

Semiconductor and Thin Film Etchants for Microelectronic Circuits

用于微电子电路的半导体和薄膜蚀刻剂

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1. Aluminum Etchants(微电子中镀铝用的铝蚀刻剂) Etchant 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 A

Standard aluminum etchant for use on silicon devices and other microelectronic applications

ALUMINUM ETCHANT - TYPE D

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

不含硝酸

FEATURES 特征

- Controlled etch rates 可控的蚀刻率
- Selective etching; will not attack SiO_2 or Si_3N_4 不攻击 SiO_2 or Si_3N_4
- Offers high resolution with minimal undercutting 最小凹槽
- Eliminates smut formation 消除污迹形成
- Economical; reusable 可以再度使用的

ALUMINUM ETCHANTS

DESCRIPTION 描述:

Transene 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 semiconductor and microelectronic technology. Transene 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. High resolution is practical with Transene 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.

Two aluminum etchants are offered for use in microelectronics. Type A is recommended for use on silicon devices. 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.

PROPERTIES OF TRANSENE ALUMINUM ETCHANTS 性质

	<u>TYPE A</u>	<u>TYPE D</u>
Appearance 外观	clear colorless	light green/yellow
pH	1.0	1.0
Boiling Point 沸点	> 100 °C	150 °C
Freezing Point 凝固温度	< 0 °C	< 0 °C
Sp. Gr. @ 25 °C	1.45	1.50
Flash Point 闪点	Non-flammable 非易燃的	Non-flammable 非易燃的
Solubility 溶解性	Miscible with H ₂ O 易混合	Miscible with H ₂ O 易混合
Etch Rate at 蚀刻率		
25 °C	10 Å/sec.	40 Å/sec
40 °C	80 Å/sec	125 Å/sec
50 °C	100 Å/sec	200 Å/sec
65 °C	240 Å/sec	-----
75 °C	550 Å/sec	-----
<u>Note: Etch rate slightly variable upon purity of aluminum.</u>		

APPLICATION 应用:

Aluminum metallizations up to 25,000 Å 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 Transene 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.

2. TRANSETCH-N(用于氮化镓,氮化硅,氧化铝薄膜的选择性蚀刻剂) Selective Etchant for Gallium Nitride, Silicon Nitride or Aluminum Oxide Films

Fast and Controllable Etching of Silicon Nitride (Si_3N_4), Galium Nitride (GaN), or Aluminum Oxide (Al_2O_3) Films in New Semiconductor Technology

UNIQUE ADVANTAGES

- Convenient, ready to use.
- Selective, etches gallium nitride, silicon nitride or aluminum oxide films.
- Re-usable, does not weaken with use.
- Produces no noxious fumes, requires no hoods or venting.
- Virtually eliminates over-etching and under-cutting.
- Ensures successful planar passivation of silicon semiconductor devices.

TRANSETCH - N DESCRIPTION 描述

TRANSETCH-N is a purified reagent, derived from ortho-phosphoric acid, which selectively etches silicon nitride or aluminum oxide in the presence of silicon dioxide or silicon. When used as directed, it produces openings in these films with a degree of resolution comparable to the best obtainable with SiO_2 in conventional planar technology, but with essentially no effect on exposed silicon or silicon dioxide surfaces. The photoresist materials, processes and equipment used in conventional etching operations are retained, and the additional equipment required is minimal and inexpensive.

Transetch-N contains no fluorides. Unlike etchants based on fluoride chemistry, TRANSETCH-N produces minimal undercutting and therefore provides a wide margin of safety in the selection of etching times.

Transetch-N is stable and long-lived. The only attention which it may require in use is the addition of small amounts of water to replace that lost through evaporation.

PHYSICAL PROPERTIES 物理属性

Liquid 液体	Colorless, odorless
Boiling Temp. 沸点 (with evolution of H_2O).....	180 °C
Specific gravity 20 °C 比重	1.757
Etch Rates - 180 °C: 蚀刻率	
Aluminum oxide 氧化铝	120 Å/min
Silicon nitride. 氮化硅	125 Å/min

Gallium nitride 氮化镓	80 Å/min
Silicon dioxide. 二氧化硅	1 Å/min
Silicon 硅	1 Å/min

APPLICATION 应用:

TRANSETCH-N is employed in the new technology for surface passivation of semiconductor devices based upon the use of deposited Si_3N_4 , GaN and Al_2O_3 films. This technology leads to high quality and reliability of semiconductor products and is particularly helpful in stabilizing MOS and MIS devices. Inversion layers and ion migration are virtually eliminated: leakage currents approach theory; and surface states are notably controlled.

INSTRUCTIONS 用法说明:

TRANSETCH-N works best with a suitably etched layer of deposited SiO_2 serving as the mask for the deposited film. The SiO_2 layer is most conveniently applied immediately after the deposition of the passivating film. A thickness of 1000 Å is usually quite adequate for this purpose.

Conventional processes are employed to produce the image of the desired opening in the photoresist and in the deposited SiO_2 layer. The photoresist is then removed with a chromic acid-sulfuric acid stripper.

The stripped and rinsed slices are then placed in boiling TRANSETCH-N for a period of time which allows one minute for each 100 Å of deposited film thickness. Water rinsing removes all traces of etchant.

NOTE: It is important that the boiling point of TRANSETCH-N be maintained at 180 °C. This generally requires that evaporative loss of water be minimized by the use of proper apparatus. Small amounts of distilled water may be added from time to time to ensure that the temperature of TRANSETCH-N does not exceed 180 °C.

3. Silicon Dioxide (SiO₂) Etchants(二氧化硅蚀刻剂)

High purity buffered HF etchants for thermally grown or deposited silicon dioxide films. Transene silicon dioxide etchants are ideal for semiconductor applications requiring minimal undercutting and broad compatibility.

BUFFER-HF-IMPROVED 改良的缓冲氢氟酸

Highest etch rate for thermally grown silicon dioxide films. Also suitable for deposited SiO₂.

BD ETCHANT

Buffered dip etchant for polysilica glass (PSG) and borosilica glass (BSG) systems. The etch rate is variable depending upon PSG or BSG composition.

SILOXIDE ETCH

Selective, controlled etching for SiO₂ films deposited from silanes or ethylorthosilicate.

TIMETCH

Optimum control for etching of deposited silicon dioxide films.

SILOX VAPOX III

Etches deposited oxides on silicon. Saturated with aluminum to minimize attack on metallic substrates.

BUFFERED OXIDE ETCHANTS

FEATURES:

- Wide range of etch rates
- High purity
- Ready to use
- Broad compatibility with photoresists

Buffer HF Improved

FLUORIDE - BIFLUORIDE - HYDROFLUORIC ACID BUFFER

Improved HF buffer system with stabilized HF activity - selective solvent for SiO₂ used in semiconductor technology of planar passivated devices - transistors, integrated circuits, diodes, rectifiers, SCR, MOS, FET.

UNIQUE ADVANTAGES

- Ready-to-use
- Economical
- HF activity buffer stabilized 稳定
- Excellent process reproducibility 卓越的工艺重复性
- Does not undercut masked oxide 不伤害掩蔽氧化物
- Will not stain diffused silicon surfaces 不沾污硅表面
- Avoids contamination on silicon surfaces
- Photoresist compatibility

BUFFER HF IMPROVED DESCRIPTION

BUFFER HF IMPROVED is an idealized buffer preparation characterized by a high buffer index and an optimized, uniform oxide-etch rate. The composition of BUFFER HF IMPROVED is precisely controlled by HF activity measurements and electrometric pH. The mass balance corresponds essentially to $\text{HF} + \text{F} + 2(\text{HF}_2)$ for a two-ligand mononuclear complex and the charge balance is $(\text{H}^+) - (\text{F}) + (\text{HF}_2^-)$. The HF activity is maintained constant through the specific equilibrium constant, which regulates the equilibrium reaction between fluoride, bifluoride, and HF buffer components. A second equilibrium constant participates in the regulation of the hydronium ion concentration.

BUFFER HF IMPROVED is produced and analyzed to be essentially free of impurities. Nitrate ions, a common impurity causing stains on diffused silicon surfaces, are specifically removed. Heavy metal impurities, which can lead to degradation of device characteristics, are rigidly controlled under manufacturing process specifications.

Properties of Buffer HF Improved

Appearance 外观	Clear liquid
Nitrate 硝酸盐	Absent
Sp. Gr. 格拉肖夫数	1.12
Buffer Etch Capacity 缓冲蚀刻能力	65 mg. SiO_2/ml
pH	5.0
Etch Rate @ 20 °C. 蚀刻率	800 Å / minute*
free HF 自由氢氟酸	10^5 M
Storage 贮藏	Room Temperature Crystallization occurs below 10 °C.
Principal Ion 主要离子	HF_2 ligand
Heavy Metals 重金属	0.5 ppm

* Etch rate may vary depending upon silica film structure

USE OF BUFFER HF IMPROVED

BUFFER HF IMPROVED dissolves silica films (both thermally grown and silane SiO_2) produced on the surfaces of silicon and exposed by photolithography. It also is capable of dissolving doped silica films such as phosphosilica and borosilica glasses as formed in semiconductor processing. The overall chemical reaction is: $4\text{HF} + \text{SiO}_2 \rightarrow \text{SiF}_4 + 2\text{H}_2\text{O}$

For trouble-free operation BUFFER HF IMPROVED is recommended in the new technologies for manufacture of semiconductor planar and mesa devices. it is compatible with both negative and positive photoresists. Excellent results with good reproducibility are simple to achieve without undercutting marked oxides, surface staining or device degradation by metallic impurities.

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INSTRUCTIONS 用法说明

Most practical oxide passivation layers range from 2000 Å to 5000 Å in thickness, and good results are obtained by exposure in BUFFER HF IMPROVED for 2 to 5 minutes at room temperature. Exposure time may be decreased or increased if necessary. BUFFER HF IMPROVED should be rinsed off with deionized water. The high buffer index of BUFFER HF IMPROVED permits repeated use of the buffer at fixed exposure time. For faster etch rate (approx. 2X) use BUFFER HF IMPROVED at 35 °C.

SILICON DIOXIDE THICKNESS VS. REFLECTED COLOR

COLOR			THICKNESS	Å X 10 ³	
gray,tan,brown	0.1	0.3	0.5	--	--
blue	0.8	1.5	3.0	4.9	6.9
violet	1.0	2.7	4.7	6.5	--
green	1.9	3.3	5.2	7.2	--
yellow	2.1	3.7	5.6	7.5	--
orange	2.2	4.0	6.0	--	--
red	2.5	4.4	6.3	--	--

BD Etchant FOR PSG-SiO₂ SYSTEMS

An improved buffered etch formulation for delineation of phosphosilica glass - SiO₂ (PSG), and borosilica glass - SiO₂ (BSG) systems, in the passivation of transistor surfaces. BD Etchant has a low PSG/SiO₂ ratio, minimizing the undercutting of the PSG passivating film.

ETCH CHARACTERISTICS OF BD ETCHANT

	20 °C	25 °C	30 °C
<u>Dielectric Material</u>	<u>Å/sec.</u>	<u>Å/sec</u>	<u>Å/sec</u>
Thermally grown SiO ₂	0.87	1.22	1.72
PSG (6 mole % P ₂ O ₅)	1.85	2.47	3.35
Etch Ratio (PSG/SiO ₂)	2.12	2.02	1.95

Note: etch rate is dependent upon composition of PSG and BSG.

APPLICATION 应用:

Employed as a dip etch to remove SiO₂ films from contacts without the disturbance of the PSG film. BD Etchant is used prior to metallization of the contact holes of the silicon transistor wafers followed by water and alcohol rinses.

Siloxide Etchant

Selective Etchant For Deposited SiO₂

Modified HF Buffer solution specific for etching deposited silica (SiO₂) films in semiconductor microelectronics.

FEATURES 特征

- Specific for etching SiO₂ films deposited from silane or ethyl orthosilicate processes
- Ready to use
- Economical
- Precision control in etch process - oxide undercutting avoided
- Compatible with photoresists

SILOXIDE ETCHANT

DESCRIPTION 描述

Siloxide Etchant is the preferred etchant for deposited SiO₂ films in semiconductor microelectronics. The etchant is formulated as a buffered system containing bifluoride ion. HF activity is regulated by the equilibrium reaction between fluoride, bifluoride and HF buffer compounds. Impurity levels are rigidly controlled to less than 1 ppm concentration of heavy metals to insure quality. There is excellent functional compatibility with both negative and positive photoresists.

Properties of Siloxide Etchant 性质

Appearance 外观	Clear liquid
Specific Gravity 比重	1.1
pH	5.0
Heavy metals 重金属	< 1 ppm
Etch rate at 25 °C 蚀刻率	40 Å/second
Buffer etch capacity 蚀刻能力	20 mgs. SiO ₂ /mL.
Operating temperature 工作温度	25 °C
Compatible photoresist 兼容光刻胶	Neg & Pos type
Storage 贮藏	Room temperature

APPLICATION 应用

Siloxide Etchant is used in the photolithographic process for the manufacture of semiconductor devices and integrated circuits. Deposited SiO_2 functions in these applications as a passivating dielectric or as an etch mask in conjunction with silicon nitride passivation. Typical SiO_2 deposits are on the order of 2000 Å thick.

Conventional buffered HF solutions used to etch thermally grown SiO_2 should not be used for deposited SiO_2 films. Deposited SiO_2 films are produced from the oxidation of silane or by the pyrolytic hydrolysis of ethyl orthosilicate. These deposited silica films etch much faster as compared to thermally grown SiO_2 . Siloxide Etchant gives the necessary etch control for these deposited SiO_2 films.

ETCH CONTROL OF DEPOSITED SiO_2 FILM WITH SILOXIDE ETCHANT

<u>ETCH TIME</u>	<u>DEPOSITED SiO_2 THICKNESS</u>	<u>REFLECTED COLOR</u>
<u>SECONDS</u>	(Å)	
0	2150	YELLOW-ORANGE
3	2100	YELLOW
6	1900	GREEN
9	1700	GREEN-BLUE
12	1500	BLUE
15	1250	BLUE-VIOLET
20	1000	VIOLET
25	900	VIOLET-BLUE
30	800	BROWN
35	500	TAN
40	300	GRAY
45	100	GRAY-CLEAR
50	0	CLEAR

Timetch

Controlled Etchant for Silicon Dioxide Films

TIMETCH is a specially prepared etchant solution offering excellent control in the etching process of silicon dioxide, without undercutting. TIMETCH is compatible with negative and positive photoresists.

TIMETCH is used for the removal of silicon dioxide and for the control of oxide thickness of MOS devices. The product is also recommended for the removal of surface oxide of diode and transistor devices prior to metallizations.

Rate of oxide removal is 1.5 Å/second at room temperature for deposited oxides. The rate is somewhat slower for thermal oxide. The etch process is followed by rinsing with distilled deionized water. Timetch is compatible with copper.

PROPERTIES 性质

Appearance 外观	Clear solution
pH	5.5
Operating Temperature 工作温度	25 °C
Flash Point 闪点	Not Flammable
Solubility 溶解性	Miscible with water
Etch Rate 蚀刻率	1.5 Å/second; 90 Å/minute
Shelf Life 保存限期	1 Year
Storage 贮藏	Room Temperature

Silox Vapox III

- I. This etchant is designed to etch deposited oxides on silicon surfaces. These oxides are commonly grown in vapox silox or other LPCVD devices and differ radically from their thermally grown cousins in many important ways. One way is their etch rate another is their process utility. The deposited oxide is many times used as a passivation layer over a metallized silicon substrate. Silox Vapox Etchant III has been designed to optimize etching of a deposited oxide used as a passivation layer over an aluminum metallized silicon substrate. This etchant has been saturated with aluminum to minimize its attack on the metallized substrate.

II. Deposited Oxide (Vapox/Silox) Etch Rate:

4000 Å / minute @ 22 °C

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- III. This product contains:
Ammonium Fluoride
Glacial Acetic Acid
Aluminum corrosion inhibitor
Surfactant
DI Water

Buffered Oxide Etchants

Standard blends of high purity ammonium fluoride and hydrofluoric acid in standard and customized ratios.

4. CHROMIUM ETCHANT(铬蚀刻剂)

Etchants for chromium thin films for microelectronics applications offer excellent compatibility with positive and negative photoresists. Chromium Etchants provide fine-line control with minimal undercutting. High purity formulations filtered to 0.2 micron are ideal for critical devices.

CHROMIUM ETCHANT 1020

Fast etch rate with minimal undercutting 最小凹槽的快速蚀刻率

CHROMIUM ETCHANT 1020AC

Slower etch rate to eliminate undercutting and for broader compatibility
消除凹槽的慢速蚀刻率, 更宽兼容性

CHROMIUM ETCHANT CRE-473

Compatibility with copper, nickel, gold, and molybdenum films.

CHROMIUM MASK ETCHANT

Ideal for high precision photomask etching.

CHROMIUM CERMET ETCHANT

For chromium-silicon films.

FEATURES 特征:

- High purity 高纯度
- 0.2 micron filtration 0.2 微米渗透
- Excellent photoresist compatibility 卓越的光刻胶兼容性
- Uniform etch rates and patterns. 恒定蚀刻率和模式

Chromium Etchants 1020 and 1020AC

DESCRIPTION 描述:

Transene Chromium Etchants 1020 and 1020AC are high purity ceric ammonium nitrate systems for precise, clean etching of chromium and chromium oxide films. Chromium Etchant 1020AC is nitric-acid free and exhibits a slower etch rate. Both etchants are compatible with positive and negative photoresists. Chromium Etchant 1020 is filtered to remove all particulates above 0.2 microns. Minimal undercutting is achieved with Chromium Etchant 1020AC.

Etchant 1020AC 不含硝酸, 慢速蚀刻率.

Etchant 1020 可渗透 0.2 微米移除所有的微粒, 比 Etchant 1020AC 更小凹槽.

PROPERTIES 性质:

	1020	1020AC
Appearance 外观	Clear, orange 透明, 橙色	Clear, orange 透明, 橙色
Specific Gravity 比重	1.127-1.130	1.127-1.130
Filtration 渗透	0.2 micron 微米	-----
Operating Temperature 工作温度	Variable 可变的	Variable 可变的
Etch Rate, 40 °C 蚀刻率	40 Å / sec	32 Å / sec
Storage 贮藏	Room Temperature 室温, 常温(约 20 摄氏度)	Room Temperature 室温, 常温(约 20 摄氏度)
Rinse 冲洗	Deionized Water 除去离子水	Deionized Water 除去离子水

APPLICATION:

Etching temperature varies depending on film thickness. Etch times range from 15 seconds to 60 seconds at room temperature. Chromium Etchants should be operated in a well ventilated hood.

Chromium Etchant CRE-473

DESCRIPTION:

Chromium Etchant CRE-473 is a selective chromium etchant for microelectronics applications. CRE-473 effectively etches chromium films deposited on copper, nickel, gold, or molybdenum. Excellent compatibility with positive and negative photoresists.

PROPERTIES:

Appearance	Water white
Etch Rate @ 25 °C	14 Å / sec
Operating Temperature	25-40 °C
Rinse	Deionized Water
Storage	Room Temperature

APPLICATION:

Chromium Etchant CRE-473 is a ready-to-use solution specifically designed to remove chromium films from metal substrates such as copper, gold, nickel, and molybdenum. Heating the etchant to 40 °C will speed the etch rate for thicker films.

Chromium Mask Etchant For High Precision Metal Photomasks

An improved chromium etchant used in the new technology for fabricating high quality chrome photomasks. Removes chromium chromium-clad glass plates to form masking patterns in microelectronic applications.

FEATURES 特征

- Excellent resist compatibility
- Room temperature operated
- Visual etching control
- Definition in submicron range
- Economical

CHROMIUM MASK ETCHANT DESCRIPTION:

Transene Chromium Mask Etchant is a product designed for the critical etch process in the new technique for making chrome metal photomasks. Chrome masks are economical to produce and, as used in microelectronics, give much better service than emulsion type photomasks.

Chromium Mask Etchant permits precise etching of chromium. It is relatively non-toxic and non-hazardous to use, replacing conventional dangerous laboratory etchants in the mask making process. The etchant is room-temperature operated, offers excellent visual etch control and is compatible with both positive and negative photoresist materials. Fine line definition and geometrics are registered and held to tolerances in the sub-micron range.

Transene Chromium Mask Etchant is used successfully on all Kodak chromium-clad plates or chromium-on-glass plates in general.

Properties of Chromium Mask Etchants 性质

Etch rate 蚀刻率	800 Å/min at 25 °C
	2400 Å/min at 40 °C
Etch capacity 蚀刻能力	30 mgs chromium/ml etchant
Operating Temp 工作温度	25 °C
Miscibility 可混和性	Water
Storage 贮藏	Room Temp.
Shelf Life 保存限期	Unlimited

APPLICATIONS 应用

Recommended photoresist materials, highly compatible with Chromium Mask Etchant, including all positive and negative photoresists. These afford reproductions of micro-images in chromium. The etchant can be used directly on Kodak MetalClad Plate P which incorporates a positive-working photosensitive resist coating on chromium-coating glass.

Operating procedures should be followed as described in the instructions. In general the etch process involves the following operations:

1. Application of photoresist
2. Pre-bake
3. Exposure of photoresist to U.V.
4. Develop photoresist
5. Post-bake
6. Etch chromium

The thickness of chromium clad on plates is on the order of 800 Å. The etching time is therefore on the order of 60 seconds.

Chromium and Nichrome Etchants For Use in Thin Film Microelectronics.

These etchants are designed for minimal undercutting and good process control. They are compatible with negative and positive photoresists.

Chromium Etchant - Type TFD

Standard Chromium Etchant

Etch: 20 Å/Sec. @ 40 °C

Chromium - Types 8001-N and 8002-A

For slower etch rate

8001-N: Nitric acid based

8002-A: Acetic acid based

Chromium Cermet Etch - Type TFE

Standard Cr-Si and Cr-SiO Cermets

Etch Rate: 1000 Å/min (for 20 atomic % SiO)

5. Printed Circuit Copper Etchants(印刷电路铜蚀刻剂)

Ferric chloride solutions for etching copper, copper alloy and Kovar in printed circuit board applications. Ammonium Persulfate Etchant for Thin Film applications.

PC COPPER ETCHANT -100

For immersion etching

PC COPPER ETCHANT -200

For spray etching techniques

APS-100 COPPER ETCHANT

For thin film and PC circuits

FEATURES 特征

- Ready - to - use
- Highly compatible with widely used photoresists
- Etches copper with straight sides
- Easily processed

PRINTED CIRCUIT COPPER ETCHANTS

DESCRIPTION 描述

Transene Printed Circuit Copper Etchants (CE-100 and CE-200) are ferric chloride solutions formulated with proprietary wetting antifoam plus chelating additives to optimize etching performance. Ferric chloride solutions are the most widely used etchants for copper, copper alloys and Kovar in printed circuit board applications. The etchants are highly compatible with commonly used photoresists (KPR, DYNACHEM, AZ, RISTON, SCREEN RESISTS, etc.) These etchants should not be used when solder-plated resists are employed.

APS-100 Copper Etchant is formulated for controlled etching providing fine line definition suitable for thin film circuits. Additionally, compatibility with nickel and tin-lead solders is assured.

PC COPPER ETCHANTS

	<u>CE-100</u>	<u>CE-200</u>	<u>APS-100</u>
Etchant type 蚀刻类型	Immersion	Spray	Immersion/Spray
	Dip or Spray		
Operating Temperature 工作温度	40-60 °C	40-60 °C	30-40 °C
Etch Rate@ 40 °C 蚀刻率	1 mil/min	.5 mil/min.	80Å/sec.
Time to etch 1oz. copper	1 1/2 min.	3 minutes	7 1/2 min.
Etch capacity 蚀刻能力	19 oz. Cu/gal.	14 oz Cu/gal.	10 oz Cu/gal.

APPLICATION 应用:

Copper Immersion Etchant (CE-100) is supplied ready-to-use. Recommended operating temperature is 40-60 °C. Many users discard spent etchant at 50% solution exhaustion (i.e. after etching 8-10 oz. Cu metal/gal.) and replace with fresh etchant.

After etching 8 oz. Cu metal/gal. etch rates may become longer than desired. Addition of 500 ml HCl (37%) per gallon of etchant will effectively increase etch rate and allow use of etchant to 70% solution exhaustion (14 oz. Cu metal/gal.) Agitation of work in the etchant bath is advisable and will increase etch rates and improve definition.

Copper Spray Etchant (CE-200) is supplied ready-to-use. The recommended operating temperature is

40-60 °C. Its use is recommended for spray etching techniques and will provide precision etching at controlled rates. Spent etchant should be discarded and replaced with fresh etchant when etch rates become longer than desired. (i.e. 7-8 oz. Cu metal/gal.)

After etching with either CE-100 or CE-200, rinse work with heavy water spray followed by a rinse with 5 - 10% HCl (or oxalic acid) then final water spray.

ETCHING TANK AND EQUIPMENT - DISPOSAL OF SPENT ETCHANT

Use PVC, glass, or epoxy-coated tanks. Heaters may be quartz, carbon or titanium (nickel or cobalt-steel may also be used). Neutralize spent CE-100/200 with calcium carbonate and dilute with water. Sewer disposal is not recommended.

6. GALLIUM ARSENIDE ETCHANTS(砷化镓蚀刻剂)

GA Etch 100

Based on sulfuric acid/hydrogen peroxide chemistry.

GA Etch 200

An ammonium hydroxide-hydrogen peroxide blend.

GA Etch 300

Utilizes a mildly acidic citric acid-hydrogen peroxide formulation to achieve greater versatility.

DESCRIPTION 描述:

Gallium arsenide etchants offer isotropic or anisotropic etching of gallium arsenide and ternary compounds such as gallium indium arsenide and aluminum gallium arsenide. Clean, uniform etching is available in combination with silicon dioxide masks.

Three etching systems are offered. GA Etch 100 is an acidic, isotropic etchant with fast etch rate. GA Etch 200 is an alkaline anisotropic etchant for optimal etch control. GA Etch 300 provides greater versatility, broad photoresist compatibility, and an extended shelf life. All GA Etches require cold storage conditions.

PC COPPER ETCHANTS

	<u>GA Etch-100</u>	<u>GA Etch-200</u>	<u>GA Etch-300</u>
Appearance 外观	Clear, colorless liquid	Clear, colorless liquid	Clear, colorless liquid
pH	< 2	>10	6-7
Storage Temperature 贮藏温度	40-50°F	40-50°F	40-50°F
Shelf Life 保存限期	3 months	2 months	3 months
Etch Rate 蚀刻率	100 nm/sec @ 40°C	20 Å/sec @ 5°C	22 Å/sec @ 25°C
Chemistry	Sulfuric-peroxide	Hydroxide-peroxide	Citric acid-peroxide

APPLICATION 应用:

GA Etches may be used in Pyrex, HDPE, Teflon, or other tank materials. Surface smoothness may be controlled by varying the agitation rate. Transene's proprietary stabilizer package allows for consistent etch results over a longer time frame than typically available from peroxide chemistries.

All GA Etches are manufactured using high purity raw materials such as semi of ACS Reagent chemicals and 1018 Mohm.cm resistivity deionized water.

7. Gallium Phosphide Etchant(用于发光二级管的磷化镓蚀刻剂) For Light Emitting Diodes

Controlled chemical etching of gallium phosphide for light emitting diodes, (LED), and matrix arrays with dielectric isolation.

FEATURES 特征

- Produces polished, unpitted surface
- Does not attack silica or titanium masks or beam lead metallizations
- Removes surface damage
- Etches <100> and <111> crystal orientations
- Etch rate 5 mils/hour at 80 °C

GALLIUM PHOSPHIDE ETCHANT DESCRIPTION 描述:

Transene Gallium Phosphide Etchant is an effective etchant designed for the fabrication of light emitting diodes and diode matrix arrays. It offers controlled chemical etching of gallium phosphide to produce mesa structures required for efficient LED and for the separation of LED to generate matrix arrays of alpha numeric displays. During the separation the LED can be shaped into domed structures also essential for efficient electroluminescent devices. The etchant is, furthermore, compatible with lead beam technology.

Transene Gallium Phosphide Etchant exhibits a high etch rate for all crystal orientations. All crystal faces of the <100> orientation of GaP are etched uniformly, producing a polished, unpitted surface. The faces of the <111> orientation etch differently; the <111> (Ga plane A face) develops a smooth orange-peel surface, whereas the <111> (P plane B face) becomes smooth, polished and unpitted. N- and P-type GaP have equivalent etch rates.

GaP Etchant is stable, non-toxic, economical and easily used for the state-of-the-art gallium phosphide LED and beam lead electroluminescent devices. The etchant does not attack Pd, Au or Pt lead beam metallizations. Ti and SiO₂ masks show minimal attack.

PROPERTIES OF GALLIUM PHOSPHIDE ETCHANT 性质

Appearance 外观	Amber liquid
Boiling point 沸点	> 100 °C
pH	13 - 14
Solvent Rinse 溶剂冲洗	H ₂ O
Etch Rates at 80 °C in Microns/hour 蚀刻率	
P-Type <100>	210

N-Type <100>	210
P-Type <111>	
A Face (Gallium)	115
B Face (Phosphorus)	210
Compatible Dielectric Material 兼容绝缘材料	Sputtered or Silane SiO ₂
Compatible Masking Material 兼容掩模材料	SiO ₂ , Ti, Au, KMER
Compatible Beam Lead Materials 兼容梁式引线材料	Ti, Pd, Au, Cr, Pt
Recommended Oper. Temp. 工作温度	70-80 °C
Etch Capacity 蚀刻率	12 grams/liter

APPLICATION 应用:

Transene Gallium Phosphide Etchant is employed in several manufacturing operations for the production of light emitting diodes. The etchant may be used first to remove surface damage of mechanically polished p-type and n-type gallium phosphide. The following procedures are generally followed for device fabrication:

1. Formation of mesa configuration with GaP etchant and SiO₂ as a mask.
2. Beam lead metallization and contact metallizations using photoresist techniques.
3. Separation of GaP wafer into individual dies, by partial cutting with abrasive dicing machines followed by chemical etching with Transene GaP Etchant.

8. Gold Etchants(用于微电子中的金蚀刻剂) for Microelectronics Circuits

Selective etchants for gold, compatible with negative and positive photoresists-used in thin film microelectronics to develop circuit elements.

- Etching readily controlled with minimum undercutting — provides excellent definition.
- 蚀刻中容易控制最小凹槽-提供极好的清晰度
- Room-temperature operated. 常温(约 20 摄氏度) 工作
- Uniform etch rates 恒定蚀刻率
- Economical 节约的

GOLD ETCHANT TFA / GE-8148 DESCRIPTION 描述:

These thin film etchants are used to obtain selective etching of gold in the photo fabrication of microelectronic circuits. Used in conjunction with photoresist technology, these etchants form precise electrodes and resistor patterns in thin films prepared on alumina and other substrates.

High purity, low sodium and 0.2 micron filtration for semiconductor and microelectronics applications.

高纯度, 低钠, 0.2 微米渗透

Gold Etchant TFA - Cyanide free for standard applications.

金蚀刻剂 TFA 不含氰化物

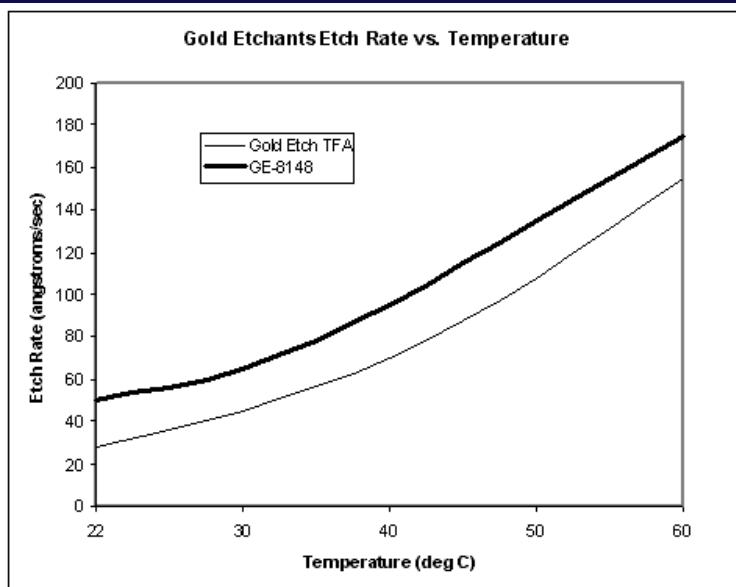
GE-8148 - Cyanide free, no attack of nickel films.

	TFA	GE-8148
Operating Temperature 工作温度	Room Temperature 常温(约 20 摄氏度)	Room Temperature
Ventilation 通风	Hood recommended 建议加机罩	Hood recommended
Agitation 搅动	Work agitation; Speed accelerates etch rate 工作搅动, 加速蚀刻率	Work agitation; Speed accelerates etch rate
Tank 容器	Glass 玻璃制品	Glass
Etch Rate @ 25 °C 蚀刻率	28Å/sec.	50Å/sec.
Composition 成分	Ready -to - use liquid Contains KI-I ₂ complex	Ready -to - use liquid Contains KI-I ₂ complex -

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		Phosphate compound
pH @ 20 °C		8.15 0.2
Density @ 20 °C		1.265 0.01
Etch Capacity gm/gal 蚀刻容量	100	100
Resist Compatibility	Neg & Pos.	Neg. & Pos.
Rinse 冲洗	Distilled, Dionized Water 除去离子水	
Waste Disposal 废物处理 (Reclaim Gold in spent etchant.)	Dispose in accordance with all federal, state and local regulations. Send waste to an approved waste disposal facility.	



Max. Impurity (ppm, Gold Etch TFA)

Sodium (Na)	40
Chlorine & Bromides (Cl)	100
Lead (Pb)	5
Iron (Fe)	3
Sulfur (as sulfates)	50
Phosphorous (as phosphates in TFA)	10

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GOLD ETCHANT

GE-8110

GE-8111

GE-8110 and GE-8111 Gold Etchants are etching solutions designed specifically for etching thin films of gold in the fabrication of semiconductor devices and thin film microelectronics. The solutions are based on potassium iodide and iodine (KI/I₂) chemistry and do not contain cyanide. They are compatible with both positive and negative photoresist materials, giving controllable line definition. GE-8110 is buffered to approximately pH 8.0 while GE-8111 is acidic with a lower solids content and is a slower acting etching solution. Both etchants should be used at room temperature in a well-ventilated area.

Physical and Chemical Properties 物理和化学性质:

Appearance and odor: dark brown liquid with iodine vapor odor.

	GE-8110	GE-8111
pH (20 °C)	7.9 0.1	2.5 0.1
Density (20 °C)	1.33 0.01	1.15 0.01
Etch Rate	20Å/sec	30Å/sec

REAGENT GRADE CHEMICAL 试剂等级

IMPURITY 杂质	SPEC. PPM (MAX) 百万分率
MAX-IMPURITY PPM	
Sodium (Na) 钠	40
Chlorine & Bromides (Cl) 氯	100
Lead (Pb) 铅	5
Iron (Fe) 铁	3
Sulfur (as sulfates) 硫	50

Storage and Handling

Store at room temperature away from sunlight. Keep container sealed when not in use. Iodine vapor can irritate the eyes severely. Open in ventilated areas. In case of contact with eyes or skin, wash with plenty of water (or soapy water for skin), and consult a physician if irritation persists.

GOLD ETCHANT TFAC FOR INTERMETALLIC SUBSTRATES

DESCRIPTION 描述:

Gold Etchant TFAC is a selective etchant for the preparation of microelectronic circuits on gallium arsenide, gallium phosphide, and other intermetallic semiconductor compounds. Gold Etchant TFAC provides excellent definition with minimal undercutting. Uniform etch rates are obtained with this cyanide based etchant. Gold Etchant TFAC strips gold from copper, brass, bronze, nickel, and other non-ferrous metals (except silver). Gold Etch TFAC is compatible with aluminum.

PROPERTIES 性质:

Operating Temperature 工作温度	Room Temperature
Ventilation 通风	Hood
Agitation 搅动	Work agitation speed accelerates etch rate
Tank	Polypropylene
Etch Rate 10Å@ 25 °C 40Å@ 40 °C	5-10 Angstroms/second 30 angstroms/second
Composition 成分	Cyanide-containing powder. Dilute with water (8oz /gal) prior to use.
Etch Capacity @ 60 °C 蚀刻能力	65 x 10 ⁻⁶ inches in 2 minutes
Rinse 冲洗	Water
Disposal 处理	See Below

APPLICATION 应用:

Warm water to approximately 50 °C to aid dissolution. Add 8oz Gold Etchant TFAC powder per gallon deionized water. Etch the conductor pattern to remove gold; etch time depends on thickness. Spent etchant should be saved for gold reclamation.

Disposal: Segregate solution. Cyanide should be handled carefully and disposed of according to local and state regulations.

9. Tin Oxide(氧化锡-氧化铟锡蚀刻剂)

Indium Tin Oxide Etchant TE-100

Tin Oxide/Indium Tin Oxide Etchant TE-100 is a selective etchant for tin oxide and indium tin oxide (ITO) layers in microelectronics applications. TE-100 effectively etches ITO and tin oxide films deposited on ceramics, dielectrics, semiconductors, and many metals. TE-100 provides excellent definition and etch rate control. Broad compatibility with positive and negative photoresists is offered. TE-100 is not compatible with nickel, copper, nichrome, and aluminum.

APPLICATION 应用:

ITO films are best prepared by first depositing a film of indium-tin. The indium-tin film is then oxidized in an oxygen plasma or at elevated temperatures in an oxygenating atmosphere. When etched, indium is solublized as a trivalent aquocomplex $[\text{In}(\text{H}_2\text{O})_6]^{3+}$ while tin forms a $[\text{SnCl}_6]^{2-}$ anion.

PROPERTIES 性质:

Appearance 外观	Dark amber
Etch Rate @ 25 °C 蚀刻率	15-20 Å / sec (immersion)
Operating Temperature 工作温度	40-50 °C
Rinse 冲洗	Deionized Water
Storage 贮藏	20-25 °C
Shelf Life 保存限期	1 year at 15-25 °C

10. Iron Oxide Mask Etchant(氧化铁掩模蚀刻剂)

Fabrication of Fe₂O₃ See-through Masks

Iron Oxide Mask Etchants are recommended for generating patterns used as electron resist masks or as semi-transparent see-through masks on glass for photoresist imaging in the manufacture of microelectronic devices.

The fabrication of solid state devices depends heavily on the use of photolithography for definition of patterns. The current technique using ferric oxide see-through masks represent the best choice when employed with a suitable etchant. Two such etchants are offered: Type ME-10 standard and Type ME-30 for a minimum cost.

The ferric oxide see-through mask on glass allows simple alignment and smaller geometries, now requisite for the micro-electronics industry. With ferric oxide masks, unwanted light is absorbed, rather than reflected, as with chromium masks. Halation effects are therefore minimized. In addition, ferric oxide masks offer much lower pinhole density, particularly important in large scale integration.

The etch rates are somewhat variable with the thermal history of ferric oxide. At high heat, Fe₂O₃ becomes insoluble in dilute acids. CVD material produced at over 180 °C exhibits insolubility. Therefore, for ease of etching, the temperature of formation of Fe₂O₃ film should be less than 160 °C. To provide control in mask-making, a thickness of 2000 ± Å is recommended.

PROPERTIES OF IRON OXIDE MASK ETCHANTS

	<u>ME-10</u>	<u>ME-30</u>
Description 描述	Liquid - light green	Liquid-clear
Etch Rate 蚀刻率	50 Å/sec	25 Å/sec. (with Fe ₂ O ₃)
@ room temperature		deposited @ 155 °C
Rinse 冲洗	Water	Water
Shelf Life 保存限期	6 Months	1 Year
Flash Point 闪点	None	None
Compatibility 兼容性	Neg & Pos. Photoresist	Same
Pinhole Density 小孔密度	Zero Defects	> 0
Resolution 分辨率	< 1 micrometer	1 micrometer

APPLICATION 应用

Use standard photo-lithographic techniques for imaging and pattern formation; then follow recommended etch procedure:

1. Immerse ferric oxide-coated plates in etchant @ 25 °C.
2. Provide mild mechanical agitation or solution movement.
3. After complete removal of exposed oxide film, rinse in deionized water bath.

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11.Kapton Polyimide Film Etchant 聚酰亚胺膜蚀刻剂

AN ETCHING REAGENT FORMULATED FOR POLYIMIDE/COPPER LAMINATES, COMPATIBLE WITH PHOTORESIST PROCESSES - RISTON, EASTMAN KODAK, AND DYNACHEM.

ETCH RATE 蚀刻率	
40 °C	0.013 MILS/MINUTE
60 °C	0.07 MILS/MINUTE
RINSE	WATER
STORAGE	ROOM TEMPERATURE
DISPOSAL	DISPOSE OF ACCORDING TO LOCAL, STATE, AND FEDERAL REGULATIONS.

12.Moly Etchant - TFM

Tungsten Etchant - TFW

TFM 钼蚀刻剂和 TFW 钨蚀刻剂

Selective etchants for molybdenum and tungsten thin-film metallizations used in semiconductor and microelectronics technology. TFM and TFW selective etchants are buffered, mildly alkaline ferricyanide-based formulations providing high resolution patterns with minimal undercutting and photoresist compatibility. Controlled, uniform etching is achieved by immersion or spray etch technique.

PROPERTIES 性质

	MOLY ETCH TFM	TUNGSTEN ETCH TFW
Appearance 外观	Amber, aqueous solution	Amber, aqueous solution
pH	10.0	8.0
Dilution 稀释	Distilled Water	Distilled Water
Compatible Photoresists 兼容光刻胶	Negative: PKP (Transene) KMER,KTFR,KPR	Negative & positive
Rinse 冲洗	Distilled Water	Distilled Water
Flash Point 闪点	Non-Flammable	Non-Flammable

	Mo	W
Etch Rate 蚀刻率	-----	30Å/sec. (immersion)
20 °C	-----	80Å/sec. (spray)
30 °C	55Å/sec.	140Å/sec.
60 °C	85Å/sec.	250Å/sec.
Etch Capacity 蚀刻能力	30 grams/gallon	64 grams/gallon (10,000 in ² /5000Å thick

13. Nichrome Etchants TFC and TFN(镍铬合金蚀刻剂)

Nichrome Etchants TFN and TFC are designed for etching nichrome thin films in microelectronics applications. Nichrome Etchants are compatible with positive and negative photoresists and provide fine-line control with minimal undercutting. High purity formulations filtered to 0.2 micron are well suited to critical microelectronic applications.

NICHROME ETCHANT TFC

Slower etch rate for precise control.

NICHROME ETCHANT TFN

Minimal undercutting with excellent fine-line control. Consistent operation.

FEATURES 特征:

- High purity
- 0.2 micron filtration
- Compatibility with positive and negative photoresists
- Fine line control
- Uniform etch rates

NICHROME ETCHANTS TFC AND TFN

DESCRIPTION 描述:

Transene Nichrome Etchants TFC and TFN are high purity systems based on ceric sulfate and ceric ammonium nitrate, respectively. Nichrome Etchants provide clean, precise etching of evaporated nichrome layers for the preparation of thin film circuits. Nichrome Etchants contain semiconductor grade ingredients for ultra-high purity and are filtered to 0.2 microns to remove particulates.

PROPERTIES 性质:

	TFC	TFN
Appearance 外观	Clear orange	Clear orange
Chemistry Base	Ceric Sulfate	Ceric Ammonium Nitrate
Specific Gravity 比重	1.09-1.10	1.127-1.130
Filtration 过滤	0.2 microns	0.2 microns
Operating Temperature 工作温度	25 °C	40 °C
Etch Rate 蚀速率	30 Å /sec @ 25 °C	50 Å /sec @ 40 °C
Etch Capacity 蚀刻能力	168g/gal	-----
Rinse 冲洗	1% Sulfuric acid/ deionized water	Deionized water

APPLICATION:

Nichrome Etchants may be operated at room temperature or elevated temperature to increase etch rates. Nichrome Etchant TFC may require a rinse with 1 % sulfuric acid followed by a deionized water rinse to remove etch residue. Nichrome Etchant TFN is an improved formulation which etches more cleanly, eliminating the need for an intermediate rinse.

14.Nickel Etchants(薄膜电路镍蚀刻剂)

For Thin Film Circuits

Etchants for evaporated or electroplated nickel films. Good compatibility with positive and negative photoresists. Ideal for gold / nickel / nichrome or chromium resistor boards with alumina substrates.

NICKEL ETCHANT TFB

Standard nickel etchant for evaporated nickel films.

NICKEL ETCHANT TFG

High purity etchant for electrodeposited nickel films. Nickel Etchant TFG is compatible with copper, gallium arsenide, and other III -V compounds.

NICKEL ETCHANT TYPE I

High purity etchant for nickel, nickel-iron alloys, and stainless steel.

FEATURES 特征

- Economical
- Compatible with positive and negative photoresists
- Excellent fine line definition
- Uniform etch rates

NICKEL ETCHANTS DESCRIPTION 描述:

Transene Thin Film Nickel Etchants (Nickel TFB and Nickel TFG) are high-purity nitrate-based formulations for superior etching of evaporated or electroplated nickel films. Nickel Etchants are compatible with both positive and negative photoresist materials. Recommended resists include AZ-111, AZ-1350 OH, and KMER. Nickel Etchants are commonly employed in the manufacture of resistor boards where films of gold, nickel, and nichrome or chromium are to be etched. Nickel Etchant TFG is compatible with copper.

PROPERTIES 性质:

Etchant Type 蚀刻类型	TFB	TFG
Operating Temperature 工作温度	25 °C	40 °C
Etch Rate 蚀刻率	30 Å/sec	50 Å/sec
Nickel Deposition 镍沉积	Evaporated / sputtered	Electroless / Electroplated
Etch Capacity 蚀刻能力	270 grams / gal	100 grams/gallon
Typical Film Thickness 典型薄膜厚度	1500 Å/ 5-50 micro inches	-----
Tank 槽	Glass	Glass

APPLICATION 应用:

Nickel Etchants are supplied ready-to-use as immersion type etchants. Etch rates may be controlled via operating temperature. Nickel is normally sandwiched between gold and nichrome or chromium on an alumina substrate. Either evaporative or electroless nickel may be employed. Actual etch is related to film thickness and operating temperature but is typically approximately one minute for evaporative nickel and about four minutes for electroless nickel. Etching should be followed with a deionized water rinse.

Nickel Etchant Type I

Nickel Etchant Type I is a high purity etchant for nickel, nickel-iron alloys, iron, iron oxide, and some types of stainless steel. Copper is also etched by Nickel Etchant Type I. Compatible with a wide range of photoresists (including KPR, Dynachem, AZ, Riston, and Screen Resists). Nickel Etchant Type I contains metal chelating ingredients for optimal performance. Nickel Etchant Type I will not attack gold films.

PROPERTIES 性质:

Operating Temperature 工作温度	30-60 °C
Tank	Glass
Rinse 冲洗	Water
Etch Rate-蚀刻率 Ni	3 mil/hr @ 40°C
Etch Rate-蚀刻率 Ni-Fe	400 Å/sec @ 50°C
Etch Rate-蚀刻率 Stainless Steel (AISI 316 grade)	45 Å/sec @ 30°C 105 Å/sec @ 25°C
Etch Rate-蚀刻率 Stainless Steel (AISI 304 grade)	500 Å/sec @ 45°C
Etch Rate-蚀刻率 Fe ₂ O ₃	50 Å/sec @ 50°C
Etch Rate-蚀刻率 Cu	1 mil /min @ 40°C
Agitation 搅动	Continuous, mild

APPLICATION 应用:

Nickel Etchant Type I is used at elevated temperatures, typically 30-60°C. Continuous agitation is required for uniform, consistent results. A variety of metal, metal alloy, and metal oxide materials may be etched with Nickel Etchant Type I.

15.NICKEL VANADIUM ETCHANT NiV 28-23(镍钒蚀刻剂)

DESCRIPTION 描述:

Transene Thin Film Nickel Vanadium Etchant NiV 28-23 is a high-purity nitrate-based formulation for superior etching of evaporated nickel-vanadium alloy. NiV 28-23 is compatible with both positive and negative photoresist materials. Recommended resists include AZ-111, AZ-1350 OH, and KMER. NiV 28-23 etchant meets SEMI grade standards and is filtered to 0.2 micron.

PROPERTIES 性质:

Etchant Type 蚀刻类型	Nickel Vanadium NiV 28-23
Operating Temperature 工作温度	25 °C
Etch Rate 蚀刻率 (varies with ratio)	25-35 Å/sec
Alloy Deposition 合金沉积	Evaporated / sputtered
Etch Capacity 蚀刻能力	220 grams / gal
Typical Film Thickness 典型薄膜厚度	1500 Å/ 5-50 micro inches
Tank	Glass

APPLICATION 应用:

Nickel Vanadium Etchant NiV 28-23 is supplied ready-to-use as an immersion type etchant. Etch rates may be controlled via operating temperature. Actual etch is related to film thickness, alloy makeup, density, and operating temperature but is typically approximately one minute for evaporative deposits. Etching should be followed with a deionized water rinse.

16. Palladium Etchants(钯蚀刻剂\铂蚀刻剂) Platinum Etchant

PALLADIUM ETCHANT TFP

Palladium Etchant TFP is designed for high resolution pattern delineation of sputtered, evaporated and electrolessly deposited films. These films are commonly employed barrier layers for silicon wafer metalization systems of nickel and gold.

PROPERTIES 性质:

Appearance 外观	Dark Amber Aq. Sol.
pH	< 1
Flash Point 闪点	Non-Flammable
Storage 贮藏	Room-Temperature
Shelf/Life 保存限期	1 year
Toxicity 毒性	Acid

OPERATION:

Tank	Glass/Pyrex/PVC
Temperature 温度	40-60 °C
Etch Rate 蚀刻率	110Å/Sec @ 50°C
Rinse 冲洗	Water
Compatible Resists	Pos. & Neg.
Metallization 镀金属	Gold/Ni-gold

PALLADIUM ETCHANT 1:1

Palladium Etchant 1:1 A and B is suitable for etching thin films of palladium metal. Palladium Etchant 1:1 is a two part system which must be mixed in equal parts immediately prior to use. Broad compatibility with other materials including photoresists and a moderate etch rate are properties of Palladium Etchant 1:1.

Special handling of this cyanide-containing material is required.

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PALLADIUM ETCHANT EC

Palladium Etchant EC is formulated for precise electrochemical etching of palladium substrates. Electrochemical etching allows for targeted etching of the substrate material.

OPERATION 操作:

Appearance 外观	Transparent Solution
pH	< 1
Temperature 温度	25-30 °C
Power 功率	10 V DC
Cathode Shelf Life	Graphite
Shelf Life 保存限期	6 months

PLATINUM ETCHANT 1:1

Platinum Etchant 1:1 A and B is suitable for etching thin films of platinum metal. Platinum Etchant 1:1 is a two part system which must be mixed in equal parts immediately prior to use. Broad compatibility with other materials including photoresists and a moderate etch rate are properties of Platinum Etchant 1:1.

Platinum Etchant 1:1 is best for e-beam evaporated platinum films. Mechanical abrading or plasma treatment of the surface is required for successful etch results.

Special handling of this cyanide-containing material is required.

17. Preferential Silicon Etchants(择优硅蚀刻剂)

Anisotropic etching of silicon on the $\langle 100 \rangle$ and $\langle 110 \rangle$ crystal orientation planes.

PREFERENTIAL SILICON ETCHANT - PSE-200

Alkali based - for $\langle 110 \rangle$ crystal orientation - etches with vertical walls.

PREFERENTIAL SILICON ETCHANT - PSE-300, PSE-300F

Ethylenediamine based - for $\langle 100 \rangle$ crystal orientation.

PREFERENTIAL SILICON ETCHANTS

DESCRIPTION 描述

Preferential Silicon Etchants are preparations which have the greatest etch rate on a specific plane of orientation. These anisotropic etchants are used in lead beam technology to separate silicon chips and a technique to obtain electrical isolation within integrated circuit chips. The etching systems may also be used for chemical shaping of silicon and as etchants with photomask of Ag, Cu, Au, Ta, or SiO_2 as these materials are not etched.

Two etching systems are offered: PSE-200 is alkali-based, is safe to use and has a fast etch rate. It is used to etch deep-wall patterns in silicon. PSE-300 is ethylenediamine-based and has a moderate etch rate. For faster etching, PSE-300F is available.

PROPERTIES OF PREFERENTIAL SILICON ETCHANTS 性质

	PSE-200	PSE-300
Appearance 外观	Odorless, colorless liquid	Clear liquid
Composition 成分	Alkali-based	Ethylenediamine-based
Boiling Point 沸点	$> 100^\circ\text{C}$	118°C
Oper. Temp 工作温度	$75\text{-}100^\circ\text{C}$	100°C
Preferred Operation	$\langle 110 \rangle$ direction	$\langle 100 \rangle$ direction
Other Common Orientations	----	$\langle 110 \rangle$ can be used
$\langle 111 \rangle$ Plane		$\langle 111 \rangle$ negligible
Etch Rate 蚀刻率	1 mil/3 min. @ 100°C	25 /hr. $\langle 100 \rangle$
Etch Rinse 蚀刻冲洗	Water	Water
Metallization	Attacks Al; does not attack Au; mild attack on Ag	No attack on Au, Ta; Attacks Al, Cu; mild attack on Ag
SiO_2	Will attack Use as mask	Negligible

APPLICATION 应用

The etching process using PSE-300 is best carried out in a flask fitted with a reflux condenser. The flask should be heated gently so that the etchant is just at the boiling point. PSE-200 is commonly used with a thermally grown silica mask for etching mesas. It is employed at approximately the boiling point of the preparation. Oxides present on the silicon wafer may interfere with all etching; a preliminary dip in HF or buffered HF is desirable. Of the two etchants, PSE-300 is the safer product.

Reagent Semiconductor Etchants

Pre-mixed and ready-to-use etchants containing electronic quality nitric-acid-HF-acid mixtures for silicon, germanium, gallium, arsenide and other semiconductor materials.

Special Silicon and Germanium Etchants

<u>Product No:</u>	<u>Etchant</u>	<u>RT Etch Rate:</u>
RSE-100	Slow Silicon Etch	12-15Å/sec
RSE-200	Mesa Etch	100Å/sec
RSE-563	Germanium Etchant	250Å/sec

Standard Nitric-HF-Acid Etch

Product No:	Etchant Ratio
RSE-101	10:1
RSE-41	4:1
RSE-31	3:1
RSE-12	1:2

Standard Nitric-HF-Acetic Etch

Product No:	Etchant Ratio
RSE-533	5:3:3
RSE-511	5:1:1
RSE-111	1:1:1
RSE-322	3:2:2
RSE-1155	11:5:5
RSE-563	5:6:3

SPECIAL PROPRIETARY FORMULATIONS IN ANY RATIO CAN BE PROVIDED.

18.Silver Etchant(用于微电子电路中的银蚀刻剂) for Microelectronics Circuits

Selective etchant for silver, compatible with negative and positive photoresists-used in thin film microelectronics to develop circuit elements.

- Etching readily controlled with minimum undercutting — provides excellent definition.
- Room-temperature operated.
- Uniform etch rate
- Economical

Silver Etchant TFS DESCRIPTION 描述:

This thin film etchant is used to obtain selective etching of silver in the photo fabrication of microelectronic circuits. Used in conjunction with photoresist technology, this etchant forms precise electrodes and resistor patterns in thin films prepared on alumina and other substrates.

High purity, low sodium and 0.2 micron filtration for semiconductor and microelectronics applications.

Silver Etchant TFS - Cyanide free for standard applications.

	TFS
Operating Temperature 工作温度	Room Temperature
Ventilation 通风	Hood recommended
Agitation 搅动	Work agitation; Speed accelerates etch rate
Tank 槽	Glass
Etch Rate @ 25 °C 蚀刻率	200Å/sec.
Composition 成分	Ready -to - use liquid Contains KI-I ₂ complex
pH @ 20 °C	
Density @ 20 °C 密度	
Resist Compatibility	Neg & Pos.

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Rinse 冲洗	Distilled, Dionized Water
Waste Disposal 废物处理 (Reclaim Silver in spent etchant.)	Dispose in accordance with all federal, state and local regulations. Send waste to an approved waste disposal facility.

Max. Impurity (ppm) 杂质

Sodium (Na) 钠	40
Chlorine & Bromides (Cl) 氯	100
Lead (Pb) 铅	5
Iron (Fe) 铁	3
Sulfur (as sulfates) 硫	50
Phosphorous (as phosphates) 磷	10

19.TANTALUM ETCHANTS SIE-8607 and 111(钽蚀刻剂)

DESCRIPTION 描述:

Transene Tantalum Etchants SIE-8607 and 111 are high purity etchant systems for precise, clean etching of tantalum, tantalum nitride, and tantalum oxide thin films and resists in electronics applications. Tantalum Etchant SIE-8607 is a more aggressive etchant for faster etch rates. Tantalum Etchant 111 is a slower etching solution for optimum control and is more effective for removing tantalum oxide layers. Both etchants are filtered to remove all particulates above 0.2 microns.

PROPERTIES 性质:

	Tantalum Etch SIE-8607	Tantalum Etch 111
Appearance 外观	Clear	Clear
Solubility 溶解性	Infinite in water	Infinite in water
Filtration 过滤	0.2 microns	0.2 microns
Operating Temperature 工作温度	25 °C	25 °C
Etch Rate (Ta), 25 °C 蚀刻率	70-80 Å / sec	30-40 Å / sec
Storage 贮藏	Room Temperature	Room Temperature
Shelf Life 保存限期	1 year	1 year
Mask Materials	Gold; Positive or Negative Photoresists	Gold; Positive or Negative Photoresists
Rinse 冲洗	Deionized Water	Deionized water

APPLICATION 应用:

Etch times vary depending on material type (Ta, TaN, or Ta₂O₅) and purity. Parts to be etched should be placed in etchant solution with mild to moderate mechanical agitation. Tantalum Etchants contain hydrofluoric acid and will attack silicon oxides, titanium, nickel, aluminum, and chromium.

20.TITANIUM ETCHANTS(钛蚀刻剂)

Selective and controllable etchants for application in semiconductor fabrication and thin film microelectronics technology.

Titanium Etchant TFT

Designed for etching evaporated films commonly employed as bonding and barrier layers in microelectronics. Excellent resolution, photo resist compatibility, and minimal undercutting are readily achieved.

Titanium Etchant TFTN

Intended for etching Ti films deposited on glass or SiO₂ substrates. TFTN does not contain hydrofluoric acid.

PROPERTIES 性质:

	TFT	TFTN
Appearance 外观	Clear Aqueous Solution	Clear Aqueous Solution
pH	1	1
Flash Point 闪点	Non-Flammable	Non-Flammable
Storage 贮藏	Room Temperature	Room-Temperature
Shelf/Life 保存限期	1 year	1 year
Toxicity 毒性	Strong Acid	Strong Acid

OPERATION 操作:

	TFT	TFTN
Tank 槽	Polyethylene/ Polyethylene	Polyethylene/ Polyethylene
Temperature 温度	20°-50°C	70°-85°C
Etch Rate 蚀刻率	25Å/sec @ 20°C 50Å/sec @ 30°C	10Å/sec @ 70°C 50Å/sec @ 85°C
Rinse Water 冲洗	Water	Water
* Compatible Resists	Pos & Neg.	Pos & Neg.
Metallization		Most Metals Except Al

* KPR/KMER/KTFR: PKP (Transene); AZ/RISTON/ETC.

21. Ti-Tungsten TiW-30(钛钨蚀刻剂)

Ti-Tungsten TiW-30 is a selective etchant for titanium-tungsten adhesion layers in microelectronics applications. TiW-30 effectively etches Ti-tungsten films deposited on copper, silicon nitride, or silicon oxide. TiW-30 provides excellent definition and etch rate control. Broad compatibility with positive and negative photoresists is offered.

APPLICATION 应用:

Ti-Tungsten TiW-30 etchant is a ready-to-use solution specifically designed to remove titanium-tungsten alloy adhesion layers from substrates such as silicon dioxide and silicon nitride. TiW-30 will not attack copper or aluminum films. Heating the etchant to 40°C will speed the etch rate for thicker films.

PROPERTIES 性质:

Appearance 外观	Water white
Shelf Life 保存限期	2 months @ 25 °C 6 months @ 0 °C
Storage 贮藏	0 °C
Rinse 冲洗	Deionized Water
Etch Rate @ 25 °C 蚀刻率	10-15 Å / sec (immersion)
Operating Temperature 工作温度	25-40 °C

22.Moly Etchant - TFM

Tungsten Etchant - TFW

TFM 钼蚀刻剂和 TFW 钨蚀刻剂

Selective etchants for molybdenum and tungsten thin-film metallizations used in semiconductor and microelectronics technology. TFM and TFW selective etchants are buffered, mildly alkaline ferricyanide-based formulations providing high resolution patterns with minimal undercutting and photoresist compatibility. Controlled, uniform etching is achieved by immersion or spray etch technique.

PROPERTIES

	MOLY ETCH TFM	TUNGSTEN ETCH TFW
Appearance 外观	Amber, aqueous solution	Amber, aqueous solution
pH	10.0	8.0
Dilution 稀释	Distilled Water	Distilled Water
Compatible Photoresists	Negative: PKP (Transene) KMER,KTFR,KPR	Negative & positive
Rinse 冲洗	Distilled Water	Distilled Water
Flash Point 闪点	Non-Flammable	Non-Flammable

	Mo	W
Etch Rate 蚀刻率	-----	30Å/sec. (immersion)
20 °C	-----	80Å/sec. (spray)
30 °C	55Å/sec.	140Å/sec.
60 °C	85Å/sec.	250Å/sec.
Etch Capacity 蚀刻能力	30 grams/gallon	64 grams/gallon (10,000 in ² /5000Å thick

23. Transene Semiconductor and Thin Film Etchants Selection Guide

Transene 半导体和薄膜蚀刻剂选型指南

THIN FILM 薄膜	TRANSENE ETCHANTS 蚀刻剂	OPERATING RANGE 工作范围	RECOMMENDED RESIST	APPLICATION 应用
Al 铝	ALUMINUM ETCHANTS TYPE A TYPE D	@25 °C @ 40 °C 30 Å/sec 80 Å/sec 40 Å/sec 125 Å/sec	Negative* & Positive	Semiconductor & Integrated Circuits GaAs & GaP Devices
Al₂O₃	TRANSETCH N	120 Å/sec @ 180 °C	SiO ₂	Semiconductor Devices
BOE	BUFFERED OXIDE ETCHANT	Variable	Negative* & Positive	Semiconductor & Integrated Circuits
Cr 铬	CHROMIUM ETCHANTS CRE-473 Chromium Mask TFD 1020 1020AC	@ 25 °C @ 40 °C 14 Å/sec 25 Å/sec 50 Å/sec	Negative* & Positive	Thin Film Circuits
Cr-Si Cr-SiO	CHROMIUM CERMET TFE	1000 Å/min @ 50 °C	Negative*	Thin Film Circuits
Cu 铜	COPPER ETCHANTS CE-100 CE-200 APS-100	1 mil/min @ 50 °C 0.5 mil/min @ 50 °C 80 Å/sec @ 40 °C	Screen Resists Positive & Negative	P.C.Boards Thin Film Circuits
GaAs 砷化镓	GALLIUM ARSENIDE GA ETCH 100 GA ETCH 200 GA ETCH 300 AB ETCH	100 Å/sec @ 40 °C 20 Å/sec @ 5 °C 22 Å/sec @ 25 °C Defect Delineation	Negative	Microelectronic Circuits Semiconductor Testing
Ga₂O₃	GALLIUM OXIDE	10 sec @ 25 °C	Negative	Microelectronic Circuits
GaP	GALLIUM PHOSPHIDE	A Face(Ga): 115 micron/hr @ 80 °C B Face (P): 210 micron/hr @ 80 °C	Negative	Light Emitting Diodes
Ge 锗	GERMANIUM	250 Å/sec @ 20 °C	Negative* & Positive	Semiconductor Devices

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GaN	Gallium Nitride	80 Å/min @ 180 °C	SiO ₂	Semiconductor and Integrated Circuits
Au 金	GOLD ETCHANTS TFA TFAC GE-8148 GE-8110 GE-8111	28 Å/sec @ 25 °C 10 Å/sec @ 25 °C 50 Å/sec @ 25 °C 15 Å/sec @ 25 °C 15 Å/sec @ 25 °C	Negative* & Positive	Thin Film Circuits GaAs compatible Ni compatible
In₂O₃ ITO	INDIUM OXIDE INDIUM TIN OXIDE	30 min @ 25 °C	Negative	Microelectronic Circuits
InP	INDIUM PHOSPHIDE	30 mins @ 25 °C	Negative	Microelectronic Circuits
Fe₂O₃	IRON OXIDE MASK ETCHANT ME-10 ME-30	50 Å/sec @ 25 °C 25 Å/sec @ 25 °C	Negative* & Positive	Microelectronic Circuits
Polyimide 聚酰亚胺	KAPTON POLYIMIDE ETCHANT	0.013 mil/min @ 40 °C 0.07 mil/min @ 60 °C	Negative* & Positive	Polyimide/Copper Clad Laminates
Mo 钼	MOLY ETCHANT TFM	55 Å/sec @ 30 °C 85 Å/sec @ 60 °C	Negative*	Microelectronic Circuits
Nb NbN NbO	Niobium Niobium Nitride Niobium Oxide	50Å / sec @ 25 °C	Negative* & Positive	Microelectronics
Ni-Cr	NICHROME ETCHANTS TFC TFN	20 Å/sec @ 25 °C 50 Å/sec @ 40 °C	Negative* & Positive	Thin Film Circuits
Ni 镍	NICKEL ETCHANTS TFB TFG Type I	30 Å/sec @ 25 °C 50 Å/sec @ 40 °C 3 mil/hr @ 40 °C	Negative* & Positive	Thin Film Circuits
Ni-V	Nickel-Vanadium Etch	30 Å/sec @ 20 °C	Negative&Positive	Microelectronics
Pd 钯	PALLADIUM ETCHANTS Pd Etch 1:1 TFP	110 Å/sec @ 50 °C	Negative* & Positive	Semiconductor & Thin Film Circuits
Pt 铂	PLATINUM ETCHANT 1:1	10 Å/sec @ 25 °C	Positive	Semiconductor & Thin Film Circuits
REAGENT SEMICONDUCTOR ETCHANTS (RSE)				
Ru 钌	RUTHENIUM ETCH	50 Å/sec @ 20 °C	Negative&Positive	Microelectronics
SEMICONDUCTOR DEFECT DELINEATION ETCHANTS				
Si 硅	REAGENT SEMICONDUCTOR ETCHANTS (RSE)	Variable		Semiconductor Devices

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	SILICON SLOW ETCH SILICON MESA ETCH PREFERENTIAL SILICON ETCHANTS PSE 200 PSE 300 SOLAR CELL ETCHANTS SCE-200 SCE-300 WRIGHT ETCHANT WRIGHT-JENKINS ETCHANT SIRTL ETCHANT	Variable Variable 1 mil/3 min @ 100 °C 25 m/hr @ 100 °C 1 hr @ 75-100 °C 5-10 min @ 118 °C Defect Characterization Defect Characterization Defect Characterization	KMER PKP Type I <110> <100> <110> <100> N/A N/A N/A	Semiconductor Devices MEMS Semiconductors Solar Cells Semiconductor Testing Semiconductor Testing Semiconductor Testing
SiO₂	BUFFER HF IMPROVED BD ETCHANT SILOXIDE ETCH TIMETCH SILOX VAPOX III BUFFERED OXIDE ETCHANTS (BOE)	800 Å/min @ 25 °C Thermally Grown Variable 40 Å/sec @ 25 °C 90 Å/min @ 25 °C 4000 Å/min @ 22 °C Variable	Negative* & Positive	Semiconductor & Integrated Circuits PSG/BSG CVD CVD CVD
SiO	SILICON MONOXIDE ETCH	5000 Å/min @ 85 °C	Negative* & Positive	Semiconductor Devices
Si₃N₄	TRANSETCH N	125 Å/min @ 180 °C	SiO ₂ (Silox)	Semiconductor & Integrated Circuits
Ag 银	SILVER ETCHANT TFS	200 Å/sec @ 25 °C	Negative* & Positive	Semiconductor & Thin Film Circuits
Stainless Steel	Nickel Etch Type I	45 Å/sec @ 25 °C, AISI 316	Negative* & Positive	Alloys
Ta Ta₃N₅ Ta₂O₅	SIE-8607 Ta Etch 111	70 Å/sec @ 25 °C 30 Å/sec @ 25 °C	Negative* & Positive	Capacitors Semiconductors
TaSi	Tantalum Silicide Etch	50 Å/sec @ 20 °C	Negative&Positive	Thin Film Electronics/TD>
Ti 钛	TITANIUM ETCHANTS TFT TFTN	25 Å/sec @ 20 °C 50 Å/sec @ 30 °C 10 Å/sec @ 70 °C 50 Å/sec @ 85 °C	Negative* & Positive	Integrated Circuits SiO ₂ Compatible
TiN	Titanium Nitride Etch	30 Å/sec @ 20 °C	Negative&Positive	Microelectronics
Ti-W	TUNGSTEN ETCHANT	20-30 Å/sec	Negative* & Positive	TUNGSTEN ETCHANT

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	TiW-30			Adhesion Layer
W	TUNGSTEN ETCH TFW	140 Å/sec @ 30 °C	Negative* & Positive	Integrated Circuits
SnO	NESA ETCHANT TE-100	0.02 micron/min @ 20 °C	Screen Resists	Electronic Circuits
	ELECTRONIC GRADE CHEMICALS (SOLVENTS, ACIDS)			

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24. Etchant/Metal Compatibility Chart(Transene 蚀刻剂/金属匹配性表)

	Al 铝	Au 金	Cr 铬	Cu 铜	Ni 镍	Si 硅	Si ₃ N ₄	SiO ₂	Ti 钛	W	GaAs	Ta/TaN
Aluminum A	etch	ok	etch	etch	etch	surf ox	slight	ok	ok	ok	etch	surf ox
Aluminum D	etch	ok	slight	ok	ok	ok	slight	ok	ok	ok	ok	ok
Chromium Etch 1020	etch	ok	etch	etch	etch	surf ox	ok	ok	ok	ok	etch	surf ox
Chromium Etch CRE-473	etch	ok	etch	ok	slight	ok	ok	ok	etch	ok	etch	ok
Chromium Etch TFD	etch	ok	etch	etch	etch	surf ox	ok	ok	ok	ok	etch	surf ox
Copper Etch 100	etch	ok	slight	etch	etch	ok	ok	ok	slight	ok	etch	ok
Copper Etch 200	etch	ok	slight	etch	etch	ok	ok	ok	slight	ok	etch	ok
Copper Etch APS-100	ok	ok	ok	etch	slight	ok	ok	ok	ok	slight	NA	ok
GE-8110	etch	etch	ok	corrode	ok	ok	ok	ok	ok	ok	etch	ok
GE-8111	etch	etch	ok	corrode	ok	ok	slight	ok	ok	ok	etch	ok
GE-8148	etch	etch	ok	corrode	ok	ok	ok	ok	ok	ok	etch	ok
Gold Etch TFA	etch	etch	ok	corrode	slight	ok	ok	ok	ok	ok	etch	ok
Nichrome Etch TFC	etch	ok	etch	etch	etch	surf ox	ok	ok	ok	ok	etch	surf ox
Nichrome Etch TFN	etch	ok	etch	etch	etch	surf ox	ok	ok	ok	ok	etch	surf ox
Nickel Etch TFB	etch	ok	etch	etch	etch	surf ox	ok	ok	ok	ok	etch	surf ox
Nickel Etch TFG	etch	ok	ok	ok	etch	ok	ok	ok	ok	ok	ok	ok
Nickel Etch Type I	etch	ok	slight	etch	etch	ok	ok	ok	slight	ok	etch	ok
Silver Etch TFS	etch	etch	ok	corrode	slight	ok	ok	ok	ok	ok	etch	ok
Tantalum Nitride Etch III	etch	ok	etch	etch	etch	etch	ok	etch	etch	ok	etch	etch
Tantalum Nitride SIE-8607	etch	ok	etch	etch	etch	etch	ok	etch	etch	ok	etch	etch
Titanium Etch TFT	etch	ok	etch	ok	ok	ok	etch	etch	etch	ok	ok	ok
Titanium Etch TFTN	etch	ok	etch	slight	slight	ok	ok	ok	etch	ok	etch	ok
Ti-Tungsten TiW-30	ok	ok	ok	ok	slight	ok	ok	ok	slight	slight	etch	ok
Tungsten Etch TFW	etch	etch	etch	ok	etch	slight	ok	slight	ok	etch	etch	ok

LEGEND: etch = significant attach / slight = slight attack / ok = no attack / surf ox = surface oxidation / corrode 表面氧化/腐蚀 = surface corrosion 表面腐蚀

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