MERCK

Technical datasheet

AZ® Organic Developers

Metal Ion Free (TMAH) Photoresist Developers

APPLICATION

AZ MIF developers are high contrast, ultra-high purity tetramethyl-ammonium hydroxide (TMAH) based photoresist developers formulated for a wide range of advanced IC and thick photoresist applications.

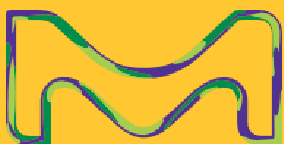
- Surfactant enhanced and surfactant free options
- Industry leading normality control
- Wide range of normality available
- High purity, low particulate formulations
- Multiple bulk and non-bulk packaging options

PROCESSING

GENERAL PROCESSING GUIDELINES

AZ MIF developers should be used at room temperature in puddle, spray, or batch immersion processing mode. Variations in develop time, developer temperature, and substrate temperature will result in inconsistent develop uniformity and will affect process repeatability/reproducibility. It is important to monitor and control these variables.

When processed in batch immersion mode, MIF developer bath life will be limited by the volume of dissolved photoresist in solution and by carbonate uptake from the fab environment. Bath change out frequency should be specified by the number of substrates processed and by elapsed time since the last bath change. The maximum number of substrates that may be processed through a given bath will depend upon the photoresist thickness, the % of substrate surface covered, and the volume of the developer tank.



When not in use, developer tanks should be covered to minimize evaporation and the rate of carbonate uptake. Inert gas blankets (dry N2 for example) may also be used to isolate developer tanks from the fab environment. In general, immersion tanks should be changed at least every 24 hours (or sooner if the maximum number of substrates processed is reached).

BATH AGITATION

Mild agitation of immersion developer tanks may improve wafer-to-wafer develop uniformity and photo speed when batch processing substrates.

PUDDLE DEVELOPING

Due to their lower surface tension, surfactant enhanced developers improve substrate wetting and facilitate puddle formation using lower dispense volumes than typical surfactant free developers. Complete development of patterns in thick photoresist films (> 3.0µm) may require multiple developer puddles. Increased normality developers and/or aggressive surfactants can improve dissolution rates and reduce develop time for thick photoresist films (see application guide section of this publication).

RINSING

Use de-ionized water only to rinse wafers post develop and to “quench” the developer activity. Spray pressure or bath agitation during rinsing may reduce post develop defect density by minimizing redeposited surface particles.

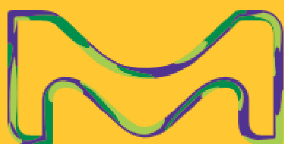
DEVELOPER APPLICATIONS GUIDE

0.26N (2.38%) TMAH DEVELOPERS

0.26N TMAH developers are the industry standard for advanced integrated circuit (IC) production and general lithography.

AZ 300MIF Developer

AZ 300MIF is an ultra-high purity, general purpose, surfactant free 0.26N TMAH developer featuring class leading normality control and ppb level metals content. Recommended for puddle, spray, and immersion applications.



AZ 726MIF Developer

AZ 726MIF is a surfactant enhanced 0.26N TMAH developer optimized for puddle develop processes.

AZ 917MIF Developer

AZ 917 MIF is a surfactant enhanced 0.26N developer formulated to improve photo speed in puddle or immersion develop processes with no loss of contrast or selectivity. Improves photo speed by 10-20% vs. AZ 726MIF.

AZ 2026 MIF Developer

AZ 2026 MIF developer contains different surfactants which also have an impact on dissolution rate of photoresist. Dark erosion is higher than with AZ 726 MIF, however this helps to avoid scrumming, which mainly is observed when the photoresist is processed on steppers without applying a post-exposure-bake (PEB).

CUSTOM NORMALITY TMAH DEVELOPERS

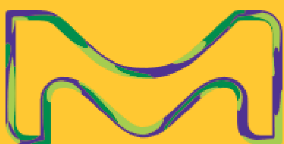
Custom normality developers may be desirable in cases where the develop rate or selectivity provided by 0.26N materials is inadequate. Reduced normality developers can improve selectivity to unexposed resist and increased normality developers will reduce the required exposure dose and/or develop time for thick resist processing.

AZ 422 MIF Developer

AZ 422 MIF developer is a reduced normality (0.215N) surfactant free developer engineered to maximize dissolution selectivity and process control.

AZ 435MIF Developer

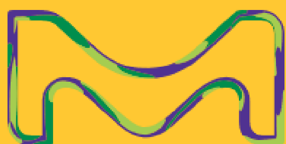
AZ 435 MIF developer is a surfactant free, increased normality (0.35N) TMAH developer optimized to improve photo speed for medium thick photoresist processing (5-10µm thick) while maintaining good process control. Recommended for use with AZ 9200 and AZ P4000 series photoresists.



AZ 405 MIF DEVELOPER

AZ 405 MIF developer is an aggressive, surfactant enhanced, high normality developer (0.405N) designed for thick photoresist processing (>15µm thick). This developer provides a metal ion free alternative to the sodium or potassium based developers typically employed in thick resist processing. Recommended for use with AZ 9260, AZ 50XT, and AZ P4620 photoresists.

Developer	Normality	Surfactant
AZ 300 MIF developer	0.26N	No
AZ 726 MIF developer	0.26N	Yes
AZ 927 MIF developer	0.26N	Yes
AZ 2026 MIF developer	0.26N	Yes
AZ 422 MIF developer	0.215N	No
AZ 435 MIF developer	0.35N	No
AZ 405 MIF developer	0.405N	Yes
AZ 732c MIF developer	0.30N	Yes



MATERIALS COMPATIBILITY AND HANDLING

TMAH containing developers are compatible with all standard semiconductor processing equipment designed to handle high pH aqueous solutions.

Note: Contaminating inorganic developer baths or lines with tetramethylammonium hydroxide (TMAH) based metal-ion-free developers, even at the parts-per-million level, will neutralize the dissolution activity of the inorganic developer process. Use extreme caution when changing developing equipment from a metal-ion-free to an inorganic process.

TMAH containing developers should be avoided in cases where slight etching of an aluminum layer cannot be tolerated. 0.26N TMAH developers will etch typical deposited aluminum substrate layers at ~100Å/min.

Recommended personal protective gear during handling includes eye protection, apron, caustic resistant gloves. Refer to the current version of the SDS for information on exposure hazards.

STORAGE

Store AZ MIF Developers in a cool, dry location in sealed original containers away from sunlight and incompatibles. Do not expose to excessive temperatures or moisture. Recommended storage temperature is >0°C. Do not freeze. Empty containers may contain harmful residue.

DISPOSAL

AZ MIF Developers are compatible with typical facility acid/base drain lines and materials. For disposal other than via facility solvent drains, refer to the current product SDS and to local regulations.

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