

## Technical Data Sheet (TDS)

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### 1. Product Overview

- **Product Name:** Metal Etchant
- **CAS Number:** N/A
- **Formula:** Blend of Inorganic Acid Mixture, Organic Corrosion Inhibitor, Chelating Agent & Deionized Water
- **Molecular Weight:** Variable
- **Chemical Source:** Synthetic industrial chemical mixture (customized for copper/aluminum/iron alloy etching; formulated with high-purity inorganic acids, compounded with efficient corrosion inhibitor and chelating agent to ensure precise etching and low metal corrosion; purified by precision filtration to remove impurities and ensure etching uniformity).
- **Product Trait:** Amber transparent homogeneous liquid with slight acidic odor; corrosive aqueous solution, fully miscible with water, insoluble in organic solvents; stable under normal storage/processing conditions, excellent etching uniformity, controlled etching rate, and good corrosion inhibition effect on non-etched metal surfaces; suitable for precision metal etching in electronics/metal processing industry.
- **Core Properties:** **High-precision industrial metal etchant** with adjustable etching rate (1.5-4.0  $\mu\text{m}/\text{min}$ ), excellent etching uniformity ( $\pm 0.2 \mu\text{m}$ ), and strong corrosion inhibition; suitable for copper, aluminum and iron alloy etching; no over-etching, no pitting on metal surface; compatible with common metal processing equipment and post-etching cleaning processes; meets electronics and metal processing industry precision etching standards.
- **Main Application:** PCB/FPC flexible circuit board metal layer etching; electronic component (connector/terminal) metal surface precision processing; metal mold (copper/aluminum mold) fine etching; aerospace/automotive precision metal part etching; hardware product surface texture etching.

### 2. Technical Specifications (Industrial Etching Grade, Complies with SJ/T/ISO Standards)

Item	Specification
Appearance	Light yellow to amber transparent homogeneous liquid
Total Acid Content	15.0-20.0%
Etching Rate (Copper, 25°C)	2.0-4.0 $\mu\text{m}/\text{min}$
Etching Rate (Aluminum, 25°C)	1.5-3.0 $\mu\text{m}/\text{min}$
pH Value (25°C)	0.5-2.0
Corrosion Inhibition Efficiency	$\geq 90\%$
Iron Ion Content	$\leq 0.05\%$
Heavy Metals (Pb)	$\leq 5 \text{ ppm}$
Heavy Metals (As)	$\leq 1 \text{ ppm}$
Density (25°C)	1.10-1.20 $\text{g}/\text{cm}^3$
Viscosity (25°C)	20-50 $\text{mPa}\cdot\text{s}$
Stability (25°C, 7d)	No precipitation/stratification
Etching Uniformity	$\pm 0.2 \mu\text{m}$
Post-Etching Surface Roughness (Ra)	$\leq 0.5 \mu\text{m}$
Compatible Metals	Copper, aluminum, iron alloy, brass
Compatible Cleaning Agent	Neutral water-based cleaning agent, weak alkaline cleaning agent

### 3. Product Advantages

1. **Precision Etching Performance:** Controlled etching rate (adjustable by dilution), excellent etching uniformity ( $\pm 0.2 \mu\text{m}$ ), no over-etching or pitting; post-etching metal surface with low roughness ( $\text{Ra} \leq 0.5 \mu\text{m}$ ), meeting precision processing requirements.



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- 2. **Efficient Corrosion Inhibition:** Contains high-efficiency organic corrosion inhibitor, corrosion inhibition efficiency  $\geq 90\%$ ; no corrosion to non-etched metal surfaces and equipment, reducing production loss.
- 3. **Wide Metal Compatibility:** Suitable for etching of copper, aluminum, iron alloy, brass and other common industrial metals; one product for multiple metal etching, reducing production cost.
- 4. **Good Process Compatibility:** Compatible with common metal processing equipment (spray etching machine, immersion etching tank); matched with post-etching cleaning processes (water washing/neutralization); easy to integrate into existing production lines.

## 4. Application Fields

### 4.1 Electronics & PCB Industry

- PCB/FPC flexible circuit board copper layer etching; HDI board high-density metal layer precision etching; electronic connector/terminal metal surface etching and thinning.

### 4.2 Metal Processing Industry

- Copper/aluminum mold fine pattern etching; aerospace/automotive precision metal part surface etching; hardware product surface texture/LOGO etching.

### 4.3 Other Industrial Fields

- Battery pole piece metal surface etching; metal mesh (copper mesh/aluminum mesh) precision etching; decorative metal product surface pattern etching.

## 5. Usage & Formulation Guidelines

### 5.1 Recommended Etching Process Parameters (25°C, Normal Pressure)

Process Step	Parameter	Copper Etching	Aluminum Etching
Formulation	Ready-to-use	Undiluted / 1:0.5 (water)	1:1 / 1:2 (water)
Etching Method	Spray/immersion	Spray (0.2-0.4 MPa)	Immersion (stirring)
Etching Temperature	20-30°C	25±2°C	25±2°C
Etching Time	According to thickness	1-5 min	2-8 min
Post-Etching Treatment	Neutralization → Water washing → Drying	Neutralize with 2% NaHCO <sub>3</sub> (pH 7-8), rinse with deionized water 3 times, dry at 60°C	Same as copper etching

## 6. Packaging & Storage

### 6.1 Packaging Specifications (Industrial Corrosive Grade, Acid-Resistant & Anti-Leakage)

- 1 L HDPE acid-resistant plastic bottle (laboratory/R&D/small-batch use, anti-leakage)
- 5 L HDPE acid-resistant plastic drum (medium-batch production use, anti-leakage)
- 25 L HDPE acid-resistant plastic drum (bulk production use, acid-resistant + anti-leakage)
- 1000 L IBC tote (acid-resistant inner tank, large-scale industrial use, anti-leakage + pressure relief valve)
- Custom packaging (2 L/10 L) available for R&D and small-batch production needs (all **acid-resistant + anti-leakage**).

## 7. Safety & Protection

- The product is a Class 8 corrosive liquid, causing severe skin/eye burns and respiratory tract corrosion; **all operations must be conducted by trained professional personnel** with full specified PPE (acid-resistant full face shield + safety goggles, neoprene acid-resistant gloves  $\geq 0.5$  mm, acid-resistant clothing/apron, anti-corrosive shoes, half-face acid gas respirator).
- Operate in a well-ventilated fume hood with acid exhaust system; the operation site must be equipped with emergency shower, eye wash station and sodium bicarbonate neutralizing agent; no eating/drinking/smoking in the work area.
- In case of skin contact: Remove contaminated clothing immediately, rinse with plenty of water for 15 minutes, and seek emergency medical treatment at once. In case of eye contact: Rinse with plenty of water for 20 minutes, and go to the hospital for ophthalmic treatment immediately.