

## Product Application

TechniEtch Al-80 is a standard acidic aqueous mixture based upon a Acetic/Nitric/Phosphoric water blend.

### Solution Main Features:

- High etch rate at room temperature.
- High stability even in presence of metal contamination
- Loading & bath life mainly dependent of process temperature, tool and extraction flow

### ✓ Aluminum Etching Mechanism

Standard Aluminum etchants are mixtures of 1-5 %  $\text{HNO}_3$  (as oxidizing agent ), 65-75 %  $\text{H}_3\text{PO}_4$  (to dissolve  $\text{Al}_2\text{O}_3$ ), 5-10 %  $\text{CH}_3\text{COOH}$  (as wetting and buffering agent) and water ( to tune the etch rate up ). Aluminum etch reaction is a very exothermic process and can lead to certain drawbacks such as isotropic etching with resist mask undercuts, localized heating, which would apply to have a great control of the bath homogeneity (agitation) to prevent such process issues. Additionally, vigorous  $\text{H}_2$ -bubbling nearby the aluminum surface may alter the normal oxidation rate and bath homogeneity. Process control Improvements can be achieved by applying a multi-steps sequence of dip & rinse for which

the hydrogen formation quenching led to better Wafer to Wafer etch uniformity..

NOTES: Al etching reaction kicks off when the  $\text{Al}_2\text{O}_3$  passivation layer has been removed first by  $\text{H}_3\text{PO}_4$ . Although, it worth mentioning that a proper photoresist development process is also mandatory to prevent defects such as organic micro masking of the metal oxide surface and TMAH attack at resin edge, resin footing that could impact CD feature by subsequent alkaline etching . Dependant on the resin developing process time and queue time ( delay between development and Al-etching), the process parameters may lead to a spatial inhomogeneous aluminum surface.

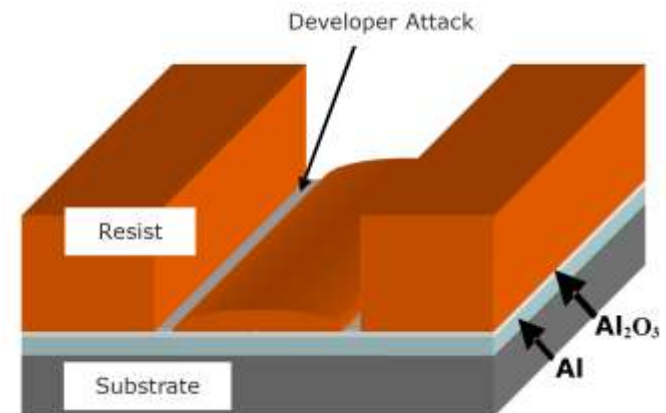


Fig:1- General drawing after resin development

## Etch rate & selectivity

Al etch rate in  $H_3PO_4/HNO_3$  mixtures is strongly dependent upon the chemical temperature (fig:2) with an Arrhenius' behavior where Al etch rate is doubling up for every 5°C. Aluminum alloyed with few % of Silicon has similar etch rate as compared to pure Aluminum. In such oxidative Al etchants, significant copper and mild nickel attack are expected. Titanium, Tantalum, chromium and silver are hardly etched, noble metals such as gold and platinum are not attacked.

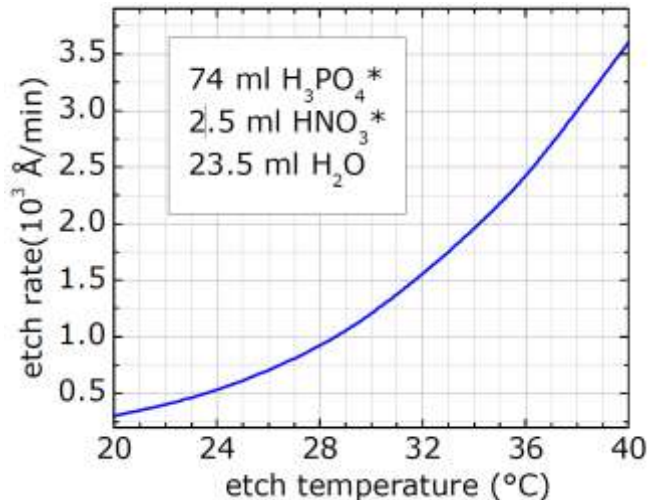


Fig:2-Al etch rate VS Temperature

## Photoresist

For Al Etching , many AZ®, JSR, and other resins vendors have got suitable and stable materials to be applied as masks. Generally, it is recommended to use resists with optimized adhesion and/or adhesion promoter . In order to improve the resist adhesion, a hardbake (140-145°C for 5-10 minutes ) after development can be beneficial. Finally, to prevent any film cracking formation during the cooling step, a gradual temperature decrease protocol should be applied

Cause most of alkaline based developers i.e. NaOH-, KOH-,and TMAH- attack Aluminum at a rate ranging from approx. 50 to 100 nm/min, Al-compatible developers are also available .

For resist removal after etching, the TechniStrip Series Remover is firmly recommended to promote resin dissolution and prevent severe aluminum attack as observed with standard alkaline resin strippers.

## TechniEtch Al-80

TechniEtch Al-80 can be delivered in different packaging sizes from 2.5liters to 1tonne IBC in VLSI quality. Other grades/sales volumes available on request

## Physico-Chemical properties

- State: Liquid
- Color: colorless
- Density: 1,
- pH:< @ 25°C.
- Miscible with water in all proportions.
- Boiling point: >100°C.
- Vapor pressure: < 1 (water = 1).

## Quality

Technic' solutions are formulated using most adopted purity and quality raw materials to ensure and respond to specific customer's process specifications .e.g. metal level contamination, particle count, packaging...

The full manufacturing process is in accordance with the company quality policy.

## Health, Safety and Environment

To obtain comprehensive information on the safe use and handling of the Technic's solutions, a material safety data sheet is available on request.

**Technic's safety policy is to optimize and promote safer chemical to the industry in accordance to latest European regulation and Customer' chemical banned substance list.**

## Contact

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