overlap deionized water rinse in conjunction with the developer cycle is recommended to prevent drying on the substrate surface.

VI. Bath Control

Immersion: For maximum process control, replace with a fresh bath at least once per shift. Cover when not in use.

Spray and puddle: Not applicable.

Batch Spray: As recommended by the equipment manufacturer.

VII. Determination of Total Alkaline Normality

Principle—The normality is determined by direct potentiometric acid-base titration.

A. Reagents and Apparatus

1. Hydrochloric acid (HCl), 1 N, standardized ± 0.001 .
2. Autotitrator (e.g. Metrohm Potentiograph or Titroprocessor) with 20.0 ml volume burette.
3. pH electrode and single junction reference electrode or combination pH electrode.
4. Magnetic stir plate.

B. Procedure (to be run in duplicate)

1. Pipette 50.0 mls of sample into a 250 ml beaker, add a magnetic stir bar and dilute to approximately 150 mls with deionized water.
2. Calibrate autotitrator with fresh pH buffer solutions (pH 4.0, 7.0, 10.0).
3. Place electrode and titrant dispenser into sample solution on magnetic stir plate. Stir rapidly without loss of solution.
4. Titrate sample with standardized 1 N HCl to approximately 2.0 mls past the inflection point.
5. Determine inflection point and calculate the volume of HCl to inflection in milliliters (mls).

C. Calculation

$$\text{NORMALITY} = \frac{\text{mls of HCl} \times \text{N of HCl}}{\text{Sample aliquot (50 mls)}}$$

Note: Reproducibility is dependent on accuracy from both operator and instrument. Analysis should be repeated until a constant value for inflection is assured.

D. Results

The normality of a fresh MICROPOSIT MF-319 DEVELOPER should be approximately 0.237 N.

Equipment

Use polypropylene, polyethylene, 316 stainless steel, polytetrafluoroethylene, or equivalent materials.

Storage

Store MICROPOSIT MF-319 DEVELOPER only in upright, original containers in a dry area at 50°-90°F (10°-32°C). Store away from acids. Do not store in sunlight. Store away from heat and sources of ignition. Keep containers sealed when not in use. MICROPOSIT MF-319 DEVELOPER has a limited shelf-life.

Waste Treatment

A used MICROPOSIT MF-319 DEVELOPER bath may be treated according to Shipley Waste Treatment Procedure WT 77-1. Contact your Shipley Technical Sales Representative for more information. It is your responsibility to verify that this procedure complies with federal, state, and local laws and regulations for wastewater discharge.

Due to the nature of MICROPOSIT MF-319 DEVELOPER, disposal of it, or residues therefrom, should be made in compliance with federal, state, and local environmental laws.

Properties as Delivered

MICROPOSIT MF-319 DEVELOPER is manufactured to the highest quality standards and is subjected to state of the art testing for physical, chemical and functional properties to assure the user of maximum lot to lot reproducibility.

MICROPOSIT MF-319 DEVELOPER is filtered to 0.2 μ m absolute directly into clean containers.

Certificates of Analysis will be supplied with each shipment upon request. Quality Assurance Material Specifications and Analytical Testing Procedures may be obtained upon request from your Shipley Technical Sales Representative.

MICROPOSIT MF-319 DEVELOPER has the following typical properties:

- Specific gravity at 20/20°C: Approximately 1.0
- Color: Water white to light yellow
- Turbidity: 2 NTU's maximum
- Total Alkaline Normality: 0.232 -0.242 N
- Sodium Content: 0.5 ppm maximum

Handling Precautions

DANGER! MICROPOSIT MF-319 DEVELOPER is an alkaline corrosive solution containing tetramethyl ammonium hydroxide. Contact with eyes causes burns. Contact with skin or mucous membranes may cause irritation. Handle with care. Do not get in eyes, on skin or on clothing. Avoid breathing vapors. Use adequate ventilation. Wash thoroughly after handling.

Wear chemical goggles, chemical gloves and suitable protective clothing when handling MICROPOSIT MF-319 DEVELOPER.

In case of eye or skin contact, flush affected areas with plenty of water for at least 15 minutes. Then contact a physician at once.

Consult product Material Safety Data Sheet before using.

FLUSH EMPTY CONTAINERS THOROUGHLY WITH WATER BEFORE DISCARDING.

CAUTION! When using immersion heaters, failure to maintain proper volume level can expose tank and solution to excessive heat resulting in a possible combustion hazard, particularly when plastic tanks are used.



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