



AZ 400K

Developer for
AZ 4500 series

Description

AZ 400K Developer is the potassium based counterpart of AZ 351B. It was designed to achieve utmost contrast and best wall profile together with AZ 4500-series photoresists at high coating thickness. It is an odourless, aqueous, inorganic, alkaline solution, free of phosphates and sodium. It is compatible with batch and in-line spray-developing processes. Precise manufacture and stringent quality control ensure batch-to-batch reproducibility and product quality.

AZ 400K Developer is supplied as a concentrate. The standard high contrast make-up provides optimum resolution and contrast as well as maximum processing latitude. The standard high-speed dilution results in very high production throughput.

Bath Make-Up

To prepare the standard high resolution and high-speed dilutions from the concentrate, mix AZ 400K Developer and deionized water by volume as follows:

Developer Make-Up	AZ 400K Developer	Deionized Water	Normality
High Contrast	1.0 part	4.0 parts	0.28 N
High Speed	1.0 part	3.0 parts	0.35 N

Mix well. Adjust to desired temperature prior to use.

Physical and Chemical Properties

Colour	Clear
Normality	1.40 +/- 0.04 N
Filtration	0.2 µm absolute

Exposure

AZ 4500-series photoresists respond to radiation in the range of 310 – 450 nm. The absorption maxima are at 350 and 398 nm. High-pressure mercury, metal halide, or other sources with high output in this region are recommended. Because of wide variations in exposure systems, monitoring devices and processing parameters, specific exposure doses cannot be provided. See also the data sheets for the photoresist used.

Development

Immersion

For most applications immersion for approximately 1 – 3 minutes in the high contrast make-up is recommended. For thicker resist films, especially with AZ 4562, use about 30 seconds per micron film thickness as a starting value. The developer bath should be maintained at constant temperature (+/-1°C) within the range 20 – 25 °C. For less critical applications immersion for approximately 60 seconds in the high-speed make-up is recommended, for thick coatings time has to be prolonged as mentioned above. In all cases use mechanical agitation with the motion in the plane of the wafers. Avoid vigorous agitation. Rinse immediately in deionized water until resistivity is within specifications. Spin dry in air or force dry with filtered nitrogen.

Fresh developer gives optimum results. Major degradation of developer activity is caused by carbon dioxide absorption from air. It is recommended that the bath solution be replaced at least once a shift. Protection of the bath with a nitrogen curtain extends its life time.

Recirculating Bath Spray

Replenish with fresh developer as recommended by the equipment manufacturer. Moderate spray pressure is recommended.

In-Line Spray

Control developer temperature at the dispensing head at a constant temperature ($\pm 1^\circ\text{C}$) within the range of $20^\circ - 25^\circ\text{C}$. Moderate spray pressure is recommended. A typical process will involve spraying either the High Speed or High Contrast developer on a slowly spinning wafer for 30 – 60 seconds, and overlapping a deionized water rinse with the developing cycle. After a 10 – 15 second D.I. rinse, the wafer is spun dry.

Determination of Normality

Reagents

Hydrochloric acid (HCl) 0.2 N, standardised
Methyl Red indicator (0.2% in methanol)

Procedure

1. Pipette 5 ml of AZ 400K Developer into a 250 ml Erlenmeyer flask
2. Dilute with approximately 100 ml deionized water
3. Add 3 drops of methyl red indicator
4. Titrate with hydrochloric acid (0.2 N) to a red endpoint

Calculation

$$\frac{(\text{ml HCl}) \times (\text{N HCl})}{5 \text{ ml AZ 400K}} = \text{N of AZ 400K}$$

Normality of a freshly made-up batch should be 0.27 to 0.29 for the high-contrast make-up (1 + 4).
Normality of a freshly made-up batch should be 0.34 to 0.36 for the high-speed make-up (1 + 3).

Handling Advises

Consult the **Material Safety Data Sheets** provided by us or your local agent!

Store in sealed original containers between 0°C and 35°C , prevent from freezing.

Shelf life is limited, the **expiration date** is printed on the label of every bottle below the batch number and coded as [day/month/year].

AZ 400K Developer is compatible with most commercially available wafer processing equipment.

Recommended materials include PTFE, stainless steel and high-density poly-ethylene and -propylene.



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