

ALUMINUM ETCHANTS

Etchants for Aluminum Metallizations in Microelectronics

Chemical etchants compatible with negative and positive photoresists for developing ohmic contacts and interconnections in integrated circuits, transistors, diodes, MOD and FET devices.

ALUMINUM ETCHANT TYPE D

DESCRIPTION:

Standard aluminum etchant for use on gallium arsenide, arsenide and gallium phosphide devices and for aluminum metallizations on nichrome resistors.

FEATURES:

- Controlled etch rates
- Selective etching: will not attack SiO₂
- Offers high resolution with minimal undercutting
- Eliminates smut formation
- Economical; reusable

ALUMINUM ETCHANTS

DESCRIPTION:

Aluminum Etchants are stable, non-toxic preparations used to etch aluminum metallizations on silicon devices and in integrated circuit applications. Aluminum contacts are defined and interconnections are formed. These Aluminum Etchants formulated with unique properties easily overcome many of the difficulties experienced in aluminum etch processes.

The aluminum metallization and etching process using photo-lithographic techniques is basic to the semiconductor and microelectronic technology. Aluminum Etchants are highly compatible with commercial photoresists (KTFR, AZ, Hunt, Waycoat, etc.) and permit delineation into high resolution patterns. Metal line width of 1 mil and separations less than 5 microns are feasible. The high resolution is practical with Aluminum Etchants because lifting of photoresist patterns does not occur and undercutting is minimized. Furthermore, the etchants do not attack silicon, silicon dioxide, silicon nitride or nichrome resistor films.

Type D is recommended for use on gallium arsenide and gallium phosphide devices to avoid attack of the etchant on the intermetallic compound. It is also recommended for etching aluminum metallizations on nichrome thin film resistors.

APPLICATION:

Aluminum metallizations up to 25,000Å are vacuum deposited on the silicon slice, coated with a photoresist, and UV exposed using an appropriate photographic mask. The resist is developed to protect the aluminum where interconnections are desired. Then the unprotected areas of the aluminum are removed by etching with Aluminum Etchant, followed by a water rinse.

Etching time is dependent upon the etchant temperature and the aluminum film thickness. When etching thick aluminum films, a higher etch rate is required; thus a higher etchant temperature should be used. Likewise, for thinner aluminum films, slower etch rates are desired and a lower etchant temperature should be chosen. At a specific etchant temperature, the etching time is given by the following formula:

$$\text{Etching time (second)} + \frac{\text{Film Thickness (Å)}}{\text{Etch Rate (Å/sec)}}$$

PROPERTIES OF ALUMINUM ETCHANT TYPE D

How do I increase the etch rate?	<ol style="list-style-type: none"> 1. The rate will approximately double with every 10 °C increase in temperature. 2. Increase the rate of stirring or agitation.
How do I reduce the etch rate?	Adding 1 part deionized water to 2 parts etchant will reduce the etch rate approximately 50%.
Do I need to dilute the etchant?	No, it is ready to use.
How do I reduce undercutting?	Increase the rate of stirring or agitation.
Appearance	Water-white to light yellow
pH	Strong Acid
Etch Rate at 25 °C	40 Å/second
At 40 °C	125 Å/second
Etch Capacity (rate declines at ~70%)	60 g/gallon
Shelf Life	1 year
Storage Conditions	Ambient
Filtration	0.2 µm
Recommended Operating Temperatures	20-80 °C (30-40 °C most common)
Rinse	KLT6000 Series, KLT 5300 Series, HARE SQT (SU-8 type), TRANSIST, or PKP II
Photoreist Recommendations	KLT 6000 Series, TRANSIST, PKP II
Select Compatible Materials	SiO ₂ , Au, Pd, Pt, Ru, Si, Steel, Ti, Ta/TaN, W, Cu, Fe, GaAs, Mg, MgO, Nb, Ni
Select Incompatible Materials	Al ₂ O ₃ , Si ₃ N ₄ , ZnO, Al, C, Co, Cr
Compatible Plastics	HDPE, PP, Teflon, PFA, PVC
Country of Origin	USA
Packaging	HDPE
Isotropy	Isotropic
Incompatible Chemicals	Strong Bases
Additional Information	---

©2020 Sigma-Aldrich Co. LLC. All rights reserved. SIGMA-ALDRICH is a trademark of Sigma-Aldrich Co. LLC, registered in the US and other countries. Sigma brand products are sold through Sigma-Aldrich, Inc. Purchaser must determine the suitability of the product(s) for their particular use. Additional terms and conditions may apply. Please see product information on the Sigma-Aldrich website at www.sigmaaldrich.com and/or on the reverse side of the invoice or packing slip.

The life science business of Merck KGaA, Darmstadt, Germany operates as MilliporeSigma in the U.S. and Canada.

**MILLIPORE
SIGMA**