HIGH PURITY CHEMICAL INNOVATIONS FOR ELECTRONICS
电子工业的高纯度化学品
January 2005

MISSION STATEMENT
- TRANSENE COMPANY MANUFACTURES HIGH PURITY CHEMICALS AND MATERIALS USED IN SEMICONDUCTOR AND ELECTRONICS APPLICATIONS.
- TRANSENE IS COMMITTED TO PROVIDING CUSTOMERS WORLDWIDE WITH THE HIGHEST LEVEL OF VALUE THROUGH A COMBINATION OF SERVICE, PRODUCT DIVERSIFICATION, QUALITY, AND CONSISTENCY.

COMPANY HISTORY(公司历史)
- 1965 FOUNDED BY DR. BENJAMIN HECHT
- 1969 SUPPLIED MATERIALS USED IN FIRST MANNED FLIGHT TO THE MOON
- 1978 EXPANDED ROWLEY PLANT
- 1985 MARTIN HECHT, CURRENT PRESIDENT, ASSUMES LEADERSHIP
- 1992 ACQUIRED CHEMTECH, A MANUFACTURER OF ETCHANTS AND PHOTORESIST CHEMICALS
- 1994 EXPANDED VLSI WATER PURIFICATION SYSTEM FOR LARGER CAPACITY
- 1996 MOVED TO LARGER DANVERS PLANT
- 2004 ADDED ULSI WATER PURIFICATION SYSTEM

TRANSENE CUSTOMERS(TRANSENE 公司客户)
- GOVERNMENT(政府) < 5%
  –NIST, NREL , SANDIA, OAK RIDGE, LNL
- ACADEMIC(学院) < 5%
  –MIT (美国)麻省理工学院, HARVARD 美国哈佛大学,
  –UniVersity of California, Berkeley,美国加利福尼亚-伯克利大学
  –Simon Fraser University(Canada)
  –California Institute of Technology 加利福尼亚理工学院
- INDUSTRIAL (工业) > 90%
  - INTEL 美国英特尔公司, Motorola 美国摩托罗拉半导体公司,
    Fairchild 美国仙童(飞兆)半导体公司, National Semiconductor 美国国家半导体公司,
    IBM 美国国际商用机器公司, HITACHI 日立, NORTEL NETWORKS 北电网络,
    SAMSUNG 韩国三星公司,韩国 LG SILTRON, 美国 RAYTHEON, GE 通用电气公司,
    WINN SEMI, VISHAY GENERAL SEMI 美国通用半导体公司, BAE SYSTEMS,
  - Osram Opto Semiconductor 欧斯朗光电子半导体,
    Unipac in Taiwan 台湾联友光电股份有限公司

PRODUCT APPLICATIONS(TRANSENE 公司产品应用)

- COMPOUND SEMICONDUCTORS 化合物半导体
- MEMS FOR AUTOMOTIVE SENSORS (AIRBAGS, TIRE PRESSURE SENSOR)
- OPTICS 光学
- THIN FILM, HYBRID IC 薄膜,混合集成电路
- ETCHING OF MULTILAYER STACKS 多层堆栈蚀刻
- TELECOMMUNICATIONS

TRANSENE PRODUCTS(TRANSENE 公司产品)

一. 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
二. Epoxy Adhesives(环氧粘合剂)
三. Electroplating chemical (电镀化学品)
四. Photoresist Materials(光刻胶,其他译名:光致抗蚀剂\感光性树脂\光阻材料)
五. Semiconductor Materials
Cleaning and Polishing(清洗剂和抛光剂)
Junction Coatings(结合涂料)
Heat Sinks and Vacuum Oil (吸热设备和真空油)
Diffusants (扩散剂)
六. Encapsulants for Electronic Packaging(电子封装密封剂)
七. Printed Circuit Board Manufacturing Materials(印刷电路板制造材料)
八. Transene Cathode Coatings(阴极涂料)
九. SILICON NITRIDE ETCHING APPARATUS(氮化硅蚀刻仪器)



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一. Transene Cathode Coatings(阴极涂料) ----------13

1. Cathode Coatings For Thermal Electronic Emission(电子散热阴极涂料)
2. Emission Carbonates Powder(散热二氧化碳粉末)
3. BINDERS FOR CATHODE COATINGS(阴极涂料粘结剂)

二.Conformal Coatings for Electronic Packaging ----------21 (用于电子封装的保形涂料)

1 Silicoat®SILICONE COATING FOR PRINTED CIRCUIT ASSEMBLIES
用于印刷电路装配的硅树脂保形涂料

2. Hybrisil™Conformal Coatings for Thin Film/Thick Film
用于薄膜/厚膜的保形涂料

3. Q-Lac®Radio Frequency Dielectric LacquerRF 射频绝缘漆

4. Resistor Coatings-High Temperature Conformal Coatings
高温电阻器保形涂料

5. Radiation Curable Conformal Coating-
防辐射保形涂料



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三. Electroplating chemical (电镀化学品)

Transene Electroplating chemical Cleaners(电镀化学清洗剂) ----------32
GOLD/SILVER CLEANER
Electroplating chemical—Electroless(电镀化学品- Electroless 无电镀) ----------33
1. GOLD (Au) 金
   A. Bright Electroless Gold (光亮无电镀金)
   B. IMMERSION GOLD CF-CYANIDE-FREE ELECTROLESS 浸液金 CF(不含氰化物)
2. SILVER (Ag) 银
   Electroless Silver (无电镀银)
3. TIN (Sn) 锡
   Bright Electroless Tin (光亮无电镀锡)
4. COPPER (Cu) 铜
   PCB Electroless Copper(印刷电路板无电镀铜)
5. NICKEL (Ni) 镍
   A. Nickelex-Improved Electroless Nickel Plating Solution Ammonia Free
      (不含氨改良的无电镀镀镍解决方案)
   B. Electroless Nickel Plating Ammonia Type(FORMERLY ENPAT) (含氨的无电镀镀镍)
   C. Electroless Nickel Plating Strike-For Copper, Brass and Copper Alloys (无电镀镍触击电镀)
   D. Nickel - B-Special Electroless Nickel - Boron
      For High Electrical Conductivity and Oxidation Resistance
      (用于高电导和抗氧化的无电镀镀镍)
6. Plating on Non-Conductive Surfaces
   RTM Process-Room Temperature Metallizing For Alumina 导电面的电镀(氧化铝室温金属化)

Electroplating chemical—Electrolytic(电镀化学品-电解液) ----------52
1. GOLD (Au) AND ALLOYS(金和合金)
   A. Special Gold-Room Temperature Metallizing For Alumina(氧化铝室温金属处理)
   B. TRANSENE SULFITE GOLD - TSG-250 (亚硫酸金)
      Gold Electroplating Solution for Electronic and Aerospace Applications(电子和宇航领域的镀金解决方案)
2. SILVER (Ag) 银
   Standard Silver/High Speed Silver Electroplating Solutions(标准\高速镀银解决方案)
3. TIN-LEAD (100% Sn 锡, 100% Pb 铅, all alloy ratios 合金) 锡-铅
   Tin-Lead Plating Solutions(锡-铅电镀解决方案)
4. NICKEL (Ni) 镍
   A. Watts Nickel Plating Solution
      High Quality General Purpose Nickel Plating Composition(高品质镀镍解决方案)
   B. Woods Nickel
   C. Sulfamate Nickel Plating SN-10
5. COPPER (Cu) 铜 Copper Plating Acid Type(镀铜酸)



四.Encapsulants for Electronic Packaging(电子封装密封剂)

Epoxies for Potting(环氧填充材料) ----------63
A. Epoxy 125/175/200/225
General Purpose Epoxies For Electronic Potting Applications(电子填充的通用环氧材料)
B. Epoxy Based Potting Compound XS-531(用灌注混合物 XS-531 制造的环氧材料)
C. Epotherm 130/180 Thermally Conductive Epoxy Compounds
(环氧树脂 Epotherm 130/180-热传导环氧混合物)
High Purity Passivation Materials ----------69
1. SES-Low Viscosity Silicone Elastomer for Semiconductors
(用于半导体的低粘性硅树脂橡胶)
2. SES Black -Modified Silicone Elastomer For Light Absorption (改良的吸光硅树脂橡胶)
3. MBS®Moisture Barrier Silicone(防潮硅树脂橡胶)
4. SSE®Self-Catalyzed Silicone Elastomer(自催化硅树脂橡胶)
Resistor Coatings(电阻涂料) ----------78
A. Hybrisil™Conformal Coatings for Thin Film/Thick Film (用于薄膜/厚膜的保形涂料)
B. Q-Lac®Radio Frequency Dielectric Lacquer(RF 射频绝缘漆)
C. Resistor Coatings-High Temperature Conformal Coatings(高温电阻保形涂料)
Flip Chip Underfill(倒装晶片底层填料) ----------78
Underfill 25-High Purity, Fast Curing Underfill Encapsulant 高纯度,快速硫化底层填料密封剂
Silicone for Potting and Encapsulation(填充和封装用硅树脂) ----------87
1. Translastic ® RTV Silicones
Potting and Encapsulation of Electronic Components and Circuit Modules
(电子元器件和电路模块填充和封装用硅树脂)
2. Translastic RTV 1602
3. Translastic ® S-2007
Silicone Junction Coating For Rectifiers(用于整流器的硅树脂接合涂料)
4. Semiconductor Junction Coating(半导体接合涂料)
Silicone Elastomer Systems for Protection and Passivation of Semiconductor Junctions
(用于半导体结保护和钝化的硅树脂橡胶)
5. Silicone Semi-Gel Transparent Dielectric Potting(透明绝缘的填充硅树脂)
6. Thermasil- Thermally Conductive Fire Retardant Silicone(导热抗热硅树脂)
7. Radiation Curable Encapsulant(防辐射密封剂)
8. Silicoat®SILICONE COATING FOR PRINTED CIRCUIT ASSEMBLIES
(用于印刷电路装配的硅树脂涂料)



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五. Epoxy Adhesives(环氧粘合剂)

Insulative Epoxy Adhesives(绝缘环氧粘合剂)----------107

1. Epoxy 13/14/15 Single Component High Viscosity 单成份高粘性
   - Epoxy 13: Moisure Resistant 防湿
   - Epoxy 14: Thermal Conductivity 导热
   - Epoxy 15: High Peel 高剥离
2. Epoxy 16/17 Two Component High Viscosity 双成份高粘性
   - Epoxy 16: High Peel 高剥离
   - Epoxy 17: High Peel; Thermal Conductivity 高剥离，导热
3. Optical Epoxy 光环氧
   - Epoxy 20: Optical Clarity 透光
   - Epoxy 30: Radiation Resistance 防辐射
   - Epoxy 50: Adhesive Sealant 粘合剂,密封剂

Conductive Adhesives(传导粘合剂)----------115

1. Ohmex AG-Thermosetting Silver for Ohmic Bonding to Semiconductors(用于半导体阻焊的热固性银)
2. Silver Epoxy Paste-Screenable Thermosetting Silver for Ohmic Bonding(用于阻焊的屏蔽热固性银)
3. Silver Met-Silver Metallizations for Non-Metals(用于非金属材料镀银)
4. Silver Bond-Low Temperature Thermosetting Silver(低温热固性银)
5. Microcircuit Silver- for Conductive Bonding in Microelectronics(用于微电子导焊的微电路银)
6. Nanopoxy 60-Electrically Conductive Epoxy for Nanoscale Applications(用于纳米尺寸导电环氧材料)
7. Gold Epoxy Paste-THERMOSETTING GOLD FOR OHMIC BONDING(用于阻焊的热固性银)
8. Polymide Die Attach Adhesive (PDA) -Low Mobile Ion, Silver-filled Adhesive for IC Chip Bonding
   (Polymide 模固定粘合剂-用于集成电路芯片焊的填充粘合剂)
9. Surface Mount Adhesives (SMA)
   Low cost, high density packaging of integrated circuits, lead-less chip carriers, and chip component attachment for ceramic substrates and PC Boards
   (表面贴装粘合剂)- 用于陶瓷衬底和印刷电路的集成电路\无铅芯片载体\芯片元件附件低成本,高密度封装
10. Conductive Via Fill 6030
11. Radiation Curable Adhesive(防辐射粘合剂)

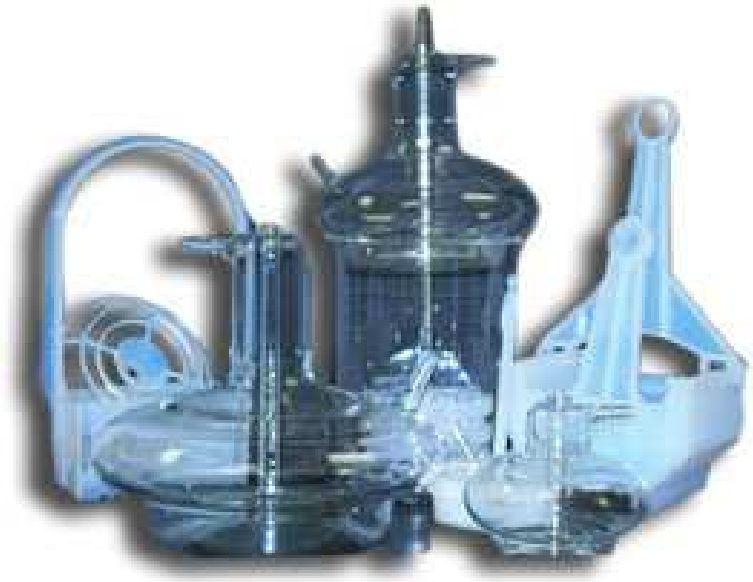


六.Semiconductor and Thin Film Etchants for Microelectronic Circuits 用于微电子电路的半导体和薄膜蚀刻剂----------137

1. Aluminum Etchants for Aluminum Metallizations in Microelectronics
微电子中镀铝用的铝蚀刻剂
2. TRANSETCH-N-Selective Etchant for Gallium Nitride, Silicon Nitride or Aluminum Oxide Films
用于氮化镓,氮化硅,氧化铝薄膜的选择性蚀刻剂
3. Silicon Dioxide (SiO_2) Etchants 二氧化硅蚀刻剂
4. CHROMIUM ETCHANT 铬蚀刻剂
5. Printed Circuit Copper Etchants 印刷电路板铜蚀刻剂
6. GALLIUM ARSENIDE ETCHANTS 砷化镓蚀刻剂
7. Gallium Phosphide Etchant For Light Emitting Diodes 用于发光二级管的磷化镓蚀刻剂
8. Gold Etchants for Microelectronics Circuits 用于微电子中的金蚀刻剂
9. Tin Oxide-Indium Tin Oxide Etchant TE-100 氧化锡-氧化铟锡蚀刻剂
10. Iron Oxide Mask Etchant-Fabrication of Fe_2O_3 See-through Masks 氧化铁掩模蚀刻剂
12. Kapton Polymide Film Etchant
13. Moly Etchant – TFM
14. Nichrome Etchants TFC and TFN 镍铬合金蚀刻剂
14. Nickel Etchants For Thin Film Circuits 薄膜电路镍蚀刻剂
15. NICKEL VANADIUM ETCHANT NiV 28-23 镍钒蚀刻剂
16. Palladium Etchants Platinum Etchant 钯蚀刻剂\铂蚀刻剂
17. Preferential Silicon Etchants 选择硅蚀刻剂
18. Silver Etchant for Microelectronics Circuits 用于微电子电路中的银蚀刻剂
19. TANTALUM ETCHANTS SIE-8607 and 111 钽蚀刻剂
20. TITANIUM ETCHANTS 钛蚀刻剂
21. Ti-Tungsten TiW-30 钛钨蚀刻剂
22. Moly Etchant – TFM -Tungsten Etchant - TFW
23. **Transene Semiconductor and Thin Film Etchants Selection Guide**
Transene 半导体和薄膜蚀刻剂选型指南
24. **Transene Etchant/Metal Compatibility Chart** Transene 蚀刻剂/金属兼容表

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七.SILICON NITRIDE ETCHING APPARATUS----------185 (氮化硅蚀刻仪器)



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八.Photoresist Materials
(光刻胶,其他译名:光致抗蚀剂\感光性树脂\光阻材料) -------191

1. PKP II Photoresist-Purified Kodak Photoresist 精炼柯达光刻胶
2. NPD Negative Resist Developers 负性光刻胶显影剂
3. Negative Resist Remover 负性光刻胶去除剂
4. Negative Resist Chemicals 负性光刻胶化学品
5. Positive Resist Removers 正性光刻胶去除剂
6. Photomask Coating-For Use in Photolithography 影印石版光掩膜涂料
7. Hexamethyldisilazane (HMDS)
8. ELECTRONICS GRADE PROCESS SOLVENT (电子生产溶剂)



九. Printed Circuit Board Manufacturing Materials----------208 (印刷电路板制造材料)

1. Copper Cleaner-For Printed Circuit Boards 印刷电路板铜清洗剂
2. COPPER OXIDE REMOVER - COR-100 氧化铜去除剂
3. Bright Electroless Tin 光亮无电镀锡
4. Bright Electroless Gold 光亮无电镀金
5. PC Electroless Copper 印刷电路板光亮无电镀铜
6. Electroless Nickel Strike-For Copper, Brass and Copper Alloys 无电镀镍触击
7. Tin-Lead Plating 锡铅电镀
8. Printed Circuit Copper Etchants- CE-100/200 印刷电路板铜蚀刻剂
9. Solder Flux 焊料助焊剂
10. Silicoat®SILICONE COATING FOR PRINTED CIRCUIT ASSEMBLIES 用于印刷电路装配的硅树脂涂料
11. Hybrisil™Conformal Coatings for Thin Film/Thick Film 薄膜/厚膜保形涂料
12. CONDUCTIVE VIA FILL CVF-6030
13. Radiation Cure Coatings 防辐射涂料



十.Semiconductor Materials(半导体材料)

Cleaning and Polishing(清洗剂和抛光剂) ----------233

1. Waxcut®
2. Waxstrip L2X
3. Transene-100 For Ultra Clean Surfaces 超清洁表面
4. Transene Ultrasonic Detergent (TUD) 超声波去垢剂
5. Lab Glass Cleaner LGC-300 实验室玻璃制品清洁剂
6. Transene Glass Cleaner- 409 玻璃制品清洁剂
7. ESP - Electroless Silicon Polish 无电镀的硅抛光剂
8. Polimet – Alumina Type Polishing Lapping Preparations 氧化铝抛光研磨
9. Polmet - Alumina Type Polishing and Lapping Compounds 氧化铝抛光和研磨化合物
10. Sequestrox - Residue Removers for Low K Dielectric and Silicon Devices
    低 K 电介质和硅器件残渣去除剂
11. Ultrapure Water 超纯水
12. Gold/Silver Cleaner 金/银去除剂
13. Tetramethylammonium hydroxide (TMAH)四甲基铵-氢氧化物

Diffusants (扩散剂) ----------256

Heat Sinks and Vacuum Oil (吸热设备和真空油) ----------258

Junction Coatings(结合涂料) ----------262

1. SES-Low Viscosity Silicone Elastomer for Semiconductors
   用于半导体的低粘性硅树脂橡胶
2. SES Black-Modified Silicone Elastomer For Light Absorption 改良的光吸收硅树脂橡胶
3. SSE-Self-Catalyzed Silicone Elastomer 自催化硅树脂橡胶
4. Translastic S-2007-Silicone Junction Coating For Rectifiers 整流器硅树脂结合涂料
5. MBS-Moisture Barrier Silicone 防潮硅树脂
6. Junction Coating Type I
   Silicone Elastomer Systems for Protection and Passivation of Semiconductor Junctions
   用于半导体结合的保护和钝化硅树脂橡胶



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Transene 电子工业的高纯度化学品完全手册

Transene Cathode Coatings(阴极涂料)----------13

Conformal Coatings for Electronic Packaging(用于电子封装的保形涂料)----------21

Transene Electroplating chemical Cleaners(电镀化学清洗剂) ----------32

Electroplating chemical—Electroless(电镀化学品- Electroless 无电镀的) ----------33

Electroplating chemical—Electrolytic(电镀化学品-电解液) ----------52

Encapsulants for Electronic Packaging(电子封装密封剂)

Epoxies for Potting(环氧填充材料) ----------63

High Purity Passivation Materials(高纯度钝化材料)----------69

Encapsulants for Electronic Packaging(电子封装密封剂) Resistor Coatings(电阻涂料)

Flip Chip Underfill(倒装晶片底层填料)----------78

Silicone for Potting and Encapsulation(填充和封装用硅树脂) ----------87

Insulative Epoxy Adhesives(绝缘环氧粘合剂) ----------107

Junction Coatings(结合涂料) ----------115

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----------137

SILICON NITRIDE ETCHING APPARATUS(氮化硅蚀刻仪器) ----------185

Photoresist Materials(光刻胶，其他译名光致抗蚀剂，感光性树脂，光阻材料)-------191

Printed Circuit Board Manufacturing Materials(印刷电路板制造材料)----------208

Semiconductor Materials(半导体材料)

Cleaning and Polishing(清洗剂和抛光剂) ----------233

Diffusants (扩散剂) ----------256

Heat Sinks and Vacuum Oil (吸热设备和真空油) ----------258

Junction Coatings(结合涂料) ----------262

Transene Cathode Coatings(阴极涂料)

2. Cathode Coatings For Thermal Electronic Emission(电子散热阴极涂料)----------2

2. Emission Carbonates Powder(散热二氧化碳粉末)----------8

3. BINDERS FOR CATHODE COATINGS(阴极涂料粘结剂) ----------8

注:"-----2"页码标注从本页是第 1 页算起

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1. Cathode Coatings
For Thermal Electronic Emission(电子散热阴极涂料)

Lacquer spray and electrophotoretic coatings of emission carbonates (Ba-Sr-Ca) for oxide coated cathodes in electronic tube applications.

SPECIAL FEATURES

- Spray and electrophoretic coating applications.
- High purity carbonates with isomorphous crystal structure.
- Controlled viscosity, uniformity, and particle size.
- Excellent emission characteristics.
- Long term stability

Cathode Coatings prepared to customer specifications are also offered. All items subject to minimum order quantities.

CATHODE COATINGS
DESCRIPTION

Transene double and triple carbonates are specially prepared electronic materials used for efficient thermal electron emission of cathode structures. These carbonates are compounds of Ba, Sr, and Ca, occurring as homogenous crystallites with an isomorphous crystal structure, carefully dispersed in a lacquer vehicle. Furthermore, the vehicle contains an improved ethyl cellulose binder to create a highly stable lacquer spray coating. An electrophoretic cathode coating is also offered. These coatings can be applied to various geometric hot cathode structures.

- Filamentary, cylindrical, disk, hollow, etc.

Upon heating (breakdown), the carbonate coatings are converted to semiconductor oxides of Ba, Sr, and Ca. These oxides are characteristically n-type and exhibit high electron conductivity paralleling the high functional activity of the hot cathodes. In addition, the pore structures produced from these carbonate coatings are optimized to augment emission and conductivity.

Cathode Coating Types

CATHODE COATING –100 High calcium triple carbonate spray coating	(Ba-Sr-Ca) CO_3 56-31-13%
CATHODE COATING –200 High calcium, high density, triple carbonate spray coating	(Ba-Sr-Ca) CO_3 56-31-13%
CATHODE COATING – 300 Low calcium, triple carbonate spray coating	(Ba-Sr-Ca) CO_3 56-39-4%
CATHODE COATING –400 Low calcium, high density, triple carbonate spray coating.	(Ba-Sr-Ca) CO_3 56-39-4%
CATHODE COATING – 500 High density, barium and strontium carbonate spray coating	Equimolar $BaCO_3$.$SrCO_3$
CATHODE COATING – 600 High density, barium and strontium carbonate electrophoretic coating.	Equimolar $BaCO_3$.$SrCO_3$
CATHODE COATING – 700 High density, triple carbonate	(Ba-Sr-Ca) 57-39-4%

APPLICATIONS

Transene Cathode Coatings offer selection of materials to best satisfy requirements for electron emissive surface in radio tubes, TV and cathode ray tubes, power tubes, thyratrons, and other electron devices. Cathode Coating - 100 is for general-purpose applications. Cathode Coatings - 200 and - 400 are recommended where grid-to-cathode spacing must be held very closely. Cathode Coating - 300 and - 400 permit cathodes to be operated at elevated temperatures; while tube transconductance shows excellent stability during life. Cathode Coating - 500 is useful when arc prevention is essential. Cathode coatings - 600 and - 700 are electrophoretic types designed to achieve very high packing density of emission carbonates.

Special emission coatings are also available or can be developed for particular applications and requirements. These special products include coatings for cataphoresis, dip, and automatic or hand spray methods.

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Electrophoretic Cathode Coating – Type 600 - Instructions
DESCRIPTION:

This product contains double carbonates of barium and strontium suspended in an organic vehicle. The product includes an activator (Part B) which is added to Part A, containing the suspension of double carbonates.

This mixture is suitable for electrophoretic coating after the addition of the activator (Part B). The suspended double carbonate particles carry a negative charge. The charge is developed when the activator is added as a result of adsorption of hydroxyl ions.

As a result, the double carbonate particle will migrate to the positive terminal of the cell.

Procedure for Electrophoretic Coating

1. Equipment needed:
    A. Stainless steel beaker
    B. Stirrer
    C. High voltage DC supply (0 to 400 volts and 0 to 200 ma)
2. Room temperature 25 °C
3. Voltage: 200 to 400 volts
4. Polarity work – positive
5. Mild agitation or stirring recommended.

The electrophoretic coat thickness is a function of temperature, time, voltage, and inter-electrode distance. Relationship of coating thickness to time and voltage is shown in Figure 2.

Electrophoretic Cathode Coating – Type 700 - Instructions
DESCRIPTION:

This product contains triple carbonates of barium and strontium suspended in an organic vehicle. The product includes an activator (Part B) which is added to Part A, containing the suspension of double carbonates.

This mixture is suitable for electrophoretic coating after the addition of the activator (Part B). The suspended triple carbonate particles carry a negative charge. The charge is developed when the activator is added as a result of adsorption of hydroxyl ions. As a result, the carbonate particle will migrate to the positive terminal of the cell.

Procedure for Electrophoretic Coating

1. Equipment needed:
    A. Stainless steel beaker
    B. Stirrer
    C. High voltage DC supply (0 to 400 volts and 0 to 200 ma)
2. Room temperature 25 °C
3. Voltage: 200 to 400 volts
4. Polarity work – positive
5. Mild agitation or stirring recommended.

The electrophoretic coat thickness is a function of temperature, time, voltage, and inter-electrode distance.

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Characteristics of Spray Cathode Coatings

TYPE	PRODUCT DESCRIPTION	SOLIDS AS CARBONATES	PERCENT COMPOSITION OF CARBONATES	VEHICLE BINDER	DILUENT	ZAHN VISCSITY #1(SEC)
CATHODE COATING-100	HIGH CALCIUM TRIPLE CARBONATE SPRAY COATING	44% W/V	56% $BaCO_3$ 31% $SrCO_3$ 13% $CaCO_3$	Ethyl Cellulose	85% Xylol- 15% Butanol Mixture	32
CATHODE COATING-200	HIGH CALCIUM HIGH DENSITY TRIPLE CARBONATE SPRAY COATING	22% W/V	56% $BaCO_3$ 31% $SrCO_3$ 13% $CaCO_3$	Ethyl Cellulose	85% Xylol- 15% Butanol Mixture	32
CATHODE COATING- 300	LOW CALCIUM TRIPLE CARBONATE SPRAY COATING	44% W/V	57% $BaCO_3$ 39% $SrCO_3$ 13% $CaCO_3$	Ethyl Cellulose	85% Xylol- 15% Butanol Mixture	32
CATHODE COATING- 400	LOW CALCIUM HIGH DENSITY TRIPLE CARBONATE SPRAY COATING	22% W/V	57% $BaCO_3$ 39% $SrCO_3$ 4% $CaCO_3$	Ethyl Cellulose	85% Xylol- 15% Butanol Mixture	32
CATHODE COATING-500	HIGH DENSITY BARIUM & STRONTIUM CARBONATES SPRAY COATING	44% W/V	57.5% $BaCO_3$ 42% $SrCO_3$	Ethyl Cellulose	85% Xylol- 15% Butanol Mixture	32

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Process for Activation of Cathodes (Double and Triple Carbonates Cathode Coatings)

The activation process described herein pertains to Transene Cathode Coatings, Types-100,-200,-300,-400, and –500. The basic process is quite conventional and involves heating in vacuum to obtain the essential "breakdown" of cathodes. The process involves four operational steps as follows:

1. Dissipation and removal of ethyl cellulose binder as volatile products.
2. Conversion of the carbonates into the corresponding oxides by thermal degradation.
3. Partial reduction of oxides by dissociation at the metal-coating interface to form free barium, with uniform dispersion of free barium resulting.
4. Cathode stabilization.

The activation process begins by cathode heating to about 500 °C for a few minutes under vacuum (at least 10^{-5}mm Hg.). The heat input is increased to raise the temperature close to 600 °C. The cathode coating will change in color during the heating process, becoming gray or black and finally pure white.

The temperature of the heated cathodes should then be increased to control the heater wattage. The temperature should rise to approximately 900 °C, to obtain complete conversion of the carbonates to oxide, e.g.:

$$BaCO_3 \quad BaO + CO_2 \ (1)$$

$$CaCO_3 \quad CaO + CO_2 \ (2)$$

$$SrCO_3 \quad SrO + CO_2 \ (3)$$

Complete conversion of the carbonates to oxides will be indicated by the sharp drop in pressure to 10^{-6} mm Hg.

Final activation is then carried out by raising the cathode temperature to 1200 °C, but not higher. At this high temperature some barium is produced forming active cathode structures.

Stabilization is generally obtained by applying voltage to draw a cathode current of 25-50 ma/cm^2 for a short time. The temperature is then reduced at 800 °C.

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CATHODE COATINGS RCA EQUIVALENT

CATHODE COATING NO:	CARBONATES	VEHICLE	METHOD OF APPLICATION	COATING DENSITY
T-33C-118	BaSrCa 56/31/13% Ammonium. Carb, Spherulite Form	Nitrocellulose	Hand Spray	Very High
T-33C-131	BaSrCa 57/39/4% Sodium carb. Ppted. Needle Form	Nitrocellulose	Hand Spray	Medium to High
T-33C-132	BaSrCa 57/39/4% Sodium carb.ppted. Needle Form	Nitrocellulose	Hand Spray	Medium
T-33C-138	BaSrCa 57/39/4% Sodium carb. Ppted. Needle Form	Nitrocellulose	Machine or Hand Spray	Low to Medium
T-33C-185A	BaSrCa 57/39/4% Sodium carb. Ppted. Needle Form Low water solubles	Nitrocellulose	Hand Spray	Medium to High
T-33C-304	BaSrCa 57/39/4% Sodium carb. Ppted. Needle Form	Methyl Methacrylate	Cataphoretic ctg. Filamentary wires	High
T-33C-326	BaSrCa 57/39/4% Nickel-carb. Type Needle Form	Nitrocellulose	Hand Spray	Medium to High
T-33C-326A	BaSrCa 57/39/4% Nickel-carb. Type Needle Form	Nitrocellulose	Machine or Hand Spray	High
T-33C-334	BaSrCa 56/31/13% Ammonium. Carb, Spherulite Form	Methyl Methacrylate	Cataphoretic ctg. Filamentary wires	High

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T-33C-337	BaSrCa 57/39/4% Amm carb, ppted. Spherulite Form	Nitrocellulose	Hand Spray	Medium to High

RCA EQUIVALENT MATERIALS

2. EMISSION CARBONATES POWDER(散热二氧化碳粉末)

Subject to Availablility and Minimum Order Restrictions

PRODUCT #	CARBONATE	COMPOSITION	FORM
Needle Form			
T-33-C-42	$(BaSrCa)CO_3$	56/31/13%	Spherulite Form
T-33-C-106	$(BaSr)CO_3$	57/43%	Needle Form
T-33-C-130	$(BaSrCa)CO_3$	57/39/4%	Needle Form
T-33-C-175A	$(BaSrCa)CO_3$	57/39/4%	High Purity

3. BINDERS FOR CATHODE COATINGS(阴极涂料粘结剂)

Nitrocellulose Binder	Methacrylate Binders
T-33-B-10	T-33-B-207
T-33-B-109	T-33-B-209
T-33-B-110	T-33-B-610F
T-33-B-114	
T-33-B-608	
T-33-B-902	

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Conformal Coatings for Electronic Packaging
(用于电子封装的保形涂料)

1 Silicoat®SILICONE COATING FOR PRINTED CIRCUIT ASSEMBLIES -------2
用于印刷电路装配的硅树脂保形涂料

2. Hybrisil™Conformal Coatings for Thin Film/Thick Film----------4
用于薄膜/厚膜的保形涂料

5. Q-Lac®Radio Frequency Dielectric Lacquer----------6
RF 射频绝缘漆

6. Resistor Coatings-High Temperature Conformal Coatings ----------8
高温电阻器保形涂料

5. Radiation Curable Conformal Coating----------11
防辐射保形涂料

注:"-----2"页码标注从本页是第 1 页算起



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1. Silicoat®
SILICONE COATING FOR PRINTED CIRCUIT ASSEMBLIES
(用于印刷电路装配的硅树脂保形涂料)

One-part, flexible, conformal coating for protection of printed circuit boards and other electrical applications.

FEATURES:

- Application versatility – dip, brush, spray
- Rapid room-temperature cure
- Provides protection against moisture
- Maintains electrical Q
- Excellent insulation properties

SILICOAT®
DESCRIPTION:

Silicoat is a flexible, conformal coating based on Transene electronic grade, translastic silicone materials. The product is specially designed to perform as an effective coating for the protection of printed circuit boards against moisture and corrosion . The protective coating also exhibits excellent dielectric properties.

Silicoat is formulated as a one-part system easily applied by brushing, spraying or dipping. Cure is accomplished simply by air drying at room temperature. The cure is moisture catalyzed.

PROPERTIES OF SILICOAT

Physical	
Color	Clear
Viscosity cps	1500 nominal
Flash Point	62 °F
Thinner	Xylene
Thickness per dip	3 mils (approx.)
Tack Free Time	45 minutes (air dry)
Full cure at 25 °C	12 hours
Sp. Gr. (cured)	1.0
Durometer (Shore A)	25
Shelf Life	1 year

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Electrical	
Dielectric Strength (V/mil)	500
Dielectric constant (100 Hz.)	2.65
Dissipation factor (100 Hz.)	0.0037
Volume resistivity (ohm-cm)	1.5×10^{14}
Operating temp. range	-70 °C to 175 °C

APPLICATION:

Silicoat is recommended as a protective coating for printed circuit assemblies and other electrical coating applications. The product is compatible with most copper-clad circuit board laminate materials described under Nema and Mil-P-13949D types of epoxy-glass, epoxy-paper and phenolic-paper. The adhesion of Silicoat is very good to glass, metal, rubber and most plastics. It is not recommended for acrylate or polycarbonate resins.

Moisture resistance may be enhanced by applying two thin coats to avoid pinholes, though the application of a single coat of Silicoat suffices. Test results also show that Silicoat increases the electrical Q of a circuit with further improvement attained by adding coat thickness. The usual effective coat thickness is approximately 3 mils.

See instructions for dilution with xylene and the relationship of the viscosity to the applied coat thickness.

For electrical repair work Silicoat may be removed or stripped by soaking in xylene.

2. Hybrisil™
Conformal Coatings for Thin Film/Thick Film
(用于薄膜/厚膜的保形涂料)

One-part silicone, conformal protective coatings for thin film and thick film resistor networks in microelectronic circuits.

HYBRISIL – 200

High power resistor silicone coating
Elevated temperature cure
Thermal class 350 °C

HYBRISIL™
DESCRIPTION

Hybrisil conformal coating is designed to protect and stabilize thick and thin film resistor networks. The Hybrisil coatings are one-part systems, silicone based and easily applied. These silicone materials provide a low cost yet reliable process for resistor encapsulation. The need for high temperature firings with cermet encapsulations is avoided.

Hybrisil 200 is a silicone-mica filled system which cures at elevated temperature.

PROPERTIES OF HYBRISIL CONFORMAL COATINGS

Uncured	HYBRISIL 200
Composition	One-part silicone filled
Color	Black
Viscosity (cps)	1,500
Thinner	Xylene
Solids	70%
Flash Point	90 °F
Chemical Resistance	Excellent
Shelf Life	6 months
Cure, Activation	Heat
CURED	
Bond Strength (peel lbs./in^2)	125
Durometer	70 (shore D)

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Dielectric Constant (1000 Hz)	4.8
Dissipation Factor (1000 Hz)	.002
Volume Resistivity (ohm-cm)	$> 10^{16}$
Water Absorption (7 days) ASTM-D570-54T	< 0.1
Temperature Rating (Continuous)	-65 °C to + 250 °C
Max. Oper. Temp.	350 °C

APPLICATION:

Hybrisil conformal coating is conveniently applied by horizontal flooding technique or brushing.

Hybrisil-200 is first baked at 65 °C for 20 minutes then heated for ½ hour at 125 °C followed by a post cure of ½ hour at 220 °C.

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3. Q-Lac®
Radio Frequency Dielectric Lacquer(RF 射频绝缘漆)

Extremely low-loss, high Q, radio frequency lacquer for protective coating and insulating electronic components and circuits.

UNIQUE PROPERTIES OF Q-LAC

- Dielectric coating with lowest dissipation factor.
- Highest insulation resistance – reliability against voltage breakdown.
- Stabilizes inductances and capacitances.
- High resistance to humidity – guards against corrosion.
- Cements and bonds for structural strength.

IMPORTANT APPLICATIONS

- General coil dope for VHF-UHF-RF windings- choke coils
- Saturant and impregnant for paper, tape, and fabric materials used in windings.
- High Q lacquer capacitors – filter circuits – printed circuits.
- Coating for moisture sensitive, high frequency electronic components and circuits.

Q-LAC® Radio Frequency Dielectric Lacquer
DESCRIPTION

Q-LAC is a special lacquer composed of a cross polymer of iso-polystyrene, formulated in accordance with the Clausius-Masotti equation as design criteria for a low loss dielectric material. Structurally, the Q-LAC formed film is a non-ionic substance with small atomic polarizabilities and no free dipoles. The complete absence of dipoles, either of the bound or free type, as well as any free ions, results in the elimination of ionic conductivity, ordinarily responsible for high loss factor. Excellent electrical properties especially at high frequencies are valuable characteristics of Q-LAC.

Q-LAC coatings are, furthermore, strongly adherent and protective with excellent resistance to moisture. Coatings show high surface resistivity on account of the strong hydrophobic character of the Q-LAC films. Exposure to 98% relative humidity does not alter the surface conductivity. Q-LAC finds important application, therefore, for coils and other electronic components and circuits where circuit Q is important.

PROPERTIES OF Q-LAC FILM

Volume Resistivity	1 x 10^{15} ohm-cm.
Surface Resistivity	5 x 10^{14} ohm
Dielectric Constant	2.53 (1 mc.) 2.52 (50 mc)
Dielectric Strength	2200 volts/mil
Power Factor	.001 (1 mc) .0005 (50 mc.)
Loss Factor	.002 (1mc) .001 (50 mc.)
Dissipation Factor	.0001 (1000 c.p.s.)
H_20 Absorbtion Coefficient	< .01
Temperature Range	-40 °C to + 100 °C.

APPLICATION TECHNIQUE

All parts to be coated should be thoroughly dry, preferable by preheating at 110 °C. Q-LAC is then applied by brushing or dipping, either air dried for 30 minutes or oven baked at 60 °-90 °C. A film thickness of about 1 mil can be expected from a single brush application or dipping. Dilution with xylene or toluene in a 1:1 ratio will film to approximately half thickness. A minimum film thickness of 1 mil is recommended.

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4. Resistor Coatings
High Temperature Conformal Coatings(高温电阻器保形涂料)

Solution type insulation coatings formulated with dielectric aluminum silicates in a special silicone base – for power resistors, capacitors and other electrical components.

RESISTOR COATING – TYPE 100
Thermal Class – 350 °C
For very high temperature applications

RESISTOR COATING – TYPE 150
Thixotropic modification of type 100
For single coat application

RESISTOR COATING – TYPE 200
Thermal class – 250 °C
For applications requiring very high adhesion and chemical resistance

RESISTOR COATING – TYPE 250
Thixotropic modification of type 200
For single coat application

FEATURES:

- Single component systems
- High insulation resistance
- High reliability performance
- Moisture resistant
- Fire resistant

RESISTOR COATINGS
DESCRIPTION

Transene conformal resistor coatings are specially formulated from insulation materials designed to pass rigid, high reliability performance standards for military and space applications. The coatings are particularly advantageous for precision power resistors as well as for other electrical components used in high temperature applications. The coatings are fire resistant and highly protective towards moisture and ambient.

Transene Resistor Coatings contain modified, high temperature silicone resins combined with dielectric grade aluminum silicate materials. These coatings exhibit excellent insulating properties, notably high dielectric strength and high electrical resistivity. Furthermore, these characteristics are maintained at elevated temperatures- as high as 350 °C continuous. A feature of these resistor coatings is their superior adhesion.

Two basic types of resistor coatings are offered based upon their temperature rating, adhesion, quality and chemical resistance. In addition, thixotropic modification of these two types allows single coat application.

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RESISTOR COATING – Type 100 was developed specifically for high temperature application; consequently it demonstrates exceptional thermal stability. Color black or green.

RESISTOR COATING – Type 150 is a thixotropic modification of type 100 to permit single coat application. Color black or green.

RESISTOR COATING – Type 200 is designed to withstand chemical attack. Its resistance to solvents is excellent while adhesion is extremely high. Color black or green.

RESISTOR COATING – Type 250 is a thixotropic modification of type 200 for single coat application. Color black or green.

PROPERTIES OF RESISTOR COATINGS

PHYSICAL PROPERTIES	Type 100 and 150	Type 200 and 250
Appearance	Liq Susp.	Liq. Susp.
Color	Black or green	Black or green
Viscosity, cps	200/1300	200/1300
Solids % by wt.	80%	80%
Sp.Gr.	1.21 blk, 1.12 grn	1.18 blk, 1.10 grn
Thinner	Xylene or toluol	Xylene or toluol
Flash Point (solvent)	90 °F	90 °F
Shelf Life	6 months	6 months
Chemical Resistance	Good	Excellent
Temperature Rating (10,000 hrs)	350 °C (cont.)	250 °C (cont.)
Temperature Cycling	-65 °C to + 250 °C	-65 °C to + 250 °C
Coverage/gal/mil/thickness	650 sq. ft.	650 sq. ft.
Bond Strength, peel lbs./in^2	125	225
Lap Shear Strength lbs/in^2	250	> 1000
ELECTRICAL PROPERTIES		
Dielectric Strength (volts/mil)	700	700
Dissipation Factor @ 1 mHz.	.002	.01
Dielectric Constant @ 1 mHz.	4.85	5.25
Volume Resistivity(ohm-cm)	> 10^{16}	> 10^{16}
CURE SCHEDULE		

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Air Drying (also between coats)	20 min	20 min
Bake at 65 °C	20 min	20 min
Cure	½ hr. at 125 °C	½ hr at 150 °C
Post Cure	½ hr at 225 °$^{+}$C	½ hr at 225 °C
Alternate Cure and Post Cure	---------	6 hrs at 135 °C

APPLICATION

Coatings can be applied by dip or roll dip. Type 100 and type 200 yield a coat thickness of about 2 mils on single application. Two or three coatings are recommended. Type 150 and 250 permit single coat application of about 7 mils, permitting greater economy and process simplification.

The coatings should be (1) air dried and baked at 65 °C for 20 minutes followed by (2) one half hour at 125 °C (or 150 °C), then (3) post cured for one-half hour at 220 °C. Alternated lower temperature cure may be used for Types 200 and 250.

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5. RADIATION CURABLE MATERIALS(防辐射保形涂料)

TUV-100 Adhesive and TUV-200 Conformal Coating are solvent-free, single component liquids which cure to hard solids when exposed to ultraviolet (UV) radiation. TUV-100 is a high T_g adhesive with fast cure and excellent adhesion to a wide range of materials. Curable up to 20 mil thick, TUV-100 tolerates wave soldering without degradation. TUV-100 is ideal when a secondary heat cure is desired.

TUV-200 is a hard, transparent coating with excellent environmental properties, resistant to thermal and electrical shock as well as impact. TUV-200 is wave solderable and responds to UV light over a range of wavelengths.

PROPERTIES:

	TUV-100	**TUV-200**
Viscocity	14,800 cp @ 25°C	7,200 cp @ 25°C 550 cp @ 60°C
Tensile Strength (psi)	1620	3640
Elongation (%)	0.7	6
Tg (°C)	303	260
Durometer, Shore D	85	78
Water Immersion	No effect	60 min @ 25°C
Cure Thickness	To 20 mil	To 20 mil
Cure Time	< 1 to 20 seconds	< 1 to 30 seconds
Wavelength response (nm)	240-250, 320-335, 360-365, 405	240-250, 320-335, 360-365, 405
Secondary Heat Cure	30 min @ 110°C	----
Heat Stability	Wave Solderable Stable 1 hr @ 100°C	Wave Solderable Stable 1 hr @ 100°C
Performance	Hard, clear, hybrid cure	Thermal, electrical, impact reisistant

APPLICATION:

TUV-100 may be applied via syringe and cured in 1-20 seconds depending on lamp intensity. High viscosity allows for delay between application and cure. Secondary cure may be effected by heating at 110°C for 30 minutes.
TUV-200 may be applied by syringe or flood coating, particularly when warmed to 50-60°C. Cure requires 1-30 seconds depending on thickness and lamp intensity.

Transene Electroplating chemical Cleaners(电镀化学清洗剂)



GOLD/SILVER CLEANER
DESCRIPTION:

Removes oxides and tarnish from gold, silver, and precious metal alloy surfaces without leaving a residue. Gold/Silver Cleaner is recommended for cleaning metal films immediately prior to further processing.

FEATURES:

- Rapid, economical cleaning
- Enhances fluxing, soldering, etching, plating, and coating
- No adverse electrical effects
- Mild pH
- Compatible with most metals
- Non-aggressive formulation
- Cyanide-free

PROPERTIES:

Tank	Pyrex glass, fiberglass, polypropylene, etc
Temperature	20-50 °C
Immersion Time	30-60 seconds or as needed
Rinse Use with agitation	Water

APPLICATION:

Substrates should be degreased first, if necessary

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Electroplating chemical—Electroless
(电镀化学品- Electroless 无电镀的)

1. **GOLD (Au) 金**
   A. Bright Electroless Gold (光亮无电镀金)----------2
   B. IMMERSION GOLD CF-CYANIDE-FREE ELECTROLESS
      浸液金 CF(不含氰化物)----------4

2. **SILVER (Ag) 银**
   Electroless Silver (无电镀银)----------5

3. **TIN (Sn) 锡**
   Bright Electroless Tin (光亮无电镀锡)----------6

4. **COPPER (Cu) 铜**
   PCB Electroless Copper(印刷电路板无电镀铜)----------8

5. **NICKEL (Ni) 镍**
   A. Nickelex-Improved Electroless Nickel Plating Solution Ammonia Free
      (不含氨改良的无电镀镀镍解决方案)---------- ----------10
   B. Electroless Nickel Plating Ammonia Type(FORMERLY ENPAT)
      (含氨的无电镀镀镍)----------13
   C. Electroless Nickel Plating Strike-For Copper, Brass and Copper Alloys
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   D. Nickel - B-Special Electroless Nickel - Boron
      For High Electrical Conductivity and Oxidation Resistance
      (用于高电导和抗氧化的无电镀镀镍)---------- ----------16

6. **Plating on Non-Conductive Surfaces**
   RTM Process-Room Temperature Metallizing For Alumina
   导电面的电镀(氧化铝室温金属化)----------18

注:"-----2"页码标注从本页是第 1 页算起



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1. GOLD (Au) 金

A. Bright Electroless Gold (光亮无电镀金)

A gold plating solution for depositing thin, uniform layers of 24 karat gold by an electroless immersion process - for printed circuit boards, transistor headers, electrical connectors, diode leads, lamps and other electronic parts.

FEATURES

- Economical gold plating
- Plates bright gold on copper, kovar, brass, nickel, tin-lead solders and indium antimonide
- Excellent solution stability
- Operates with simple control of plating solution
- Ready-to-use - no mixing required.

BRIGHT ELECTROLESS GOLD
Description

Bright Electroless Gold is formulated as a trouble-free gold plating solution designed to plate gold on metal parts by an electroless immersion process. This process operates by the electroless displacement of base metals by gold brought about by a difference in EMF potentials.

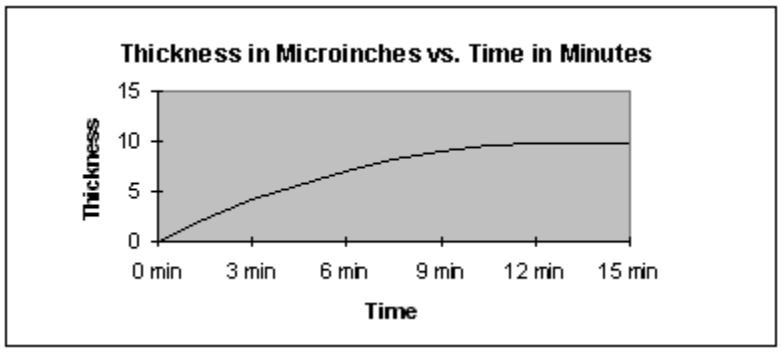
Bright Electroless Gold as normally supplied is ready to use without further modifications. This product is also available, when specified, as a concentrate to reduce shipping costs.

Bright Electroless Gold will deposit gold on most common metals and alloys including copper, commercial brass, kovar, nickel, tin-lead solders, pure-tin, iron, and indium antimonide.

PROPERTIES OF BRIGHT ELECTROLESS GOLD-Type I

Gold content per gallon	1/3 tr. oz.
Plating Coverage/gal.	175 sq.ft./1.25 x 10^{-6} in. thick
pH	7 - 9
Operating temperature	50 - 90 °C
Copper, nickel, kovar, etc.	90 °C
Tin-lead solders, pure-tin	50 °C
Plating time	10 min (Cu), 15 min (Ni)
Tank	Pyrex glass
Bath Life	unlimited until gold is depleted
Storage	Room Temperature

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APPLICATION

Metal parts to be plated should be thoroughly cleaned before use. The normal cleaning procedures for electroplating are adequate.

The solution of Bright Electroless Gold will show a decrease in pH with use. The pH should not be allowed to deviate from the normal conditions for plating since inferior deposits result. Adjustment of pH can be conveniently accomplished by the addition of small amounts of ammonium hydroxide to raise pH or citric acid to lower it.

The recommended plating temperature is 90 °C for most metals. However, for tin-lead solders and pure-tin an optimum temperature of 50 °C is recommended.

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1. GOLD (Au)
B. IMMERSION GOLD CF
CYANIDE-FREE ELECTROLESS 浸液金 CF(不含氰化物无电镀)

DESCRIPTION:

Immersion Gold CF is a two part system suitable for producing thin gold films on metal surfaces via an electroless immersion process. The cyanide-free formulation offers reduced toxicity and improved compatibility vs. cyanide formulations. Immersion Gold CF takes advantage of EMF potential differences to plate gold films with good adhesion.

Immersion Gold CF deposits gold on high - and low - phosphorus nickel as well as copper.

PROPERTIES:

Mix Ratio	3, 535 ml Part A, 250 ml Part B
Gold Content	0.5 tr oz / gal
Plating Thickness	0.5 µ maximum
pH	8.6-9.0 (lower with citric acid)
Operating Temperature	70-75°C
Plating Rate	Ni (low phosphorus) 0.025 µ / min Ni (high phosphorus) 0.01 µ / min Cu 0.04 µ / min
Tank	Glass
Agitation	Continuous, Required

APPLICATION:

Nickel and copper should be cleaned in dilute hydrochloric acid (approximately 10%) prior to plating. The pH should be adjusted and maintained in the range 8.6-9.0 for best results.

Part A should be added to the plating tank followed by Part B with stirring. Allow the two parts to mix for 5-10 minutes before use.

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2. SILVER (Ag) 银
Electroless Silver(无电镀银)

A silver plating solution for depositing thin uniform layers of bright silver by an electroless immersion process. The process operates by an electroless displacement of base metals by silver brought about by a difference in the EMF potentials. The product is designed to produce a bright silver plating on copper, brass and copper alloys with excellent adhesion. Plating occurs on other metals with varying degrees of adhesion.

PROPERTIES

pH	11
Operating Temperature	90 °C
Plating Time	5-10 minutes
Tank	Pyrex Glass
Bath Life	To exhaustion of silver
Storage	Room Temperature
Plating Capacity	8 grams silver metal per gal. equivalent to 55 sq. ft. (1mg.sq.in.)

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3. TIN (Sn) 锡
Bright Electroless Tin (光亮无电镀锡)

Simple immersion technique for bright electroless tin plating process. Deposit pure tin onto copper, brass, other copper-based alloys, gold and lead-tin electroplate.

FEATURES:

- Plates pure tin rapidly
- Plating exhibits fine-grain tin structure
- Affords unusual resistance to humidity and salt-spray
- Excellent solderability
- Process simple to operate and maintain

BRIGHT ELECTROLESS TIN DESCRIPTION:

Bright Electroless Tin is a well-developed formulation based upon the reduction characteristics of chelated tin in the divalent state. Under proper conditions reduction to pure tin occurs readily. A grain-refining agent, free of phosphorus, is present as well as an activator and buffers for pH control.

The deposited tin, in addition to good chemical resistance, exhibits excellent adhesion and is very solderable even after exposure to extreme humidity testing. Bright Electroless Tin is therefore used to provide corrosion protection to copper and lead-tin electroplate. A minimum of 25 millionths of an inch of tin deposit is required.

Bright Electroless Tin is recommended to preserve solderability of printed circuit boards, either copper or lead-tin electroplate. It is also used for plating electronic parts such as diodes or leads and for the corrosion protection of die stampings and machined copper or brass parts.

PLATING FORMULA
To prepare the electroless tin plating solution use 5 lbs. Part A with one-half gallon Part B, and add 4 gallons water. Stir. All material will dissolve when plating solution is operated at 180 °F.

PLATING RATE (on copper)

Time in minutes	Thickness in Microinches
(@ 180 °F)	(10^{-6} inches)
5	40
10	65

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15	80
30	100

PLATING YIELD

Bright Electroless Tin will deposit 25 millionths of an inch over 100 sq. ft. of copper/gallon of plating solution.

Available in

Part A - (Powder)
1 lb. container 1/2 gal container
5 lb. container 1 gal container
50 lb. container 5 gal container

Part B - (Liquid)
1/2 gal container
1 gal container
5 gal container

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4. COPPER (Cu) 铜
PCB Electroless Copper(印刷电路板无电镀铜)

Adherent copper deposition system for thru-hole plating, printed circuit boards, plastics and other materials.

MATERIALS FOR PLATING NON-METAL, THRU-HOLE PLATED PCB:

Solutions should be used in the following order:

1. Solution C;
2. Solution D;
3. Solutions A & B.

SURFACE SENSITIZING (SOLUTION C)
Immerse pre-cleaned copper-clad epoxy/glass laminates in Solution C for 2 minutes. Do not stir or agitate the solution. Avoid contamination from metal objects. Use glassware and plastic-coated tweezers or transfer racks for handling. Remove surface sensitized pieces; after water rinse, transfer to next solution.

ACTIVATOR (SOLUTION D)
PC boards should be allowed to stand in Solution D for 2 minutes. Again, do not agitate or stir. Finally, remove work and thoroughly rinse in distilled water.

PC ELECTROLESS COPPER BATH (SOLUTIONS A & B)
Bath Make Up: Mix A & B in equal volumes.

Operation of Bath: Use at 30-45 °C (not over 50 °C). Bath should be held at optimum operation temperature of 40 °C for uniform plating thickness. Continuous mild agitation of work. Nominal plating rate 0.2 mil/hour. PC Electroless Copper is used for depositing thin layers of copper, up to 0.5 microns. For thicker films, Transene Copper Plating Acid Type should be used after initial electroless copper deposition.

Thru-Hole Plating Instructions

CLEANING PROCEDURE

1. Solvent Decrease - Removes oil and grease; followed by vigorous water rinse.
2. Pumice Powder - Wet or dry, removes oxides, heavy soils (and/or vapor-blasting); followed by thorough water rinse.
3. Alkali Soak (5 Min) - Hot 150o to 180 oF to further clean copper surface; condition laminate; improve surface wetting. Followed by warm water rinse.
4. Persulfate Etch (2 min) - Produces matte pink copper surface: ammonium persulfate - 200 gm/L; sulfuric acid - 10 ml/L. Followed by water rinse.
5. 10% Sulfuric Immersion (2 min) - Removes insoluble salts (Step #4). Followed by water rinse.
6. 33% HCL Immersion (2 min) - To protect from harmful drag-in.

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PROCEED DIRECTLY TO SENSITIZER

COPPER DEPOSITION

1. Sensitizer Solution C (2 min. immersion) - Seeds epoxy/glass laminate. Followed by water rinse.
2. Activator Solution D (2 min. immersion) - Activates an autocatalytic layer for copper deposition. Followed by thorough water rinse.
3. 5% Sulfuric Dip (3-5 min. immersion) - Speeds electroless copper deposition, protects from drag-in contamination. Followed by water rinse.
4. Electroless Copper Parts A & B (5-10 min. typical) - Immerse in plating bath and agitate slowly. Operate @ 30-45 oC. Followed by water rinse.
5. 5% Sulfuric Dip - Neutralizes surface. Follow by water rinse.
6. 20% HCl Acid Dip (10-60 sec.) - Followed by water rinse.
7. Electroplate Copper - To build up desired copper thickness.

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5. NICKEL (Ni) 镍

A. Nickelex

Improved Electroless Nickel Plating Solution Ammonia Free (不含氨改良的无电镀镀镍解决方案)

Stable electroless nickel plating composition, ready to use, specified for making ohmic contacts to silicon and other semiconductor materials.

UNIQUE ADVANTAGES

- Stable, ready to use
- Plates without generating ammonia fumes
- Produces quality electrical contacts on p- and n-type silicon
- Does not compensate for p- or n- type conductivity
- Excellent adhesion and solderability
- Plates on silicon, germanium, gallium arsenide, cadmium sulfide

DESCRIPTION

Nickelex is a vastly improved, electroless nickel preparation, formulated specially for semiconductor use. The composition is based upon ions of a nickel complex and hypophosphite together in solution with a catalytic accelerator and a stabilizer. The solution is also buffered at the optimum pH for electroless nickel catalysis. In addition, only high purity chemical materials with trace impurities (such as copper) specifically removed are utilized. NICKELEX is a very stable product, free of ammonia, and ready for use without the need of any addition or mixing. Fume problems are completely eliminated. Nickelex, furthermore, is not subject to undesirable changes in composition during use.

The chemical reaction during the electroless plating process involves an oxidation-reduction reaction between nickelous and hypophosphite ions. The reaction is essentially a two step process occurring simultaneously.

(1) $H_2PO_2^- + H_2O \rightarrow H_2OPO_3^- + H_2$
(2) Ni^{++} (complex) $+ H_2 \rightarrow Ni + 2H^+$

The reaction progresses catalytically with nickel deposition occuring at the operating temperature of 95 ° – 100 °C. The nascent hydrogen evolved insures an oxide free nickel deposit. In addition, some NiP formed in a side reaction improves corrosion resistance and solderability. The nickel deposit is highly conductive and remains unstressed, particularly after suitable heat treatment, and shows good adherence.

PROPERTIES OF NICKELEX SOLUTION

Appearance	Green Solution

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PH	5
pH control	None needed
Operating Temperature	90 – 98 °C
Platable Materials	Si, Ge, GaAs, CdS, Ni, Kovar
Plating Capacity (to 50% Depletion)	1400 in^2/micron/gal.
Deposition Rate	2000 Å/min at 95 °C on silicon
Shelf Life	6 months
Storage	Room Temperature

PROPERTIES OF NICKELEX DEPOSITED NICKEL

Composition of Deposit	99 + % Ni, 1% phosphide
Melting Point	890 °C
Specific Gravity	7.85
Coeff. Of Expan.	130 x 10^{-6}in/in/°C
Reflectivity	65%
Elect. Conductivity	60 micro-ohm-cm
Thermal conductivity	0.01 cal/cm^2/cm/°C/sec
Hardness (as plated)	500 vickers
Solderability	Excellent-flux not required above 500 °C in hydrogen or forming gas atmosphere.

USE OF NICKELEX

Nickelex provides good mechanical and electrical contacts for semicodonductor devices (silicon rectifers, solar cells, varactors, microwave diodes, transistors, microcircuits, etc.). The quality of the electrical contact is excellent if the surface of silicon is abraded by lapping to increase surface recombination velocity; if the surface is highly doped from diffusion; or if the semicondcutor resistivity is low (0.1 ohm-cm). Nickelex also produces adherent deposits on germanium, gallium arsenide, and cadmium sulfide.

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The Nickelex plate exhibits excellent solderability with lead, tin, and Lead/Tin alloys. Flux can be omitted when furnace soldered in a hydrogen or non-oxidizing atmosphere.

NICKELEX INSTRUCTIONS

PROCEDURE FOR SILICON RECTIFIERS

To obtain the best nickel adhesion and quality electrical contacts, the following procedure is recommended:

1. Abrade silicon surface by means of lapping with size 200-600 carborundum grit. Sandblasting with S.S. White abrasive unit is also satisfactory. Clean thoroughly with TUD (Transene Ultrasonic Detergent) or other detergent with water rinsing.
2. Soak in hydrofluoric acid (48%) for at least 15 seconds; then rinse in distilled or deionized water to remove HF.
3. Place NICKELEX solution in a Pyrex beaker, heat the solution to 95-98 °C, then drop in silicon for electroless plating.
4. Electroless plate for five minutes. Remove plated silicon, and rinse in water. Dry.
5. Sinter the nickel plate by heat treatment at 700-800 °C for five minutes using a non-oxidizing atmosphere such as nitrogen or forming gas. In special cases, the time may be minimized to limit diffusion of nickel, as for shallow p-n junctions.
6. Place heat-treated silicon again in hydrofluoric acid (48%) for ten seconds; rinse in water; dry; then re-plate electroless nickel at 95-98 °C for five minutes. Finally rinse in water and dry.

NOTE: When heat treatment is not practical, the operations outlines steps 1-4 should be followed with the exception that iso-propyl alcohol replaces the rinse water in step 2.

PROCEDURE FOR PLANAR SILICON DEVICES

1. Soak in Transene Buffer HF Improved for 1-2 seconds, then rinse in deionized water.
2. Place NICKELEX plating solution in a Pyrex beaker, heat the solution to 95-98 °C, then drop in silicon wafers for electroless plating.
3. Remove silicon wafers as soon as complete coverage is obtained. Generally, one minute suffices. Avoid thick deposits which may peel off on polished surfaces. Rinse in deionized water thoroughly and dry.
4. Sinter the nickel plate at 450-500 °C for five minutes in a non-oxidizing atmosphere. Higher temperatures are used when p-n junction depth is not too shallow.
5. Re-plate electroless nickel for five minutes. Remove, rinse in deionized water, and dry.

NOTE: Polished silicon surfaces often exhibit non-uniform surface potentials and consequently may not plate uniformly. Areas on the silicon surface may even resist electroless plating. These conditions are controlled by sensitizing the silicon surfaces to equalize surface potentials prior to electroless nickel plating. Transene silicon surface sensitizer should then be used.

The process, based on the use of sensitizer, is as follows:

1. Soak in Transene Buffer HF Improved for 1-2 seconds; rinse in water as above.
2. Soak in sensitizer for 1 minute; rinse in water.
3. Heat treat at 500 °C for five minutes in a non-oxidizing atmosphere.
4. Electroless nickel plate, sinter, and electroless nickel plate again as above.

PROCEDURE FOR GERMANIUM, GALLIUM ARSENIDE, AND CADMIUM SULFIDE:

The procedures outlined above apply in general to other semiconductors with some notable exceptions. The heat treatment temperature for GaAs is 500 °C. Heat treatment for CdS may or may not be desirable, depending upon the application.

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5. NICKEL (Ni)
B. Electroless Nickel Plating Ammonia Type (FORMERLY ENPAT) (含氨的无电镀镀镍)

Improved standard electroless nickel plating composition specific for making ohmic contacts to silicon and other semiconductor materials.

ADVANTAGES

- Stable, ready to use
- Plates uniformly on p- and n- type silicon
- Offers excellent adhesion and solderability
- Plates on silicon, germanium, gallium arsenide
- Produces quality electrical contacts on p- and n- type silicon

ELECTROLESS NICKEL PLATING AMMONIA TYPE (Formerly ENPAT)
Description

An improved electroless nickel plating solution (Brenner type) formulated for semiconductor use. Specifically, it is designed to deposit nickel uniformly and at equal plating rates on both p- and n-type silicon. The composition of this product is based upon ions of nickel complexes and hypophosphite with stabilizers. Only high purity chemicals are used. The plating solution is a stable product ready to use without the need for additions or mixing. Transene Electroless Nickel Plating Ammonia Type operates under conditions of a catalytic oxidation-reduction reaction between nickelous and hypophosphite ions. The chemical reaction is essentially a two-step process occurring simultaneously.

$H_2PO_2^- + H_2O \rightarrow H_2PO_3^- + 2H^+ + 2e^-$ (1)
$Ni^{++} + 2e^- \rightarrow Ni$ (2)

Nickel is deposited containing about 1% phosphide, which improves the physical properties of the metalization.

The plating solution has an optimized standard electrode potential of 0.44 volts. The electrode characteristics help to regulate the difference in electronegativity between p- and n- type silicon relative to the potential of the nickel complex ions. Thus the rate of deposition of nickel on p- and n- silicon is equalized. The deposition on p- and n- type silicon is 2,000 Å/minute at 90 °C.

PROPERTIES OF ELECTROLESS NICKEL PLATING AMMONIA TYPE

Appearance	Blue Solution
pH	10

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pH control	Ammonium Hydroxide
Operating Temperature	90 – 95 °C
Platable Materials	Si, Ge, GaAs, CdS, Au, Ni, Fe, Kovar alloys
Std. Electrode potential	0.44volts at 95 °C
Nickel Metal Content	1 oz./gal
Deposition Rate	2000 A/min at 90 °C on silicon
Plating Coverage @ 75% depletion	1500 in^2/0.1 mil

PROPERTIES OF NICKELEX DEPOSITED NICKEL

Melting Point	890 °C
Specific Gravity	7.85
Composition of Deposit	99 + % Ni, 1% phosphide
Coeff. Of Expan.	130 x 10^{-6}in/in/°C
Reflectivity	65%
Elect. Conductivity	60 micro-ohm-cm
Thermal conductivity	0.01 cal/cm^2/cm/°C/sec
Hardness (as plated)	500 vickers
Solderability	Excellent-flux not required above 500 °C in hydrogen or forming gas atmosphere.

APPLICATION (on silicon)

Silicon surfaces must be clean, etched in Buffer-HF or HF solution to remove oxide, rinsed and stored in alcohol. On polished silicon wafers, plate 1000-2000 Å of electroless nickel; greater thickness on lapped silicon surfaces. The deposited nickel can be sintered into silicon between 500 °C and 750 °C to promote adhesion and ohmic contact. A second nickel deposit is generally required.

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5. NICKEL (Ni)

C. Electroless Nickel Plating Strike (无电镀镍触击电镀) For Copper, Brass and Copper Alloys

An electroless nickel plating process designed for electroless nickel plating on copper, brass and copper alloys.

PROPERTIES:

Appearance	Green solution
Operating Temp.	85 °C – 95 °C
pH	3.2 optimum
Plating Rate	20 x 10^{-6} in./min.
Deposition	Nickel 90%/Phosphorus 10%
Plating Capacity (50% depletion)	6,750 sq. in. / 20 m in./gal.

CLEANING PROCEDURE FOR COPPER SAMPLES:

1. Clean copper with some physical abrasion.
2. Dip for one minute in alkaline cleaner at 65 °C (150 °F).
3. Rinse with deionized water.
4. Dip for one minute in 30% HCl
5. Rinse with deionized water.

PLATING BATH – USE AND CONTROL

Operate bath at 95 °C. Plate for approximately one minute until surface of sample is completely nickel plated, then rinse with water. For build up of nickel deposit, use Nickelex (Electroless Nickel Plating). Maintain pH of plating solution at 2.8 to 3.5 by adding ammonium hydroxide when pH falls below 2.8.

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5. NICKEL (Ni)

D. Nickel - B

Special Electroless Nickel - Boron
For High Electrical Conductivity and Oxidation Resistance
(用于高电导和抗氧化的无电镀镀镍)

Transene's electroless nickel-boron process, NICKEL-B, offers unique characteristics (not equalled by nickel-phosphorous formulations) which are required by many electrical contact and bonding applications. NICKEL-B plates directly on oxide-free nickel / kovar / copper / tin and gold. Plating on non-metallic surfaces may be accomplished by using Transene's RTM Activator and Sensitizer.

Transene's NICKEL-B metallization resists oxidation, has excellent electrical conductivity and may be plated, soldered, brazed or welded. The NICKEL-B plate has a boron content of 2-3%, electrical conductivity approximately equal to 60/40 tin-lead solder and plate hardness of 500 Vickers. NICKEL-B metallizations are more readily soldered than electrolytic nickel and electroless nickel-phosphorus, easily die-bonded using gold-silicon preforms and completely compatible with die attach epoxies.

Ultrasonic or thermal-compression wire bonding of aluminum to NICKEL-B bonding pads can be accomplished with results superior to those employing gold bonding pads. Electrical contacts plated with 0.20 mil NICKEL-B and 10 micro-inches of gold exhibit characteristics (conductivity / hermeticity) equivalent to 50 micro-inches of gold plated on electrolytic nickel.

PROPERTIES OF NICKEL-B

Appearance	Blue solution, pH 8
pH control	Ammonium Hydroxide pH range 7-10
Operating Temperature	60-70 °C
Plating Capacity (50% depletion)	1200 in^2/0.5 mil/gal
Nickel metal content	.65 oz/gal
Deposition rate	0.45 mil/hr
Composition of deposit	98% Ni, 2% Boron

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PROPERTIES OF DEPOSITED NICKEL-B

M.P.	890 °C
Sp.Gr.	7.85
Coeff. of Expansion	130 x 10^{-6} in/in/°C
Hermeticity (0.15 mils)	Leak rate: 10^{-8} cc helium/sec
Reflectivity	65%
Elect. resistivity (0.20 mil)	30 milliohm/sq.
Thermal conductivity	0.01 cal/cm^2/cm/°C/sec
Hardness (as plated)	500 Vickers
Solderability (tin-lead)	Excellent-flux not required
Brazing-silver (hydrogen/forming gas)	Excellent @ 500-850

APPLICATION:

Supplied ready-to-use, NICKEL-B operates @ 60-65 °C depositing autocatalytically on appropriate metallic surfaces. (RTM Activator and Sensitizer may be used on non-metallic surfaces.) Applications include: Burn-in contacts, connector pins and sockets, diode cans and transistor headers, heat sinks, lead frames, PC board fingers, capacitor bodies and ceramics.

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6. Plating on Non-Conductive Surfaces
导电面的电镀(氧化铝室温金属化)

RTM Process
Room Temperature Metallizing For Alumina

Room-Temperature nickel metallizing process for alumina ceramics and other dielectric materials – strongly bonded nickel can be plated, soldered, brazed or welded.

UNIQUE FEATURES

- Low cost metallization process.
- Excellent bond strength – 100 psi typical.
- Withstands temperature extremes: - 65 °C. to + 850 °C.
- Passes Mil specifications for temperature cycling and shock.
- Hermeticity – leak rate < 10^{-8}cc helium/second.
- Permits registration of metallization patterns with good resolution using photolithographic techniques and mechanical masking.
- Process applicable to beryllia, barium titanate, ferrites, epoxies, mylar and other dielectrics.

RTM PROCESS DESCRIPTION

The RTM process offers a reliable yet simple and economical method to metallize dielectric (non-conductor) materials at room temperature. This metallizing process with nickel is specially suited for commercial alumina type ceramics. The process sequence in 5 basic operations is illustrated.

RTM PROCESS

SURFACE PRETREATMENT	BUFFERED ETCH	SENSITIZER AND CONDITIONER	FIXING	ELECTROLESS NICKEL DEPOSITION
POLIMET	SOLUTION A	SOLUTION B	SOLUTION C	SOLUTION D

Pretreatment of the ceramic material with Polimet lapping compound may be omitted if the ceramic material already shows surface roughness of at least 20 microinches, average. Surface lapping with Polimet compound will result in a uniform surface with a roughness of 25 microinches average.

The composition and formulation of A-B-C-D solutions used in RTM permit excellent control of the metallization process. The nickel deposit is found to be unstressed, highly conductive, and extremely adherent with strong bond strength exhibited from –60 °C. to + 850 °C. It has a hardness of at least 500 (vickers) as deposited. The adherent nickel deposit may be plated, soldered, brazed or welded.

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APPLICATIONS

The RTM process is applicable to metallizing alumina substrates in hybrid and microcircuits, insulated heat sinks, ceramic tubes, windows and terminals. Strong bond structures are produced. Structures with hermetic seals are formed as well.

The RTM process is also useful for metallizing barium titanate and ferrites. In addition, many polymeric materials, notably polyesters, epoxies, cellulosics, mylar and acrylonitrile-butadiene-styrene (ABS terpolymer) may be metallized following suitable modifications of the etch (Solution A).

RTM lends itself productively to the application of photolithographic technology using photoresist materials to register metallization patterns. In this manner, conductive pads may be formed for thin film and hybrid circuits. Base plates for building capacitor structures are also quite feasible.

INSTRUCTIONS

Detailed instructions are provided with each of the solutions used in the RTM process for alumina ceramics. For many other applicable materials, suitable etchants or process modifications are recommended.

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Electroplating chemical—Electrolytic(电镀化学品-电解液)

1. **GOLD (Au) AND ALLOYS(金和合金)**
   A. Special Gold-Room Temperature Metallizing For Alumina
   (氧化铝室温金属处理)----------2
   B. TRANSENE SULFITE GOLD - TSG-250 (亚硫酸金)
   Gold Electroplating Solution for Electronic and Aerospace Applications
   (电子和宇航领域的镀金解决方案)----------4

2. **SILVER (Ag) 银**
   Standard Silver/High Speed Silver Electroplating Solutions
   (标准\高速镀银解决方案)----------5

3. **TIN-LEAD** (100% Sn 锡, 100% Pb 铅, all alloy ratios 合金) 锡-铅
   Tin-Lead Plating Solutions(锡-铅电镀解决方案)----------6

4. **NICKEL (Ni) 镍**
   A. Watts Nickel Plating Solution
   High Quality General Purpose Nickel Plating Composition
   (高品质镀镍解决方案)----------8
   B. Woods Nickel
   C. Sulfamate Nickel Plating SN-10----------9

5. **COPPER (Cu) 铜**
   Copper Plating Acid Type(镀铜酸)----------11

注:"-----2"页码标注从本页是第 1 页算起



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1. GOLD (Au) AND ALLOYS (金和合金)

A. Special Gold

Room Temperature Metallizing For Alumina (氧化铝室温金属处理)

Gold Plating Preparations For Electronics And Semiconductor Applications

PURE GOLD SG-10
Electroplates Pure Gold (99.99%) Up To 1 Mil Thick.

GOLD-ANTIMONY SG-20
Electroplates Gold Alloy Containing 0.5% Sb.

GOLD-GALLIUM SG-30
Electroplates Gold Alloy Containing 0.5% Ga.

GOLD – INDIUM SG-40
Electroplates Gold Alloy Containing 0.5% In.

GOLD – ZINC SG-50
Electroplates Gold Alloy Containing 0.5% Zn.

SPECIAL GOLD
Electrolytic Plating Solutions
DESCRIPTION:

PURE GOLD SG-10 is a highly efficient electroplating formulation processed from hyper-pure gold compounds and well buffered for trouble free operation. It deposits pure gold (99.99%) with excellent plate characteristics, even on stainless steel. The gold has center cubic structure and Rockwell hardness of 24 (15T scale).

SPECIAL GOLD SG-20 through SG-50 are gold alloy plating solutions with good plating characteristics. The minor alloy constituent, Sb, Ga, In, or Zn contained in the electroplate is on the order of 0.5%.

GENERAL OPERATING CONDITIONS

Temperature	60 °C.
Current Density	10 Amperes/ft^2
Anode Composition	Gold or Stainless Steel
Anode to Cathode Ratio	2.1
Still or Mechanical Agitation	90 to 100% efficiency
PH	11.0 to 11.8 (electrometric)

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Tank	Pyrex Glass, Fiberglass, or Stainless Steel
Plating Rate	0.5 mil/hr

The composition of gold alloy deposits may be altered by varying the current density. Gold content is 1 troy ounce per gallon plating solution.

APPLICATIONS:

PURE-GOLD SG-10 is intended for general purpose, heavy gold plating to comply with MIL specifications. A gold plate of 50 millionths protects against all acid etchants (aqua regia excepted) and insures corrosion resistance under all environments.

Electrical contacts plated with PURE-GOLD SG-10 afford very low contact resistance, in the milliohm range, and very low noise levels. Particular importance is placed upon SG-10 in low level signal circuitry to eliminate contact noise problems. In waveguide applications SG-10 can be relied upon to produce quality plating to prevent corrosion and to minimize RF attenuation losses. In addition, the optical properties of SG-10 afford high reflectivity, greater than 90%, in the infrared region. In general, SG-10 provides functional uses for electrical contacts and terminals, electronic tube base pins, switches, printed circuits, and waveguides.

SPECIAL GOLD alloy plating solutions serve as "doped" gold in a simple, convenient method in preparing low resistance electrical contacts for semiconductors. The gold alloy plate is heat-fused at approximately 500 °C to form p+ and n + ohmic contacts.

Semiconductor Material	**P-Type**	**N-Type**
Silicon, Germanium	Gold-Gallium (SG-30)	Gold-Antimony (SG-20)
	Gold-Indium (SG-40)	
Gallium arsenide,phosphide	Gold-Zinc (SG-50)	

1. GOLD (Au) AND ALLOYS

B. TRANSENE SULFITE GOLD - TSG-250 (亚硫酸金)

Gold Electroplating Solution for Electronic and Aerospace Applications

(电子和宇航领域的镀金解决方案)

DESCRIPTION:

TSG-250 is a ready-to-use, cyanide free stabilized gold sulfite electroplating solution which deposits soft satin-bright electrodeposits. The solution exhibits a slightly acid or neutral pH for applications where high pH is undesirable. TSG-250 meets Type III of Mil-G-45204 C requirements.

OPERATING CONDITIONS:

Temperature	110-160°F (140° F optimum)
Current Density	1-8 ASF
Anode	Platinized
Anode to Cathode Ratio	1:1 minimum
Agitation	100% efficiency-vigorous
pH	6.0-7.0
SPG	10-30° Baume
Tank	Polypropylene, Glass, Fiberglass
Hardness	60-70 knoop as plated (may be annealed)

APPLICATIONS:

TSG-250 is ideal for applications where high pH plating solutions react with exposed materials or if a non-cyanide bath is desired. One troy ounce of gold is plated every four amp-hours. The specific gravity of the bath rises with use. Above 30° Baume precipitate sulfate using calcium acetate or barium acetate to lower the SPG to a working range.

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2. SILVER (Ag) 银
Silver Electroplating Solutions (标准\高速镀银解决方案)

These solutions are based on silver cyanide with two types offered:

STANDARD SILVER SOLUTION
HIGH SPEED SILVER PLATING SOLUTION

OPERATING CHARACTERISTICS

Plating Conditions	Standard Silver	High Speed Silver
Metallic Silver	3.5 troy oz./gal	9.5 troy oz./gal
Free Cyanide	5.5 oz./gal	10 oz./gal
Anode	Silver (99.9+%)	Silver (99.9+%)
Anode to Cathode Area	1:1 minimum	1:1 minimum
Tank	Pyrex or lined steel	Same
Operating Temp.	70 ° – 80 °F	100 ° – 120 °F
Heat	Hot Plate; Stainless Steel immers. Heater	Same
Current Density	5 – 15 amp/ft^2	50 amp/ft^2
Agitation	Desirable	Desirable
Anode Efficiency	100%	100%
Plating Rate	0.5 mil/hr	1.0 mil/hr

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3. TIN-LEAD (100% Sn 锡, 100% Pb 铅, all alloy ratios 合金) 锡-铅 Tin–Lead Plating Solutions (锡-铅电镀解决方案)

Tin, lead and tin – lead alloy plating solutions for corrosion protection provide fine grain structure and minimum operational control.

LEAD – 100%
Maximum corrosion resistance

TIN-LEAD ALLOY 5-95
Recommended for bearings

TIN-LEAD ALLOY 10-90
Special lubrication properties

TIN-LEAD ALLOY 60-40
Standard plating composition

TIN-LEAD ALLOY 80-20
Excellent solderability

TIN-100%
For wire plating applications

TIN-LEAD PLATING SOLUTIONS
DESCRIPTION
The tin-lead plating solutions consist of metal fluoborates, addition agents, stabilization additives and proprietary wetting agents. The plating solutions are available in ready-to-use form. Various alloy compositions of tin-lead offer a high degree of uniformity and fine grain structure and require a minimum of operational control. Alloy compositions high in tin provide excellent solderability. High lead alloy compositions are recommended for extreme corrosion resistance and lubricating properties as required for bearings. Pure lead is employed for extreme corrosion resistance while pure tin is recommended for plating wires for solderability.

COMPOSITION (oz./gal. metal)

100% Lead 11.0	Tin-Lead Alloy 60-40 9.0 Sn/ 5.4 Pb
Tin-Lead Alloy 5-95 .8 Sn/12.6 Pb.	Tin-Lead Alloy 80-20 10.0 Sn/2.7 Pb.
Tin-Lead Alloy 10-90 1.34 Sn/12.1 Pb.	100% Tin 11.0

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OPERATING CONDITIONS –For all Plating Solutions

Bath pH	< .5
Temperature (°F)	70-100
Current Density (Amp./Sq.Ft.)	25-30
Voltage (volts)	2-4
Anodes (Polyprop. Bagged)	Same as metal plating compositions
Anode Efficiency (%)	100
Anode to Cathode Ratio	2:1
Agitation (Cathode-Rod)	Mild
Filtration: (Continuous or periodic)	Rubber-lined steel filter presses or Other acid-resistant equipment. Filter Materials can be Terylene, nylon cloth filter paper or paper pulp.

PLATING CONTROL

1. All materials which contact plating solution must be lined with PVC, Koroseal, rubber, Lucite, or polypropylene.
2. Operating temperatures above 100 °F will increase % tin deposited.
3. Cathode current density less than 25 asf will decrease % tin in alloy deposit. Conversely, current density greater than 30 asf will increase % tin in alloy deposit.
4. Air agitation must not be used as it will oxidize tin. Adequate agitation may be provided by a moving work rod.
5. A plating thickness of .001" will be deposited in 17-20 minutes @ current density of 25-30 asf.

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4. NICKEL (Ni) 镍

A. Watts Nickel Plating Solution

High Quality General Purpose Nickel Plating Composition (高品质镀镍解决方案)

Watts Nickel Plating Solution is characterized by its versatility. Electrode deposits of nickel are widely used as an industrial coating as well as a decorative finish. Nickel can be plated on various base metals, particularly copper.

SPECIFICATIONS:

pH	4.0 – 5.0
Operating Temperature	110° – 160 °F
Current Density	10-40 amperes/foot^2
Anode/Cathode Area	1:1
Anodes	Nickel, cast or rolled (preferably bagged)
Agitation	Mild
Plating Voltage	6-12 volts
Tank	Glass, fiberglass, PVC, ceramic
Filtration	Intermittent as required

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4. NICKEL (Ni)
C. Sulfamate Nickel Plating SN-10

DESCRIPTION:

Transene Sulfamate Nickel Plating solution SN-10 is a versatile plating process for electrodepositing nickel over a wide range of properties. SN-10 is used for direct plating of for electroforming for replication applications. Processes requiring very low stress nickel over complex shapes benefit from SN-10.

SPECIFICATIONS:

pH	4.2-4.8
Specific Gravity	1.5g/cc
Hardness	175-230 VHN
Tersile Strength	Up to 620 MPa
Enternal Stress	3.4-28 MPa
Deposit	Satin
Nickel Content	10.2 oz/gal typical
Boric Acid Content	4.0 oz/gal typical
Temperature	90-140oF, 120oF typical
Current Density	5-200 ASF
Voltage	4-12 volts
Anode:Cathode Ratio	1:1
Agitation	Continuous
Anodes	Sulfur Depolarized nickel, bagged

DESCRIPTION:

Hardness, brightness, smoothness, and stress are controllable, inter-related properties of the SN-10 deposit. See the application notes for detailed instructions.

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SN-10 APPLICATION NOTES

SN-10 Solution

The entire nickel content of the SN-10 solution is in the form of nickel sulfamate. In a properly operated sulfamate nickel solution, nickel concentration is lowered only through drag-out, as nickel anode corrosion maintains the nickel concentration during plating. When necessary, the nickel metal content can be raised by the addition of SN-10 concentrate.

Operation at low nickel concentrations can cause burning at normal current densities as well as a decrease in solution conductivity and cathode efficiency. Higher metal content permits operation at higher current densities if proper anode material is used.

Boric Acid (pH buffer)

Boric acid is used to buffer the pH of sulfamate nickel solutions, allowing use of higher current densities without burning and minimizing pitting. When shipped, the SN-10 solution contains 4.0 oz/gal (30 g/L) of boric acid. This is the maximum amount of boric acid that will stay in solution at normal shipping temperatures.

Operation at low boric acid concentration may cause pitting of the deposit, so the boric acid content should be increased with an increase in the temperature.

SN-10 Hardener

SN-10 Hardener is added to a sulfamate nickel plating bath when a hard, compressively stressed, high tensile strength nickel deposit is required. Hard, compressively stressed sulfamate nickel deposits improve both the wear resistance and fatigue life of high strength metals.

SN-10 pH Adjuster

Normally, the pH of a sulfamate nickel solution using active anode material will rise slowly in value. SN-10 pH Adjuster is used to lower pH values as needed.

If the reverse is occurring, this is usually an indication of poor anode corrosion which should be corrected. Nickel carbonate is used for the purpose of raising pH values. It should be introduced through a filter to avoid deposit roughness caused by undissolved nickel carbonate.

SN-10 Wetter

SN-10 Wetter is designed for mechanically agitated sulfamate nickel plating solutions. SN-10 Wetter is a wetting agent with low foaming characteristics which enable it to function equally well in air-agitated or mechanically agitated solutions.

The superior wetting action of SN-10 Wetter significantly lowers surface tension, allowing the plating solution to spread uniformly over, and intimately contact, the metal surface of the part being plated. As a result, deposit pitting caused by interference of hydrogen bubbles and/or organic contamination is greatly reduced, or eliminated.

In addition to its effective wetting action, the SN-10 Wetter additive provides other operational benefits. It does not codeposit with the metal plate and thus do not affect deposit characteristics, such as stress; it aids in keeping anode bags clean; and its concentration in the plating solution can be easily checked with a stalagmometer.

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5. COPPER (Cu)
Copper Plating Acid Type (镀铜酸)

DESCRIPTION:

Transene Copper Plating Acid Type is ideal for high-speed copper deposition including through hole plating. The bath exhibits good stability and is easily controlled. Stabilizer limit resistivity and promote a bright deposit.

PROPERTIES

Temperature (°F)	70-120
Current Density (A/ft^2)	20-50
Anode	Copper
Anode to cathode ratio	1:1
Agitation	Mechanical
Voltage (V)	4-6
Filtration	Continuous
Tank	Glass, fiberglass, pvc, ceramic, rubber
pH	2.5 - 3.5
pH control	Sulfuric Acid
Deposition rate @ 20 asf	0.5 mil/hour
Copper concentration (oz/gal)	6

APPLICATIONS:

Copper Plating Acid Type is used to plate copper of any thickness onto ferrous base metals over copper strike. Especially suited for plating through holes and over trenches where over plating is a concern. The bright deposit consists of uniformly distributed rather than columnar grains. Copper Plating Acid Type is also advantageous as a protective coating under nichrome.

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Encapsulants for Electronic Packaging(电子封装密封剂)

Epoxies for Potting(环氧填充材料)

A. Epoxy 125/175/200/225
General Purpose Epoxies For Electronic Potting Applications
(电子填充的通用环氧材料)----------2

B. Epoxy Based Potting Compound XS-531
(用灌注混合物 XS-531 制造的环氧材料)----------4

C. Epotherm 130/180 Thermally Conductive Epoxy Compounds
(环氧树脂 Epotherm 130/180-热传导环氧混合物)----------5



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A. General Purpose Epoxies For Electronic Potting Applications (电子填充的通用环氧材料)

Newest epoxy materials for potting semiconductor components and electronic assemblies.

EPOXY – 125
Room temperature curing epoxy – for applications to 125 °C.

EPOXY – 175
Elevated temperature curing epoxy – for applications to 175 °C.

EPOXY – 200
Novalac-epoxy formulation – for applications to 200 °C.

Epoxy – 225
Resin-anhydride epoxy system – for high temperature applications to 225 °C.

GENERAL PURPOSE EPOXIES
Description:

General purpose epoxies are formulated as two component systems to provide the best electrical, physical and mechanical properties attainable. The epoxy systems comprise (1) a resin, based upon etho-xylene polymer chemistry, and (2) a reactive hardener to increase linear polymerization and cross-linking of the epoxy. Resin systems are relatively low in viscosity and contain low-loss filler for improved physical characteristics. Castings, which are shrink free, void free and low in thermal expansion, are easily prepared. The electrical characteristics are not sacrificed.

Applications
General purpose epoxies are recommended for protection and low cost packing of semiconductor components, electronic devices and circuit assemblies. The epoxy compounds meet AIEE classes A-B-C-D-H for electrical potting compounds, as well as MIL specifications.

PROPERTIES OF GENERAL PURPOSE EPOXIES

Physical Properties	Epoxy –125	Epoxy –175	Epoxy –200	Epoxy –225
Color	Black	Black	Black	Black
Heat Dist.temp. (°C)	125	175	200	225
Visc. Mixed (cps)	2,200	38,000	20,000	4,200
Flex. Str. (psi)	13,600	15,600	14,500	14,000
Flex.Mod.x 10^{-5}(psi)	4.08	3.37	3.90	4.4
Comp.Yield Str. (psi)	15,000	15,820	35,000	18,500
Comp.Mod x 10^{-5}(psi)	3.40	3.10	2.60	2.89

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Tensile Str. (psi)	11,300	10,500	10,000	10,000
Tens.Mod x 10^{-5}(psi)	¾	¾	4.3	4.4
Izod Imp. Str.(ft.lbs./in.notch)	0.3	0.33	0.50	0.48
Hardness, Shore D	85	90	90	90
Shrinkage (max.)	1%	1%	1%	1%
Thermal Expan.(in/in/°C)x 10^{-6}	30	30	30	30
Electrical Properties				
Dielectric Constant				
Frequency, cps 60	4.10	4.18	3.93	3.09
Frequency, cps 10^3	3.99	4.12	3.88	3.07
Frequency, cps 10^6	3.39	3.57	3.47	2.91
Dissipation Factor				
Frequency, cps 60	0.0099	0.005	0.0067	0.0035
Frequency, cps 10^3	0.023	0.015	0.015	0.0054
Frequency, cps 10^6	0.034	0.039	0.029	0.015
Volume Resist.	1.19 x 10^{16}	1.2 x 10^{16}	1.2 x 10^{16}	5.8 10^{16}
Surface Resist.	7.9 x 10^{15}	7.8 x 10^{15}	7.9 x 10^{15}	7.9 x 10^{15}
Dielect. Str. V/mil	420	455	585	390
Arc Resit. (Av.Sec.)	¾	¾	120	75
Cure Schedule				
Resin: Hardener Ratio	100:17	100:12	100:10	100:45
Pot Life	1 hr.	4 hrs.	4 hrs.	>24Hrs.
Initial Gel	4 hrs @ RT	2 hrs @ 90 °C.	2 hrs @ 80 °C.	2 hrs @ 90 °C.
Post-Cure	+48 hrs @ RT	+4 hrs @ 150 °C.	+2 hrs @ 150 °C.	+4 hrs @ 165 °C +16hrs@ 200°C

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B. Epoxy Based Potting Compound XS-531
(用灌注混合物 XS-531 制造的环氧材料)

Epoxy Based Potting Compound XS-531 is a high quality product formulated for potting electronic assemblies. It is designed for military applications and complies with military specifications, (XS-531 Department of Navy, Bureau of Naval Weapons).

PROPERTIES:

System	2-part
Filler	Silica
Viscosity (mixed)	2,000 pcs (approx.)
Hardness	70-90 (shore D)
Insulation Resistance, as cast	10^6 megohms (min)
Insulation Res., after humidity	10^3 megohms (min)
Bond Strength	1000 (min) psi

MIXING RATIO:
75 Part A to 25 Part B. Deaeration recommended.

CURE:
65 °-95 °C, 3-4 hours minimum

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C. Epotherm(环氧树脂 Epotherm 130/180-热传导环氧混合物) Thermally Conductive Epoxy Compounds

High thermal conductive epoxy compounds for potting semiconductor compounds for semiconductor components and electronic assemblies.

Epotherm – 130
Room temperature curing epoxy with high thermal conductivity and excellent electrical insulation properties – for applications up to 130 °C.

Epotherm – 180
Elevated temperature curing epoxy with high thermal conductivity and excellent electrical insulation – for applications up to 180 °C.

EPOTHERM DESCRIPTION

Epotherm epoxies, thermally conductive compounds, are specially formulated for the encapsulation and potting of electronic components and assemblies used at high temperatures. These potting compounds are highly filled systems containing aluminum oxide in laminar crystallographic form to achieve high thermal conductivity. Temperature-stable epoxy resins designed for these applications are also used in the formulation. Due to the excellent heat transfer characteristics of Epotherm, the dissipation of heat generated by the potted electronic components is assured.

Epotherm epoxies are supplied as two component systems, curable at room and elevated temperatures. In addition to high thermal conductivity, there is good adhesion, extremely low coefficient of expansion, and low shrinkage upon curing. High electrical insulation is not sacrificed.

APPLICATION:

Epotherm products should be used for low cost packaging of semiconductors, electronic components and assemblies when thermal considerations dictate the selection of potting materials with good heat transfer properties.

Properties of Epotherm Epoxy Compounds

Physical Properties Epotherm-130 Epotherm - 180

Color	Black	Black
Thermal Cond. Coef. BTU/hr/ft^2/°F/in	12	12
Coef. Of Therm. Expans. In/in/°C	$20x10^{-6}$	$18x10^{-6}$
Heat Distortion Temp °C	130	180

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Viscosity (mixed) (cps)	40M	100M
Flexural Strength (psi)	13,000	13,500
Flexural Modulus (psi)	$2x10^{-6}$	$2x10^{-6}$
Compressive Yield Strength psi	14,200	14,500
Tensile Strength (psi)	9,000	8,500
Izod Impact Strength lb/in notch	0.30	0.25
Hardness – Shore D	95	95
Machinability	By grinding	By grinding
Electrical Properties		
Dielect. Const. (av. 10^{-2} to 10^{10} cps)	4.0	4.5
Dissipation Factor		
Frequency 60 cps	0.01	0.008
Frequency 10^5 cps	0.02	0.01
Volume Resistivity	$8.9x10^{15}$	$5x10^{16}$
Surface Resistivity	$7.2x10^{15}$	$8.5x10^{15}$
Dielect. Strength volts/mil	420	450
Arc.Resistance sec.	--	100
Cure Schedule		
Resin: Hardener	100:5.5	100:4.5
Pot Life	1 hr.	6 hrs.
Cure	4 hrs. @ RT or mild heat	2 hrs. @ 70 °C.
Post-Cure	48 hrs @ RT	4 hrs @ 150 °C

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Encapsulants for Electronic Packaging

High Purity Passivation Materials(高纯度钝化材料)

2. SES-Low Viscosity Silicone Elastomer for Semiconductors
(用于半导体的低粘性硅树脂橡胶)----------2

2. SES Black -Modified Silicone Elastomer For Light Absorption
(改良的吸光硅树脂橡胶)----------4

3. MBS®Moisture Barrier Silicone(防潮硅树脂橡胶) ----------6

4. SSE®Self-Catalyzed Silicone Elastomer(自催化硅树脂橡胶) ----------8

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1. SES(用于半导体的低粘性硅树脂橡胶)
Low Viscosity
Silicone Elastomer for Semiconductors

Protective coating designed to stabilize semiconductor junctions and surfaces for use in device technology of diodes, rectifiers, transistors and integrated circuits – also for thin film and hybrid microelectronics circuits.

FEATURES

- Permits –60 °C. to 250 °C. continuous operation
- High voltage capability 1000 volts
- Electrical stabilization-minimize leakage current and control surface effects
- Good high frequency characteristics
- Mechanical stabilization against shock, vibration, acceleration
- Protection against weld flash and contamination
- Compatible with epoxy encapsulation
- Simple and economical to use

SES® Silicone Elastomer for Semiconductors
DESCRIPTION OF SES

SES is a thick, white liquid processed from a highly purified special siloxane derivative, which is partially condensed and polymerized. It is ready to use with addition of a trace of catalyst to produce the solid silicone elastomer with excellent electrical and physical properties. Its chemical formula shows covalent bonding of all elements without free dangling valence bonds and in general a non-polar molecular structure.

CHEMICAL STRUCTURE OF SES

SES adheres or bonds to silicon, germanium, glass, and metals. It provides a lasting, neutral, protective coating for semiconductor junctions and surfaces. The uncured SES has a storage life in excess of 5 months. Typical viscosity is 10,000 cps for the uncatalyzed products; customized viscosities ranging from 7,500 to 14,000 cps are also available.

PROPERTIES OF CURED SES

Color	White
Flexibility	-60 °C. to 250 °C.
Heat Resistance	Up to 300 °C.
Specific Gravity	1.2
Resistivity	1 x 10^{15} ohm-cm.

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Dielectric Constant	3.5 (1mc.)
Dielectric Strength	850 volts/mil
Dissipation Factor	5×10^{-3} (1 mc.)
Thermal Conductivity	0.2 btu/ft/hr/ft^2/°F
Durometer Shore A	45
Coefficient of Thermal Expansion	14.1×10^{-5} in/in °F (0-350°F)

APPLICATION OF SES

SES is simple to use and requires an air drying oven (200 °C.) for equipment. SES should first be thoroughly mixed with catalyst provided (0.25%) or less; this mixture has a useful potlife of about 5 hours. Application is made by transfer or dipping, with the coated semiconductor devices gradually heated or the temperature raised in steps to 200 °C. Vacuum heat treatment may also be used. The coated devices can be stored in the oven until packaged. Uncured material can be removed with xylene as a solvent; cured material requires commercial strippers.

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2. SES – Black(改良的吸光硅树脂橡胶)
Modified Silicone Elastomer
For Light Absorption

SES-BLACK is a high purity siloxane formulated with special inert fillers to impart light absorption and eliminate light transmission. SES-BLACK is designed as a protective coating for light sensitive semiconductor devices; other applications requiring light shielding of component arrays and digital displays are appropriate.

Catalyst SES-BLACK will cure at room temperature to a solid silicone elastomer with excellent electrical and physical properties. Elevated temperature curing will optimize electrical properties. The following products are offered:

SES-BLACK 75	VISCOSITY 7,500 CPS
SES-BLACK 150	VISCOSITY 15,000 CPS
SES BLACK 350	VISCOSITY 35,000 CPS
SES BLACK 700	VISCOSITY 70,000 CPS

Please be sure to specify viscosity of each product when ordering. Customized viscosity available.

Physical Properties	
System	Two-part
Color	Black
Solids	100%
Durometer (Shore A)	40
Catalyst (by weight)	0.1 to 0.45%
Pot Life (0.3% catalyst)	4 hours
Flexibility	-60 °C to 250 °C
Heat Resistance	Up to 300 °C
Specific Gravity	1.3
Thermal Conductivity	0.2 btu/ft/hr/ft^2/°F
ELECTRICAL PROPERTIES	

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Resistivity	1 x 10^{15} ohm-cm
Dielectric Constant	3.5 (1mc)
Dielectric Strength	500 volts/mil
Dissipation Factor	5 x 10^{-3} (1 mc)

INSTRUCTIONS:

1. Add catalyst 0.3% and mix well: SES – BLACK CATALYST
   25 gms. 3 drops
   100gms 12drops
2. Deaerate (necessary for molding thick sections).
3. Cure: 24 hrs. @ 25 °C, or 3 hrs. @ 90 °C, or 1 hr. @ 125 °C
4. Post-cure recommended for optimum electrical properties: 1 hr @ 200 °C.

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3. MBS®(防潮硅树脂橡胶)
Moisture Barrier Silicone

Single component, silicone elastomer coating designed to stabilize semiconductor junctions and surfaces and for the environmental protection of electronic components – used for diodes, transistors, integrated circuits, thick film and thin film microelectronic circuits modules.

FEATURES:

- Single component self-catalyzed system- simple and economical to use
- Unaffected by humidity
- Excellent electrical characteristics
- Wide operating temperature range - -65 °C to 275 °C (continuous)
- Useful as protective coating, encapsulant or potting

MBS Moisture Barrier Silicone Description

MBS, Moisture Barrier Silicone, is a medium viscosity translastic product specially processed from highly purified siloxane compounds. This product is particularly formulated to provide greater protection against humidity in electronic applications. MBS possesses self-catalyzing properties and cures as a single component system to form a tough protective coating impervious to moisture. Significantly, the additions of curing agents, catalysts or accelerators are not needed to effect the silicone polymerization. Furthermore, the coating shows good mechanical and electrical characteristics over a wide range of ambient conditions.

MBS is supplied at a viscosity of 45,000 cps ± 10%. Specific viscosities of 20,000 to 100,000 are available upon request.

Properties of MBS

Cured	
Appearance	White, opaque
Viscosity @ 25 °C	45,000 cps nominal
Density @ 25 °C	1.25
Cure	15 minutes @ 125 °C (minimum)
Post Cure	4 hrs. @ 150 °C (minimum)
Shelf Life (under refrigeration) +5 °C (40 °F) -10 °C (15 °F)	 3 months 6 months

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Uncured	
Physical Appearance	White, Flexible
Density	1.3
Durometer, (Shore A)	35-40
Tensile Strength (psi)	250
Elongation (%)	150
Operation Temp. Range °C	75° to + 300° (275° cont)
Dielectric Constant (mc)	3.5
Dielectric Strength (volts/mil)	500
Dissipation Factor (mc)	.001
Thermal Conductivity (cal/cm/sec/cm^2/°C)	6 x 10^{-4}
Volume Resistivity (ohm-cm @ 25 °C)	> 10^{14}
Water Absorption	Nil
Bulk Resistivity (10 days @ 100% rel. humidity)	10^{14}

APPLICATION:

MBS is recommended as a protective, moisture barrier coating for semiconductor devices and as an encapsulant for sensitive microelectronic circuits and other electronic components. MBS is applied by any convenient method and cured at 125 °C for 15 minutes followed by 4-hour cure at 150 °C. The post cure can be accelerated by heating at 250 °C for two hours or longer.

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4. SSE®(自催化硅树脂橡胶)
Self-Catalyzed Silicone Elastomer

Protective coating designed to stabilize semiconductor junctions and surfaces. For use in device technology of diodes, rectifiers, transistors and integrated circuits. Ideal also for potting sensitive electronic components.

UNIQUE ADVANTAGES

- Simple and economical to use – no catalyst needed
- Customized viscosities available
- Permits –65 °C. to 275 °C operation
- High voltage capability
- Electrical stabilization – minimizes leakage current and controls surface effects
- Good high frequency characteristics
- Mechanical stabilization against shock, vibration, acceleration
- Protection against weld flash and contamination
- Compatible with epoxy encapsulation

SSE – Self Catalyzed Silicone Elastomer
DESCRIPTION

SSE is a high viscosity silicone elastomer prepared from purified siloxane derivatives by novel condensation reactions. The chemical purity is monitored to maintain sodium (Na), potassium (K) and mobile ions at lower levels. The product is available in a pre-polymerized state, ready for application. It cures very quickly simply be heating without the addition of catalyst, due to the unique, self-catalyzing properties of SSE. The cured product is a white, resilient, dielectric material that is highly protective, heat stable, and waterproof. In addition, SSE serves as an excellent coating to obtain rapid dissipation of heat. The shelf life of SSE is approximately 6 months stored at 40 °F or below. Typical viscosity of uncured SSE is 250,000 cps. Customized viscosities are available from 100,000 to 400,000 cps.

PROPERTIES:

Viscosity	250,000 cps
Flexibility	To –75 °C.
Heat Resistance	Up to 300 °C.
Specific Gravity	1.3
Bulk Resistivity	5 x 10^{14} ohm-cm
Dielectric Constant	3.5 (1mc.)
Dielectric Factor	1.5 x 10^{-3}(1 mc.)

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Dielectric Strength	550 volts/mil
Thermal Conductivity	5.5 x 10^{-4}cal/cm/sec/cm^2/°C
Durometer Shore A	45
Shelf Life @ 40 °F or lower	6 months

APPLICATION:

FOR SEMICONDUCTOR USE - Application is easily made by means of transfer dipping. An air oven is used to cure SSE after it is applied to the semiconductor devices. The recommended curing temperature is 200 °C. for 4 hours, preceded by 1 hour at approximately 75 °C. Longer curing periods are beneficial and desirable. To stop the flow or drip after applying SSE the coated devices should be set immediately upon a hot plate (100 °C.) At this temperature SSE starts to set quickly, and the flow virtually ceases.

FOR POTTING ELECTRONIC COMPONENTS – Many sensitive electronic components and circuit modules are usually potted with SSE either by transfer, dipping, or by vacuum impregnation. The latter method for encapsulating is desirable for irregular shaped bodies to insure elimination of trapped air. The best procedure for vacuum impregnation requires that the electronic parts and SSE be placed in a vacuum chamber and evacuated. The electronic parts can then be lowered and completely immersed in SSE while still under vacuum. The vacuum is finally broken and the parts are removed and allowed to drain. The SSE coated parts are cured in an air oven at 200 °C for at least 4 hours. The curing may also be performed at a lower temperature (160 °C.) but for a longer period of time.

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Encapsulants for Electronic Packaging(电子封装密封剂)

1. Resistor Coatings(电阻涂料)

A. Hybrisil™Conformal Coatings for Thin Film/Thick Film
(用于薄膜/厚膜的保形涂料)----------2

B. Q-Lac®Radio Frequency Dielectric Lacquer
(RF 射频绝缘漆)----------4

C. Resistor Coatings-High Temperature Conformal Coatings
(高温电阻保形涂料)----------6

2. Flip Chip Underfill(倒装晶片底层填料)

Underfill 25-High Purity, Fast Curing Underfill Encapsulant
Underfill 25-高纯度,快速硫化底层填料密封剂----------9



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1. Resistor Coatings

A. Hybrisil™(用于薄膜/厚膜的保形涂料)

Conformal Coatings for Thin Film/Thick Film

One-part silicone, conformal protective coatings for thin film and thick film resistor networks in microelectronic circuits.

HYBRISIL – 200
High power resistor silicone coating
Elevated temperature cure
Thermal class 350 °C

HYBRISIL™
DESCRIPTION

Hybrisil conformal coating is designed to protect and stabilize thick and thin film resistor networks. The Hybrisil coatings are one-part systems, silicone based and easily applied. These silicone materials provide a low cost yet reliable process for resistor encapsulation. The need for high temperature firings with cermet encapsulations is avoided.

Hybrisil 200 is a silicone-mica filled system which cures at elevated temperature.

PROPERTIES OF HYBRISIL CONFORMAL COATINGS

Uncured	HYBRISIL 200
Composition	One-part silicone filled
Color	Black
Viscosity (cps)	1,500
Thinner	Xylene
Solids	70%
Flash Point	90 °F
Chemical Resistance	Excellent
Shelf Life	6 months
Cure, Activation	Heat
CURED	
Bond Strength (peel lbs./in^2)	125

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Durometer	70 (shore D)
Dielectric Constant (1000 Hz)	4.8
Dissipation Factor (1000 Hz)	.002
Volume Resistivity (ohm-cm)	10^{16}
Water Absorption (7 days) ASTM-D570-54T	0.1
Temperature Rating (Continuous)	-65 °C to + 250 °C
Max. Oper. Temp.	350 °C

APPLICATION:

Hybrisil conformal coating is conveniently applied by horizontal flooding technique or brushing.

Hybrisil-200 is first baked at 65 °C for 20 minutes then heated for ½ hour at 125 °C followed by a post cure of ½ hour at 220 °C.

1. Resistor Coatings

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B. Q-Lac®(RF 射频绝缘漆)

Radio Frequency Dielectric Lacquer

Extremely low-loss, high Q, radio frequency lacquer for protective coating and insulating electronic components and circuits.

UNIQUE PROPERTIES OF Q-LAC

- Dielectric coating with lowest dissipation factor.
- Highest insulation resistance – reliability against voltage breakdown.
- Stabilizes inductances and capacitances.
- High resistance to humidity – guards against corrosion.
- Cements and bonds for structural strength.

IMPORTANT APPLICATIONS

- General coil dope for VHF-UHF-RF windings- choke coils
- Saturant and impregnant for paper, tape, and fabric materials used in windings.
- High Q lacquer capacitors – filter circuits – printed circuits.
- Coating for moisture sensitive, high frequency electronic components and circuits.

Q-LAC® Radio Frequency Dielectric Lacquer
DESCRIPTION

Q-LAC is a special lacquer composed of a cross polymer of iso-polystyrene, formulated in accordance with the Clausius-Masotti equation as design criteria for a low loss dielectric material. Structurally, the Q-LAC formed film is a non-ionic substance with small atomic polarizabilities and no free dipoles. The complete absence of dipoles, either of the bound or free type, as well as any free ions, results in the elimination of ionic conductivity, ordinarily responsible for high loss factor. Excellent electrical properties especially at high frequencies are valuable characteristics of Q-LAC.

Q-LAC coatings are, furthermore, strongly adherent and protective with excellent resistance to moisture. Coatings show high surface resistivity on account of the strong hydrophobic character of the Q-LAC films. Exposure to 98% relative humidity does not alter the surface conductivity. Q-LAC finds important application, therefore, for coils and other electronic components and circuits where circuit Q is important.

PROPERTIES OF Q-LAC FILM

Volume Resistivity	1 x 10^{15} ohm-cm.
Surface Resistivity	5 x 10^{14} ohm
Dielectric Constant	2.53 (1 mc.) 2.52 (50 mc)
Dielectric Strength	2200 volts/mil
Power Factor	.001 (1 mc) .0005 (50 mc.)

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Loss Factor	.002 (1mc) .001 (50 mc.)
Dissipation Factor	.0001 (1000 c.p.s.)
H_20 Absorbtion Coefficient	.01
Temperature Range	-40 °C to + 100 °C.

APPLICATION TECHNIQUE

All parts to be coated should be thoroughly dry, preferable by preheating at 110 °C. Q-LAC is then applied by brushing or dipping, either air dried for 30 minutes or oven baked at 60 °-90 °C. A film thickness of about 1 mil can be expected from a single brush application or dipping. Dilution with xylene or toluene in a 1:1 ratio will film to approximately half thickness. A minimum film thickness of 1 mil is recommended.

1. Resistor Coatings

C. Resistor Coatings(高温电阻保形涂料)

High Temperature Conformal Coatings

Solution type insulation coatings formulated with dielectric aluminum silicates in a special silicone base – for power resistors, capacitors and other electrical components.

RESISTOR COATING – TYPE 100

Thermal Class – 350 °C
For very high temperature applications

RESISTOR COATING – TYPE 150

Thixotropic modification of type 100
For single coat application

RESISTOR COATING – TYPE 200

Thermal class – 250 °C
For applications requiring very high adhesion and chemical resistance

RESISTOR COATING – TYPE 250

Thixotropic modification of type 200
For single coat application

FEATURES:

- Single component systems
- High insulation resistance
- High reliability performance
- Moisture resistant
- Fire resistant

RESISTOR COATINGS DESCRIPTION

Transene conformal resistor coatings are specially formulated from insulation materials designed to pass rigid, high reliability performance standards for military and space applications. The coatings are particularly advantageous for precision power resistors as well as for other electrical components used in high temperature applications. The coatings are fire resistant and highly protective towards moisture and ambient.

Transene Resistor Coatings contain modified, high temperature silicone resins combined with dielectric grade aluminum silicate materials. These coatings exhibit excellent insulating properties, notably high dielectric strength and high electrical resistivity. Furthermore, these characteristics are maintained at elevated temperatures- as high as 350 °C continuous. A feature of these resistor coatings is their superior adhesion.

Two basic types of resistor coatings are offered based upon their temperature rating, adhesion, quality and chemical resistance. In addition, thixotropic modification of these two types allows single coat application.

RESISTOR COATING – Type 100 was developed specifically for high temperature application;

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consequently it demonstrates exceptional thermal stability. Color black or green.

RESISTOR COATING – Type 150 is a thixotropic modification of type 100 to permit single coat application. Color black or green.

RESISTOR COATING – Type 200 is designed to withstand chemical attack. Its resistance to solvents is excellent while adhesion is extremely high. Color black or green.

RESISTOR COATING – Type 250 is a thixotropic modification of type 200 for single coat application. Color black or green.

PROPERTIES OF RESISTOR COATINGS

PHYSICAL PROPERTIES	Type 100 and 150	Type 200 and 250
Appearance	Liq Susp.	Liq. Susp.
Color	Black or green	Black or green
Viscosity, cps	200/1300	200/1300
Solids % by wt.	80%	80%
Sp.Gr.	1.21 blk, 1.12 grn	1.18 blk, 1.10 grn
Thinner	Xylene or toluol	Xylene or toluol
Flash Point (solvent)	90 °F	90 °F
Shelf Life	6 months	6 months
Chemical Resistance	Good	Excellent
Temperature Rating (10,000 hrs)	350 °C (cont.)	250 °C (cont.)
Temperature Cycling	-65 °C to + 250 °C	-65 °C to + 250 °C
Coverage/gal/mil/thickness	650 sq. ft.	650 sq. ft.
Bond Strength, peel lbs./in^2	125	225
Lap Shear Strength lbs/in^2	250	1000
ELECTRICAL PROPERTIES		
Dielectric Strength (volts/mil)	700	700

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Dissipation Factor @ 1 mHz.	.002	.01
Dielectric Constant @ 1 mHz.	4.85	5.25
Volume Resistivity(ohm-cm)	10^{16}	10^{16}
CURE SCHEDULE		
Air Drying (also between coats)	20 min	20 min
Bake at 65 °C	20 min	20 min
Cure	½ hr. at 125 °C	½ hr at 150 °C
Post Cure	½ hr at 225 °$^{+}$C	½ hr at 225 °C
Alternate Cure and Post Cure	---------	6 hrs at 135 °C

APPLICATION

Coatings can be applied by dip or roll dip. Type 100 and type 200 yield a coat thickness of about 2 mils on single application. Two or three coatings are recommended. Type 150 and 250 permit single coat application of about 7 mils, permitting greater economy and process simplification.

The coatings should be (1) air dried and baked at 65 °C for 20 minutes followed by (2) one half hour at 125 °C (or 150 °C), then (3) post cured for one-half hour at 220 °C. Alternated lower temperature cure may be used for Types 200 and 250.

2. Flip Chip Underfill(倒装晶片底层填料)
Underfill 25

High Purity, Fast Curing Underfill Encapsulant(高纯度,快速硫化底层填料密封剂)

DESCRIPTION:

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Underfill 25 encapsulant is a single component epoxy system formulated for fast flow and extremely fast cure for flip chip underfill encapsulant applications. The ultra-high purity formulation provides excellent capillary flow characteristics for CSP, PPGA, and BGA assemblies on printed circuit boards. Underfill 25 penetrates sub-mil gaps easily and offers excellent temperature and chemical resistance.

PROPERTIES, UNCURED

Appearance	Transparent liquid
Filler content	0%
Viscosity, 25 °C	250 CPS
VOC	< 1 gram/L
Specific Gravity	1.18 g/cm^3
Capillary Flow Rate (100 °C, 1.5 mil aperture) 1/4 " flow 1/2 " flow	< 3 seconds < 7 seconds
Working life	30 hours at 25 °C
Cure Schedule	10 minutes at 155 °C

PROPERTIES, CURED

Glass Transition Temperature (DSC)	129 °C
Coefficient of Thermal Expansion(30 - 100 °C)	85ppm
Extractable Ionic Content Chloride (Cl) Potassium (K) Sodium (Na)	< 1ppm < 0.5ppm < 1ppm
Shore D Hardness	85

APPLICATION:

Transene Underfill 25 flip-chip encapsulant is appropriate for wire-bonded or flip-chip die applications in most cavity packages including BGA, MCM, CSP, and PPGA. In addition, Underfill 25 is suitable for direct die encapsulation on silicon, laminate, metal, ceramic, and mask substrates. Underfill 25 offers particular advantages where fast cure and fast capillary flow rates are required. Underfill 25 offers ultra-high purity for demanding microelectronic applications where ion induced corrosion is a threat.

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Encapsulants for Electronic Packaging(电子封装密封剂)

Silicone for Potting and Encapsulation(填充和封装用硅树脂)

1. Translastic ® RTV Silicones
Potting and Encapsulation of Electronic Components and Circuit Modules
(电子元器件和电路模块填充和封装用硅树脂)----------2

2. Translastic RTV 1602----------7

3. Translastic ® S-2007
Silicone Junction Coating For Rectifiers(用于整流器的硅树脂接合涂料)----------8

4. Semiconductor Junction Coating(半导体接合涂料)
Silicone Elastomer Systems for Protection and Passivation of Semiconductor Junctions
(用于半导体结保护和钝化的硅树脂橡胶)----------10

5. Silicone Semi-Gel
Transparent Dielectric Potting(透明绝缘的填充硅树脂)----------13

6. Thermasil- Thermally Conductive Fire Retardant Silicone(导热抗热硅树脂)----------15

7. Radiation Curable Encapsulant(防辐射密封剂)----------18

8. Silicoat®SILICONE COATING FOR PRINTED CIRCUIT ASSEMBLIES
(用于印刷电路装配的硅树脂涂料)----------19



注:"-----2"页码标注从本页是第 1 页算起

1. Translastic ® RTV Silicones
(电子元器件和电路模块填充和封装用硅树脂)
Potting and Encapsulation of Electronic Components and Circuit Modules

Translastic ® RTV Silicones cure to a tough flexible silicone rubber which absorbs vibration and provides environmental protection, excellent insulation, resistance to chemical attack and reversion resistance.

RTV 111
White, low viscosity

RTV 141
White, medium viscosity

RTV 130
Red, low viscosity, high strength

RTV 160
Red, medium viscosity, high strength

FEATURES

- Room temperature or elevated temperature cure
- Easy mixing, accurate measuring
- Fast cure, long pot life
- Excellent electrical protection
- Vibration damping
- Meets MIL 23586 requirements

TRANSLASTIC ® RTV SILICONES
DESCRIPTION

Translastic RTV's are poly-dimethyl siloxane systems which polymerize with the addition of appropriate catalysts. The catalyst initiates a free radical, condensation-type reaction. Reaction rates can be accelerated by heating and/or selection of catalyst. A selection of paste catalysts offer control of cure time and pot life as necessitated by process requirements. In deep or thin section, the polymerization reaction progresses without evolution of exothermic heat and minimal shrinkage.

Translastic RTV's provide environmental protection against temperature extremes, moisture, contamination, weathering, corona and corrosive atmospheres. RTV materials cure in thin or deep section to form a tough, flexible silicone rubber which absorbs mechanical shock and vibration. The product has many applications including: PC board, conformal coatings, precoating of assemblies before final encapsulation in rigid compounds, insulating motor leads and cable junctions, modules, relays, power supplies, amplifiers, transformers, ferrets, connectors and silicone mold making material.

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PROPERTIES OF TRANSLASTIC RTV SILICONES

	Type 111	Type 141	Type 130	Type 160
Uncured				
Color	White	White	Red	Red
Viscosity, cps	10,000	50,000	10,000	35,000
Specific Gravity	1.16	1.30	1.45	1.50
Shelf Life	1 year	1 year	6 months	6 months
Storage Room Temperature or Below				
Cured Physical				
Self-Extinguishing	Yes	Yes	Yes	Yes
Corrosion Resistance(M-S-23586)	Good/pass	Good/pass	Good/pass	Good/pss
H_20 Absorbtion %(7 day @ 23 °C)	0.4	0.3	0.4	0.2
Durometer	45	45	60	60
Tensile Strength (psi)	375	500	775	850
Elongation (%)	175	175	130	130
Brittle Point (C)	-50°	-50°	-50°	-50°
Tear Resistance(die B lb/in)	15	30	40	40
Operating Temp. (°C)	-50° to 250°	-50° to 250°	-50° to 250°	-50° to 250°
Cured Electrical				
Dielectrical Strength(v/mil)	500	500	500	500
Dielectric Constant	3:1	3.2	4	3.8
Diss. Factor 10^2Hz	.004	.01	.007	.003
10^6Hz		.002	.003	.003
Volume Resistivity (23 °C)	1 x 10^{15}	1 x 10^{14}	3 x 10^{15}	2 x 10^{13}
Thermal Conductivity Btu-ft/m/Ft^2/°F	0.17	0.17	0.18	0.18

APPLICATION:

TRANSLASTIC RTV's and Paste Catalysts S and M are designed for automatic dispensing, mixing and metering for volume applications. Smaller applications readily lend themselves to hand mixing, de-aerating and application by any convenient method such as pouring, dipping or brushing.

A selection of catalyst should be made for the cure. Catalyst S provides a slow cure, Catalyst M cures medium-fast, and Catalyst F provides fast cure. The catalysts are used in approximately 10% concentration.

Curing of Translastic RTV's may be accomplished at room temperature. A more complete cure may be effected by curing at elevated temperatures, up to 200 °C. Detailed instructions are supplied with each order.

TRANSLASTIC RTV SILICONES

Cured TRANSLASTIC RTV's offer retention of elastomeric properties from –90 °F to 600 °F, physical toughness and aging, resistance to chemical attack and reversion resistance.

RTV's 111 and 141 are low to moderate viscosity polymer systems with chemically inert calcium carbonate filler systems. The excellent flow characteristics and deep section cure allow potting of all electronic modules, components, assemblies and relays. Availability in various colors allows for color coding of components.

RTV's 130 and 160 are low to moderate viscosity polymer systems with a unique iron oxide filler system. Excellent physical properties and high temperature capability allow for encapsulation of transformers, coils and motor windings where elastomeric properties are required up to 600 °F.

Catalyst S, M, F

Three paste catalysts providing non-critical mixing ratios of 10:1 are supplied. The selection of catalyst is based on process requirements for total cure time, pot life and temperature limitations. Catalyst S provides the longest working time; Catalyst M provides shorter pot-life with faster cures. Catalysts S and M may be heat accelerated to provide shorter cure times. Catalyst F offers extremely fast room temperature cures with minimal working time. The Catalyst Performance Charts below provide necessary information for selection.

TABLE I CATALYST SELECTION FOR TRANSLASTIC RTV SILICONES

Room Temperature Cure – 10% Catalyst Concentration

	CATALYST S			CATALYST M			CATALYST F		
RTV PROD	POT LIFE HRS	GEL HRS	CURE HRS.	POT LIFE HRS	GEL HRS	CURE HRS.	POT LIFE HRS	GEL HRS	CURE HRS.

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111	5	10	30	2	5	25	¾	1 ½	20
141	3	8	20	1 ½	4	25	¼	1	20
130	4	8	20	2	3	15	½	1	15
160	5	8	20	2 ½	4	15	½	1	15

Pot life can be extended by refrigeration:
10 hours @ 5 °C; 2 to 4 days @ -10 °C.

TRANSLASTIC RTV SILICONES
TABLE II
CATALYST SELECTION FOR TRANSLASTIC RTV SILICONES
ELEVATED TEMPERATURE CURE – 10% CATALYST CONCENTRATION

CATALYST S			**CATALYST M**		
RTV PRODUCT	POT LIFE HRS. 25 °C	CURE HRS. (90 °C)	CURE HRS. (125 °C)	POT LIFE HRS. 25 °C	CURE HRS. (90 °C)	CURE HRS. (125 °C)
111	5	4	2	2	2	1
141	3 ½	3	1 ½	1 ½	1 ½	1
130	4	3	2	2	2	1
160	5	4	2 ½	2 1/2	2 ½	1

APPLICATION

TRANSLASTIC RTV's and Paste Catalysts S and M are designed for automatic dispensing, mixing and metering for volume applications. Smaller applications readily lend themselves to hand-mixing, deaerating and application by any convenient method –pouring, dipping or brushing.

STEP ONE – Pour RTV into mixing container about ½ full. Add catalyst and mechanically mix or hand-stir thoroughly, keeping entrapment of air to a minimum.

STEP TWO - For complex or densely packed circuit components and/or deep section casting, deaerate under vacuum (20 mm Hg) for 15 minutes.

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STEP THREE - Apply by dipping, brushing or pouring. When pouring deep sections, avoid air entrapment. Pouring under vacuum is advisable. Deaerate potting unit after pouring operation. For impregnation of coils or transformers, the deaeration should by followed by application of 10 to 50 psi air pressure.

STEP FOUR - RTV's cure at room temperature; however, to obtain optimum properties, post-cure heating is necessary. For thick section cures (1/2 " and greater) best results are obtained utilizing Catalyst S and gellation at room temperature, followed by heating in steps to 25 °C above service temperature of component.

TRANSLASTIC RTV SILICONE rubbers bond to most materials (metal, glass, plastics) with the use of Translastic 13 Organo-Silicone Primer. Simply brush, dip or spray surfaces and allow ½ hour to air-dry before potting component.

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2. Translastic RTV Silicone -1602

TRANSLASTIC RTV SILICONE –1602 is a solvent free RTV silicone base which, when mixed with catalyst, cures to a transparent elastic silicone rubber. This material may be used in potting or encapsulating applications where a high degree of mechanical strength is not required.

PROPERTIES:
UNCURED

Color	Water White
Viscosity Range (cps)	4000
Consistency specific gravity	0.98
Density at 77 °F, g/cu,in	16
Non-volatile Content (%)	99.5 min
Pot Life	4 hours
Rec. Catalyst Conc. By weight	0.3%
Shelf Life	6 months

CURED

Color	Clear
Durometer, Shore A	20
Dielectric Strength volts/mil	515
Dielectric Constant, 10^3Hz	2.6
Dielectric Factor, 10 Hz	.00003
Volume Resistivity, ohm-cm	2.5×10^{15}

PROCEDURE

Add catalyst and mix well. (Catalyst 0.3%)
Deaerate mixture and apply as required.
Select cure schedule: (0.3% catalyst)

25 °C	65 °C	100 °C	150 °C
30 hrs.	5 hrs.	1 hr.	½ hr.

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3. Translastic ® S-2007 (用于整流器的硅树脂接合涂料) Silicone Junction Coating For Rectifiers

Dielectric coating or encapsulating material for electrical components, electronic units and semiconductor rectifiers.

FEATURES

- Uniform and heat-stable
- Waterproof
- Resistant to oxidation and weathering
- Rapid heat dissipation
- Easy to apply
- Superior flow characteristics
- Fast cure
- No preliminary vulcanization

TRANSLASTIC ® S-2007 DESCRIPTION

Translastic S-2007 is an excellent dielectric coating or encapsulating material for electrical components, electronic units and semiconductor rectifiers.

Translastic S-2007 cures to form a resilient jacket which is uniform, heat-stable, waterproof and highly resistant to oxidation, ozone and weathering. Its high thermal conductivity permits rapid dissipation of heat. The excellent dielectric properties and resistance to moisture assure reliable operation under the most adverse humidity conditions.

Supplied as a solvent free, low consistency, silicone rubber composition, Translastic S-2007 is suitable for dipping or vacuum impregnation. It is virtually as easy to apply to intricately shaped parts as to simple shapes. Its flow characteristics enable it to uniformly cover all contours. It is fast curing and does not require preliminary vulcanization.

PROPERTIES OF TRANSLASTIC S-2007

Uncured	
Color	White
Specific Gravity	1.3
Viscosity (cps.nominal)	200,000
Cure Temperature	150 °C (minimum)
Shelf Life @ 25 °C	3 months
@ 10 °C	6 months

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Cured	
Durometer (Shore A)	45
Tensile Strength psi	450
Elongation %	150
Dielectric Strength, volts per mil	500
Dielectric Constant at 10^2 cycles	3.52
Dielectric Constant at 10^6 cycles	3.48
Power Factor at 10^2 cycles	0.0035
Power Factor at 10^6 cycles	0.0015
Volume Resistivity, ohm cm	17.2×10^{13}
After 7 days at 100% rel. humidity	$8.6\ 10^{13}$
Surface Resistivity, ohms	2.82×10^{13}
After 7 days at 100% rel. humidity	0.5×10^{13}
Viscosity can be modified to suit custom applications	

APPLICATION

Translastic S-2007 may be applied under pressure through a hypodermic needle. However, the geometry and size of the component part may determine the most suitable technique for the application of the material, such as transfer, dipping or by vacuum impregnating.

The temperature and time for curing the material can be varied. Curing is done in an air oven. It is preferable to cure at a lower temperature first, about 90 °C for ½ hour, followed by a higher temperature cure, up to 200 °C or higher. The final temperature for the cure should be 200 °C for at least 4 hours.

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4. Semiconductor Junction Coating (半导体接合涂料)

Silicone Elastomer Systems for Protection and Passivation of Semiconductor Junctions (用于半导体结保护和钝化的硅树脂橡胶)

Translastic Semiconductor Junction Coatings, Types 3811 and 3812, are high purity, 100% solids, siloxane systems designed for passivation coating transistor, diode and rectifier junctions. Demanding production procedures and rigid quality control requirements guarantee ionic purity levels of 1 ppm (maximum). Typical applications include conformal coatings to provide mechanical and electrical insulation prior to plastic molding; protective coatings over hybrid integrated circuits to prevent chip damage during potting; and other ultra-pure, hermetic-type passivations.

Type 3811 and 3812 Junction Coatings will prevent electrical breakdown, minimize junction surface leakage, stabilize peak inverse voltage, and provide environmental protection for high temperature performance and thermal cycling.

PROPERTIES	TYPE 3811	TYPE 3812
System	One-Part	Two-part
Solids	100%	100%
Appearance	Clear	Clear
Viscosity	7,500 cps	5,000 cps
Shelf Life	3 months	12 months
Storage Temperature	40 °F or below	Room Temperature
Specific Gravity	1.03	1.03
Mix Ratio	------	10 to 1
Pot Life	------	> 48 hours
Durometer (shore A)	30	30
Tensile Strength (psi)	400	350
Elongation (%)	130	140
Dielectric Strength	> 450	> 450
Dielectric Constant @ 10^6 Hz	3.50	3.50
Volume Resistivity ohm/cm	10^{15}	10^{15}
Dissipation Factor @ Imc	0.001	0.001

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METALLIC IMPURITY (by spectographic analysis)

Metal	ppm Max.	Metal	ppm Max.
Aluminum (Al)	1.0	Lead (Pb)	1.0
Antimony (Sb)	1.0	Magnesium (Mg)	1.0
Chromium (Cr)	1.0	Nickel (Ni)	1.0
Copper (Cu)	1.0	Potassium (K)	1.0
Iron (Fe)	1.0	Sodium (Na)	1.0

CURE:

Electrical performance of junctions coated with these elastomers is influenced by both temperature and duration of cure. Longer post-cures and higher temperatures generally improve device characteristics.

CURE SCHEDULE:

1/2 hour @ 80 °C + (optional)
1 hour @ 135 °- 150 °C (cure)
2 hours @ 200 °-225 °C (post cure-minimum)

Semiconductor Junction Coating - Type I

Low cost, heat stable, moisture resistant, high purity silicone resin for semiconductor applications. Designed specifically for environmental protection of transistors, diodes and rectifiers.

PHYSICAL PROPERTIES:

System	One-part; rigid
Base	Silicone resins
Appearance	Light amber
Specific Gravity	1.03
Viscosity	350 cps
Flash Point	90°F
Thinner	Xylene
Solids	50%
Shelf Life	5 months @ 25°C
Thermal Life 250°C	> 10,000 hours

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CHEMICAL SPECIFICATIONS:

Sodium	< 1 ppm
Potassium	< 1 ppm

ELECTRICAL:

Dielectric Strength	> 2500 (v/mil)
Dielectric Constant	2.75 (1 mc)
Volume Resistivity	> 1016 ohm-cm
Dissipation Factor	0.001 (1 mc)

APPLICATION:

Dip, paint, spray or transfer.

CURE:

Air dry for 20 minutes. Bake at 65°C for 20 minutes, then at 125° for 1/2 hour. Postcure at 225°C for 1/2 hour, or at 200°C for 5 hours.

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5. Silicone Semi-Gel (透明绝缘的填充硅树脂) Transparent Dielectric Potting

Transparent silicone potting systems – cures to a soft elastomer gel material – for mechanical cushioning, vibration damping and protective coating of sensitive microelectronic devices and circuits.

SILICONE SEMI-GEL TYPE C

Two-part, quick cure, self healing

FEATURES:

- Low viscosity – quick cure
- Shock-absorbing
- Service temperature range –60 °C to + 250 °C

SILICONE SEMI-GEL DESCRIPTION

Translastic Semi-Gels are one part silicone products which cure to a mechanical energy absorbing material. The physical properties of the cured product are intermediate between true gel and elastomeric products, offering unique advantages for the protection of sensitive electronic devices and microelectronic circuits. It is used for environmental protection and to guard against effects of shock and vibration.

Semi-Gels have a low viscosity in the uncured state which flows readily around delicate assembly structures. The product is applied easily for potting, encapsulation, embedding, coating and casting where shock absorbing material is required from –60 °C to + 250 °C. Two types of Semi-Gel are offered: B + C

Properties of Silicone Semi-Gels B + C

Uncured	**Semi-Gel Type B**	**Semi-Gel Type C**
System	One-Part	Two-part
Viscosity, cps	3,000	750
Solids	100%	100%
Shelf Life	3 months	12 months
Storage	40 °F or lower	Room Temp.
Pot Life	------	2 hours
Cured		

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Color	Optically clear	Optically clear
Sp.Gr.	1.02	.95
Hardness (Shore A)	15	-----
Penetration	-----	-----
Tensile Strength (psi)	250 min	-----
Elongation	100%	-----
Dielectric Constant	3.0	2.5
Dissipation Factor	.0008	.0001
Dielectric Strength	> 500	500
Volume Resistivity (ohm-cm)	8×10^{15}	10^{15}
Serv. Temp Range	-60 °C to +200 °C	-60 °C to +200 °C
Cure		
Mixing Ratio (by wt.)	Not applicable	1 part A: 1 part B
Cure Schedule	3 hrs @ 100 °C or	16 hrs @ 25 °C or
	2 ½ hrs @ 125 °C or	½ hr. @ 100 °C or
	1 hour @ 150 °C	10 min @ 135 °C *Vacuum deaerating recommended after mixing.
Coefficient of Thermal Expansion	15×10^{-5} in/in °F (0-350 °F)	

APPLICATIONS:

Semi-Gel is recommended as a dielectric cushioning material for integrated circuits to protect fine wire interconnections. It functions as a mechanical shock absorber and for vibration damping to ensure high reliability. Similarly the product is used for thick-film hybrid and thin-film microelectronic circuits as well as for other sensitive equipment.

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6. Thermasil (导热抗热硅树脂)
Thermally Conductive-Fire Resistant Silicone

Silicone dielectric potting and encapsulating compounds with high thermal conductivity and excellent fire resistance properties – for electronic and aerospace applications.

THERMASIL – TYPE I , IX
One–part system – ready to use

THERMASIL – TYPE II
Two-part system-low temperature cure

FEATURES

- High tensile strength
- High temperature characteristics
- Fire resistant. Self extinguishing
- High thermal conductivity
- Excellent electrical properties

THERMASIL
Description

Thermasil is a specially processed silicone rubber composition, fire-resistant and non-combustible, designed for thermally conductive potting and encapsulating of electronic equipment. Thermasil is solventless, containing 100% reactive material. Cured simply by heating, Thermasil forms a flexible, heat resistant silicone rubber. It will withstand temperatures in excess of 275 °C. Electrical properties are not sacrificed.

Properties of Thermasil

	Type I	Type II	Type IX
Uncured			
Color	White	White	White
Viscosity@ 23 °C (cps)	130,000 ± 10%	140,000 ± 10%	200,00± 10%
Sp.Gr @ 25 °C	2.25	2.03	2.25
Shelf Life	6 months	6 months	6 months
Storage	40 °F or lower	Room Temp	40 °F or lower
System	One-part	Two-part	One-part
Cured			

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Physical			
Color	White	White	White
Density	2.25	2.03	2.25
Hardness_Dur Shore A	75-85	55-65	75-85
Tensile strenght (psi)	600	600	600
Elongation %	> 100	> 100	> 100
Thermal expansion in/in/°F	35 x 10^{-6}	35 x 10^{-6}	35 x 10^{-6}
Thermal Conductivity BTU/hr/ft^2/in/°F	7	6	7
Operating Temp. Range °C	-50 to 250 (Cont)	-50 to +250 (Cont)	-50 to 250 (Cont)
Brittle Point °C	-55	-55	-55
Electrical:			
Dielectric Constant 25 °$^{+}$C @ 1KH_z	4.5	4.5	4.5
Dielectric Strength (v/mil) 1 16 sample	490	> 500	490
Volume Resistivity (ohm-cm) 500 V,dc	1 x 10^{16}	1 x 10^{15}	1 x 10^{16}
(spindle 7, 20 rpm, Brookfield HAT)			

CURE SCHEDULE

Any one of the following:

	Catalyst Conc.	Pot Life	Cure Time (hrs) 25°C 70°C 125°C		
			25°C	70°C	125°C
100 °C – 4 hours	5% Catalyst S> 1 hour	100 °C – 4 hours	15	4	2
125 °C – 1 ½ hours	10% Catalyst S> ½ hour	125 °C – 1 ½ hours	12	2	1
150 °C – 1 hour	5% Catalyst T 3 hours	150 °C – 1 hour	30	6	3

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APPLICATIONS:

Thermasil is recommended as a protective coating for electronic components from which heat is to be dissipated and where fire resistance is of prime importance, and also as a "form-in place" heat sink. It is useful as a conformal coating for electronic assemblies which must operate at high temperature and voltage conditions, as well as for power resistors, cables and connectors.

Among the advantages of Thermasil conformal coatings are: protection against corrosion and humidity, Class H insulation, high electrical insulation and stability, mechanical support, and an operating temperature range from -65 °C to + 275 °C. Application is by dipping, painting or potting followed by recommended heat cure.

Thermasil IX, 1 pound kit, corresponds to National Stock Number (NSN) 8030-01-105-8605. Thermasil II, 1 pound kit with Catalyst S, corresponds to National Stock Number 8040-01-105-8604.

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7. RADIATION CURABLE MATERIALS (防辐射密封剂)

TUV-100 Adhesive and TUV-200 Conformal Coating are solvent-free, single component liquids which cure to hard solids when exposed to ultraviolet (UV) radiation. TUV-100 is a high T_g adhesive with fast cure and excellent adhesion to a wide range of materials. Curable up to 20 mil thick, TUV-100 tolerates wave soldering without degradation. TUV-100 is ideal when a secondary heat cure is desired.

TUV-200 is a hard, transparent coating with excellent environmental properties, resistant to thermal and electrical shock as well as impact. TUV-200 is wave solderable and responds to UV light over a range of wavelengths.

PROPERTIES:

	TUV-100	**TUV-200**
Viscocity	14,800 cp @ 25°C	7,200 cp @ 25°C 550 cp @ 60°C
Tensile Strength (psi)	1620	3640
Elongation (%)	0.7	6
Tg (°C)	303	260
Durometer, Shore D	85	78
Water Immersion	No effect	60 min @ 25°C
Cure Thickness	To 20 mil	To 20 mil
Cure Time	< 1 to 20 seconds	< 1 to 30 seconds
Wavelength response (nm)	240-250, 320-335, 360-365, 405	240-250, 320-335, 360-365, 405
Secondary Heat Cure	30 min @ 110°C	----
Heat Stability	Wave Solderable Stable 1 hr @ 100°C	Wave Solderable Stable 1 hr @ 100°C
Performance	Hard, clear, hybrid cure	Thermal, electrical, impact reisistant

APPLICATION:

TUV-100 may be applied via syringe and cured in 1-20 seconds depending on lamp intensity. High viscosity allows for delay between application and cure. Secondary cure may be effected by heating at 110°C for 30 minutes.
TUV-200 may be applied by syringe or flood coating, particularly when warmed to 50-60°C. Cure requires 1-30 seconds depending on thickness and lamp intensity.

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8. Silicoat® (用于印刷电路装配的硅树脂涂料)
SILICONE COATING FOR PRINTED CIRCUIT ASSEMBLIES

One-part, flexible, conformal coating for protection of printed circuit boards and other electrical applications.

FEATURES:

- Application versatility – dip, brush, spray
- Rapid room-temperature cure
- Provides protection against moisture
- Maintains electrical Q
- Excellent insulation properties

SILICOAT®
DESCRIPTION:

Silicoat is a flexible, conformal coating based on Transene electronic grade, translastic silicone materials. The product is specially designed to perform as an effective coating for the protection of printed circuit boards against moisture and corrosion . The protective coating also exhibits excellent dielectric properties.

Silicoat is formulated as a one-part system easily applied by brushing, spraying or dipping. Cure is accomplished simply by air drying at room temperature. The cure is moisture catalyzed.

PROPERTIES OF SILICOAT

Physical	
Color	Clear
Viscosity cps	1500 nominal
Flash Point	62 °F
Thinner	Xylene
Thickness per dip	3 mils (approx.)
Tack Free Time	45 minutes (air dry)
Full cure at 25 °C	12 hours
Sp. Gr. (cured)	1.0
Durometer (Shore A)	25

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Shelf Life	1 year
Electrical	
Dielectric Strength (V/mil)	500
Dielectric constant (100 Hz.)	2.65
Dissipation factor (100 Hz.)	0.0037
Volume resistivity (ohm-cm)	1.5×10^{14}
Operating temp. range	-70 °C to 175 °C

APPLICATION:

Silicoat is recommended as a protective coating for printed circuit assemblies and other electrical coating applications. The product is compatible with most copper-clad circuit board laminate materials described under Nema and Mil-P-13949D types of epoxy-glass, epoxy-paper and phenolic-paper. The adhesion of Silicoat is very good to glass, metal, rubber and most plastics. It is not recommended for acrylate or polycarbonate resins.

Moisture resistance may be enhanced by applying two thin coats to avoid pinholes, though the application of a single coat of Silicoat suffices. Test results also show that Silicoat increases the electrical Q of a circuit with further improvement attained by adding coat thickness. The usual effective coat thickness is approximately 3 mils.

See instructions for dilution with xylene and the relationship of the viscosity to the applied coat thickness.

For electrical repair work Silicoat may be removed or stripped by soaking in xylene.

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Insulative Epoxy Adhesives(绝缘环氧粘合剂)

1. Epoxy 13/14/15 Single Component High Viscosity 单成份高粘性----------2

Epoxy 13: Moisure Resistant 防湿

Epoxy 14: Thermal Conductivity 导热

Epoxy 15: High Peel 高剥离

2. Epoxy 16/17 Two Component High Viscosity 双成份高粘性----------4

Epoxy 16: High Peel 高剥离

Epoxy 17: High Peel; Thermal Conductivity 高剥离, 导热

3. Optical Epoxy 光环氧----------6

Epoxy 20: Optical Clarity 透光

Epoxy 30: Radiation Resistance 防辐射

Epoxy 50: Adhesive Sealant 粘合剂,密封剂

注:"-----2"页码标注从本页是第 1 页算起



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1. Insul-Bond Epoxy Adhesives
ONE-PART LOW TEMPERATURE CURING SYSTEMS

Insul-bond Adhesives are solvent-free, low gassing epoxy formulations recommended for discrete component attachment, substrate mounting and lid sealing in the production of high reliability hybrid microcircuits. These adhesives provide multiple bonding of chips or components in a single operation while maintaining low processing temperatures. Subsequent thermal compression or ultrasonic bonding operations are feasible.

Insul-Bond Epoxy 13, 14 and 15 maintain minimal outgassing, high electrical resistivity and high bond strength to 200 °C operating temperatures. Compatibility with aluminum and other metallizations common to microelectronic devices is assured.

Properties of Insul-Bond Adhesives

	Epoxy 13	**Epoxy 14**	**Epoxy 15**
Physical (Uncured)			
Composition	1-part/filled	1-part/filled	1-part/filled
Color	Buff	Buff	Buff
Solids	100%	100%	100%
Viscosity. Cps	Thixotropic paste	Thixotropic paste	Thixotropic paste
Shelf life	6 months	6 months	6 months
Thermal Conductivity BTU/hr/ft^2/in/°F	4	12	4
Coef. Thermal Expansion in/in/°C/x 10^{-6}	30	23	30
Outgassing (post cure)1000 hrs @ 125 °C	0.4%	0.35%	0.4%
Moisture Absorption 7 days immersion 25 °C	0.05%	0.16%	0.05%
Bond Strength (lap shear @ 25 °C) 125 °C to 1000 HRS 30 Days H_20 immersion	2000 1500 2000	1500 1000 1500	2000 1500 ------
Service Temp. Range continuous	-40 °C + 150 °C	-40 °C to 150 °C	-40 °C to +150 °C
Electrical (cured)			
Volume Resistivity(ohm-cm)	$1x10^{15}$	$1x10^{16}$	$1 x10^{15}$
Dissipation Factor (1 mc)	0.01	0.02	0.01
Dielectric Constant(1 mc)	3.9	4.4	3.9

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Dielectric Strength(v/mil)	450	450	450

APPLICATION:

Selection of Insul-Bond Epoxy 13, 14 or 15 is made on the basis of thermal conductivity and thermal expansion requirements. Application by screen printing techniques (180-225 mesh screen) or automatic dispensing is suggested. For maximum bond strengths and reproducibility, adhesive thickness of 1 1/2-2 mil is recommended.

CURE SCHEDULE:

FAST-15 min. @ 140 °C; MEDIUM-30 min @ 115 °C; SLOW-1 hr. @ 100 °C

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2. Insul-Bond Epoxy Adhesives
Two-Part, Low Temperature Cure, High Peel Strength Systems

Insul-Bond 16 & 17 adhesives are solvent free, electrically non-conductive epoxy systems designed for die attachment, substrate mounting and lid sealing in hybrid microelectronics applications. These 2-part systems feature rapid cure at very low temperatures and outstanding bond "peel" strengths-typically 10 times greater than standard epoxy materials. Application by screen printing (180-225 SS mesh) or automatic dispensing is recommended.

Properties of Insul-Bond Adhesives

	Epoxy 16	**Epoxy 17**
Physical (Uncured)		
Composition	Two-part	Two-part
Color	Tan	Tan
Solids	100%	100%
Viscosity. cps	80,000 cps	80,000 cps
Shelf life	6 months	4 months
Pot life	>2hours	>2 hours
Mixing Ratio by weight A:B	100(A)/7(B)	100(A)/7(B)
Physical (Cured)		
Bond Strength		
Sheer	2,000 psi	2,000 psi
Peel	80 pli	80 pli
Heat Distortion Temp.	> 125 °C	> 125 °C
Outgassing (weight loss) 1000 hrs @ 125 °C	0.35%	0.35%
High Temperature Storage: Peel Strength (125 °C) Peel Strength (150 °C)	 >70 pli >70 pli	 >70 pli >70 pli
Thermal Conductivity BTU/hr/ft^2/in/°F	4	10
Coef. Thermal Expansion in/in/ °C/x 10^{-6}	35	23

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Service Temp. Range continuous	-40 °C to 150 °C	-40 °C to +150 °C
Electrical (cured)		
Volume Resistivity (ohm-cm)	10^{15} ohm/cm	10^{15} ohm/cm
Dissipation Factor (1 mc)	.01	.01
Dielectric Constant (1 mc)	3.3	3.3
Dielectric Strength (v/mil)	500 v/mil	500 v/mil

CURE:
Mix in ratio of 100 parts A to 7 parts B (hardener). Select any cure schedule as follows:

50 °C	20 min. (minimum)	20 min. (minimum)
75 °C	15 min. "	15 min. "
100 °C	10 min. "	10 min. "

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3. Optical Epoxies(光环氧)

Radiation Resistant Adhesives for Solar Cells — Epoxy 20 and Epoxy 30 Adhesive Sealant — Epoxy 50

Epoxy bonding adhesives used in electrooptical applications, and engineered for bonding cover glasses to solar cells in space vehicles. Also recommended for electrooptical applications.

EPOXY - 20

Two component system
Excellent bonding properties

EPOXY - 30

Three component system
High temperature capability
Greater bonding strength

Features

- High impact resistance
- Flexible elongation properties
- Excellent bonding strength
- Optical clarity
- Resistant to radiation darkening
- Optical Epoxies

DESCRIPTION

Epoxy -20 adhesive is a special bonding material designed and formulated for electro-optical applications requiring high light transmission and resistance to radiation darkening. Structurally, Epoxy -20 is a crossed polymer of bisphenol poly-glycol epoxide, supplied as a two component system. The product is characterized by high impact resistance, elongation properties with a degree of flexibility and excellent bonding properties. It cures at room temperature or at elevated temperature.

Epoxy -30 adhesive is a bisphenol poly-glycol anhydride epoxide system and offers higher temperature capability and greater bonding strength. It is supplied as a 3-component system.

PROPERTIES OF OPTICAL EPOXIES

	EPOXY - 20	**EPOXY -30**
Color(Gardner)	<1	<1
Gamma Radiation Resist	$>10^8$rads	$>10^8$rads

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Distortion Temperature	150 °C	200 °C
Lap Shear Strength	1200 psi	1500 psi
Shore D Durometer	75	80
Volume Resistivity	10^{15}ohm cm	10^{15}ohm cm
Dielectric Constant	3.3 (1 mc)	3.0 (1 mc)
Dissipation Factor	.032 (1 mc)	.021 (1 mc)
Storage Life	6 months (min.)	6 months (min,)
Pot Life	4 hours (min.)	4 hours (min.)
Cure Temperature	70 °C or rm. temp.	105 °C
Refractive Index	1.54	1.57
Light Transmission	3,000 A cut-off	3,000 A cut-off

Application:

Epoxy -20: Mix thoroughly 100 parts of A with 8 parts of B by weight. Avoid entrapment of air bubbles during the mixing process. Deaeration at reduced pressure permissible. Apply to clean surfaces. (solar cells may be cleaned satisfactorily in Transene 100.) Cure the bonded assemblies at 70 °C for 5 hours, or at room temperature for 4 days.

Epoxy -30: Mix 100 parts A, 70 parts B, and 2 parts of C, by weight. Warm to obtain clear mixture, then cool to room temperature. Deaeration at reduced pressure to remove air bubbles is permissible. Apply to clean surfaces; cure at 80 °C for 1 hour followed by 2 hours at 150 °C.

Note: Epoxy 30 may be subject to minimum order requirements.

Epoxy 50
ADHESIVE SEALANT

EPOXY 50 is formulated as a two-component, low temperature system, designed for use as an adhesive sealant. The curing system is composed of 100% resin-solids and contains no solvents.

PROPERTIES

Color	Water clear
Adhesion-lap shear strength	> 3,000 psi
Hardness (Shore D)	80

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HDT-Distortion Temperature	100 °C
Volume Resistivity	1.2 x 10^{16}
Dielectric Constant	3.3 @ 1 mc
Pot Life	> 3 Hours
Storage Life	> 6 Months

INSTRUCTIONS:

Mixing Ratio (by weight): 10 parts A/3.6 parts B
Cure: Select cure cycle to fit processing

Temperature °C	Gel Time	Cure Time
25 (rm. temp)	5 hours	15 hours
50	1 hour	4 hours
75	10 minutes	30 minutes
100	5 minutes	10 minutes

Epoxy 50 FL is available for applications requiring a more flexible adhesive while retaining optical clarity and bond strength.

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Epoxy Adhesives(环氧粘合剂)
Conductive Adhesives(传导粘合剂)

1. Ohmex AG-Thermosetting Silver for Ohmic Bonding to Semiconductors----------P2
(用于半导体阻焊的热固性银)
2. Silver Epoxy Paste-Screenable Thermosetting Silver for Ohmic Bonding----------P4
(用于阻焊的屏蔽热固性银)
3. Silver Met-Silver Metallizations for Non-Metals----------P6
(用于非金属材料镀银)
4. Silver Bond-Low Temperature Thermosetting Silver----------P8
(低温热固性银)
5. Microcircuit Silver- for Conductive Bonding in Microelectronics----------P10
(用于微电子导焊的微电路银)
6. Nanopoxy 60-Electrically Conductive Epoxy for Nanoscale Applications----------P12
(用于纳米尺寸导电环氧材料)
7. Gold Epoxy Paste-THERMOSETTING GOLD FOR OHMIC BONDING----------P14
(用于阻焊的热固性银)
8. Polymide Die Attach Adhesive (PDA) ----------P16
Low Mobile Ion, Silver-filled Adhesive for IC Chip Bonding
(Polymide 模固定粘合剂-用于集成电路芯片焊的填充粘合剂)
9. Surface Mount Adhesives (SMA) ----------P18
Low cost, high density packaging of integrated circuits, lead-less chip carriers, and chip component attachment for ceramic substrates and PC Boards
(表面贴装粘合剂)- 用于陶瓷衬底和印刷电路的集成电路\无铅芯片载体\芯片元件附件低成本,高密度封装
10. Conductive Via Fill 6030----------P20
11. Radiation Curable Adhesive----------P22
(防辐射粘合剂)



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1. Ohmex - AG (用于半导体阻焊的热固性银)
Thermosetting Silver for Ohmic Bonding to Semiconductors

Produces Quality Electrical and Mechanical Contacts

FEATURES

- One - part system
- High bond strength
- Ohmic contacts
- Low contact resistance
- Low thermal impedance
- Low thermal stress
- Temperature Stability -65 °C to +275 °C
- Low outgassing

APPLICATIONS

CHIP BONDING - Silicon, germanium and other semiconductor materials - for transistors, diodes, rectifiers, thermistors, integrated monolithic and hybrid circuits. Also bonds to: glass, metals, ceramic, mica, plastics, graphite, and quartz

FOR PRODUCTION AND LABORATORY USE

OHMEX - AG
DESCRIPTION

Ohmex-Ag is a conductive silver preparation containing as a bonding constituent silver epoxide. It is supplied in the form of a thin paste, ready to use. Its composition is unique, providing high conductivity and excellent bonding strength after appropriate cure. OHMEX-Ag is used to advantage in place of lead-tin solder or other alloys to avoid flux contamination or exposure to excessive temperature and for process simplification. OHMEX-Ag produces very low resistance ohmic contacts with all metals and bonds as well to most insulators. Ohmic bonds are also produced with semiconductors if the surface is first metallized or if the surface is highly "doped" and lapped. OHMEX-Ag finds extensive use in bonding semiconductor chips, integrated monolithic and hybrid circuits, diodes and transistors, and thin films on ceramic substrates - in all types of package configurations.

PROPERTIES

System	One-Part
Composition	Silver filled epoxy
Density	2.5 g/cc
Viscosity	90,000 cps.

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Electrical Resistivity, Nominal	5 x 10^{-4} ohm-cm
Thermal Conductivity	100 BTU/ft^2/hr./°F./in.
Outgassing	0.097% @ 100 °C (1250 hours)
	0.7% @ 125 °C (1000 hours)
	< 1.2% @ 160 °C (1000 hours)
Bond Shear Strength	> 1000 PSI
Temperature Stability Range	-65 °C to + 275 °C (+325 °C intermittent)
Linear Coef. of Therm Expan.	5 x 10^{-5} cm/cm/°C
Storage	40 °F or below
Shelf Life	6 months
Thinner	Butyl cellosolve acetate
Cure Temp.	150 °C (minimum)

INSTRUCTIONS

Use OHMEX-Ag as supplied. Special thinner is supplied though thinning is unnecessary for most application. Apply OHMEX-Ag to the parts to be bonded, press lightly, then cure in drying over at 150° - 160 °C for at least 15 hours or 1 hour at 150 °C followed by at least 1 hour at 265 °C.

Special Thinner available

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2. Silver Epoxy Paste (用于阻焊的屏蔽热固性银)
Screenable Thermosetting Silver for Ohmic Bonding

A screenable silver epoxy preparation for developing high quality electrical and mechanical contacts - used in bonding semiconductors and other devices in hybrid microelectronic circuits.

SILVER EPOXY PASTE - TYPE I
Standard screenable conductive epoxy

SILVER EPOXY PASTE - TYPE II
Screenable conductive compliant epoxy

FEATURES

- One component system
- Excellent screening characteristics
- Develops high bond strength
- Low contact resistance
- Very low thermal stress
- Low thermal impedance
- Temperature -65 ° to +250 °C

SILVER EPOXY PASTE
DESCRIPTION

Silver Epoxy Paste is a one component system designed as a conductive thermosetting silver preparation for screen printing applications. Its composition is unique, providing high electrical and thermal conductivity with excellent bond strength after appropriate cure. Silver Epoxy Paste is used to advantage in place of lead-tin solders to avoid flux contamination or exposure to excessive temperature and for process simplification by screening on contacts.

Silver Epoxy Paste forms ohmic bonds with semiconductors if the surface of the semiconductor is metallized, or if the surface is highly "doped" and lapped. The product finds extensive use in bonding semiconductor chips, integrated monolithic circuits, diodes, transistors and other components in thin film and thick film hybrid microelectronic circuits. It bonds to glass, mica, plastic, graphite, quartz and other materials as well.

PROPERTIES
Silver Epoxy Paste Type I & Type II

System	One-Part
Composition	Silver filled epoxy
Rheology	Thixotropic paste
Viscosity	90,000 cps.± 5%

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Thinner	Butyl carbitol acetate
Cure Temp.	150 °C (minimum)
Electrical Resistivity, nominal	1 x 10^{-4} ohm-cm
Thermal Conductivity	100 BTU/ft^2/hr./°F./in.
Bond Shear Strength	1500 PSI
Outgassing	0.097% @ 100 °C (1250 hours)
	0.7% @ 125 °C (1000 hours)
	1.2% @ 160 °C (1000 hours)
Temperature Stability Range	-65 °C to + 250 °C
Linear Coef. of Therm Expan.	5 x 10^{-5} cm/cm/°C
Storage	40 °F or below
Shelf Life	6 months @ 40 °C

APPLICATION

Follow standard thick film procedures and screen Silver Epoxy Paste onto substrate using 165 or 200 mesh stainless steel screen. Mount parts to be bonded within one half hour and press lightly. Then oven cure at 150 °C followed by at least 1 hour at 200 °C.

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3. SILVER-MET (用于非金属材料镀银)
Silver Metallizations for Non-Metals

Silver-filled, air-drying polymer formulations designed to provide high conductivity metallizations on plastics, paper, mica, ceramic and other non-conductive materials.

SILVER-MET 145

- Brush, dip or spray application

SILVER-MET 170

- Brush, dip or spray application
- High silver density

SILVER-MET 270

- Screen print application

SPECIAL APPLICATIONS:

- Tantalum capacitor terminations
- Shielding against RF/ EMI

SILVER-MET

DESCRIPTION

Transene Silver-Met formulations are silver-filled, air-drying polymers designed to provide high conductivity metallizations on plastics, paper, mica, and other non-conductive surfaces. The silver film allows direct soft-soldering without the use of flux. The film also permits subsequent metallizations through the electroplating process.

Silver-Met is suggested for use in electronics and microwave applications for connectors, contacts, magnetic shielding, capacitor terminations, etc.

The product is most effective for RF /EMI shielding because it reflects as well as absorbs energy. For tantalum capacitors, Silver-Met functions uniquely as terminations for the capacitor.

Properties of Silver-Met

	Type 145	Type 170	Type 270
Application	Dip/ Spray	Dip/ Brush	Screen print
Silver Content	45%	70%	70%

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Viscosity (cps)	500	45,000	150,000
Thinner	Butyl Acetate	Butyl Acetate	Butyl Carbitol Acetate
Sheet Resistance (milli-ohms/sq/mil)	160	160	160
Service Temperature	- 30° to 110° C	- 30° to 110° C	- 30° to 110° C
Drying Time @ 25° C	20 hours	20 hours	N/A
Drying Time @ 80° - 125° C	1 hour	1 hour	1 hour

APPLICATION

SILVER-MET 145 and SILVER-MET 170 may be applied by brush, dip or spray techniques. After application, substances should be allowed to level and air-dry at room temperature for 1/2 hour to 1 hour, then baked at 80° to 100° C for 1 hour to obtain complete drying.

SILVER-MET 270 may be applied by screen printing using standard 180 to 200 mesh screen. After application substrates should be allowed to level for 5 to 10 minutes, then baked at 80° to 125° C for 1 hour to obtain complete drying.

SILVER-MET 170 and 270 provide a metallic base for direct soft-soldering at temperatures up to 190° C. Types 145, 170, and 270 provide a suitable base for further metallization by electroplating.

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4. Silver Bond (低温热固性银)
Low Temperature Thermosetting Silver

Epoxy silver compositions for conductive bonding in microelectronic assembly applications

SILVER-BOND - TYPE 40
Standard low-temperature cure, high electrical conductivity

SILVER-BOND - Type 50
Fast low-temperature cure, high electrical conductivity

SILVER-BOND - TYPE 60
Long pot life, fast cure

FEATURES

- Low temperature curing systems
- High bond strength
- Electrical resistivity < 10^{-4}ohm-cm
- Low outgassing
- Long pot life
- Adhesive bonding to glass, metal, ceramic, plastics, graphite, quartz

SILVER-BOND
Conductive Adhesive
Description

Silver-Bond is a two component, epoxy based conductive adhesive for quality electrical and mechanical contacts. It provides high bond strength and excellent conductivity as well as low-temperature cure and long pot life. The product is designed for conductive bonding applications in microelectronics in place of lead tin solder or other alloys to avoid flux contamination or exposure to excessive temperature, and for process simplification. Silver-Bond Type 40 is especially recommended for bonding applications where it is desirable to keep process temperatures in the 100 °C range. Silver-Bond Type 50 is modified for faster curing applications. Silver-Bond Type 60 provides extended pot-life with fast cure at slightly elevated temperatures.

PROPERTIES OF SILVER-BOND

	Type 40	**Type 50**	**Type 60**
Composition	Silver Filled Epoxy	same	same
Consistency	Soft Thixotropic paste	same	same
Viscosity	90,000 cps ± 10%	same	same
Elect. resitivity	1 x 10^{-4} ohm-cm max.	same	same

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Lap shear strength	1500 psi nominal	same	same
Temperature stability range	-65 °C to + 200 °C	-65 °C to + 175 °C	-65 °C to + 175 °C
Outgassing (postcure)	<.01%/100 hr. @ 125 °C	same	same
Thermal conductivity	80 BTU/in/ft^{2}hr/°C	same	same
Pot life	6 hrs at 25 °C	2 hrs @ 25 °C	48 hrs @ 25 °C
Shelf life	one year @ 25 °C	same	same
Mixing ratio A:B(by wt.)	100/3.6	100/2.5	100/2.5
Cure (at 100 °C)	2 hrs	10 minutes	10 minutes
Thinner	Butyl Cellosolve Acetate	same	same
Mixing ratio (A : B)	100/3.6	100/2.5	100/2.5
Part A	Part B	Part B	Part B
1 gram	0.036 gm (1 drop)	0.024 gm (1 drop)	1 drop
5 grams	0.180 gm (6 drops)	0.124 gm (4 drops)	4 drops
1 oz. (28.35gm)	1.023 gms (34 drops)	0.76gm (24 drops)	24 drops
Cure schedule (Time: Temperature Relationship)			
50 °C	----	30 minutes	----
75 °C	2 1/2 hrs.	15 minutes	----
100 °C	2 hrs.	10 minutes	10 minutes
125 °C	1 1/2 hrs.	5 minutes	5 minutes
150 °C	1 hr.	----	2 minutes

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5. Microcircuit Silvers (用于微电子导焊的微电路银) for Conductive Bonding in Microelectronics

One-part thermosetting silver epoxy systems for conductive bonding in microelectronic assembly operations.

MICROCIRCUIT SILVER - TYPE K
Low temperature, fast cure- automatic dispensing

MICROCIRCUIT SILVER - TYPE L
Low temperature, fast cure - screen print

MICROCIRCUIT SILVER - TYPE N
High bond strength - 100% solids

MICROCIRCUIT SILVER - TYPE O
High electrical conductivity - 100% solids

MICROCIRCUIT SILVERS

Microcircuit Silvers are one-part, thermosetting silver-epoxy compositions designed specifically for conductive bonding in microelectronic assembly operations. Recommended applications include the conductive bonding of integrated circuit chips, capacitors, and other active and passive components. Microcircuit Silvers meet Hi-Rel requirements for low outgassing, bond strength, and electrical conductivity.

Microcircuit Silvers withstand temperatures up to 350 °C, allowing ultrasonic and thermal compression bonding of interconnecting wires. Microcircuit Silvers Types K and L, will fully cure in 15 seconds at 300 °C; thus these silver compositions possess the unique ability to cure during thermal compression bonding operations.

Several modifications of Microcircuit Silvers are offered. Types K and L exhibit low temperatures and fast cures. Types N and O are 100% solid systems which provide high electrical conductivity. Microcircuit Silvers Type K,L,N, and O are designed for screen printing or automatic dispensing applications.

Properties of Microcircuit Silvers

	Type K	Type L	Type N	Type O
Uncured				
Per Cent Silver	75	73	70	77
Solids (%)	98	98	100	100
Viscosity cps	60,000	80,000	100,000	125,000
Shelf Life-70 °F	> 6 months	> 6 months	6 months	6 months

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Application	Automatic dispense	Screen print/dispense	Screen print/dispense	Screen print
Cured				
Serv. Temp Range	-50 °C to + 175 °C (325 °C intermittent)	same	-60 °C to + 200 °C (325 °C intermittent)	same
Electrical Resistivity	5×10^{-4}	5×10^{-4}	2×10^{-3}	6×10^{-4}
Linear Coef. Therm Exp. (cm/cm°C)	5×10^{-5}	same	same	same
Thermal Conductivity (BTU $hr/ft^2/°F/in.$)	21	20	20	22
Outgassing				
1000 hrs @ 100 °C	0.05%	.05%	.09%	.08%
1000 hrs @ 125 °C	0.2%	.2%	.7%	.6%
Bond Shear Strength (psi) after cure	1500	>1500	3500	1500
aged 200 hrs @ 175 °C	>1000	>1000	2750	1000
Cure Schedule	(Select Temp.)			
115 °C	1 1/2 hrs	1 1/2 hrs	----	----
125 °C	1 hr.	1 hr.	----	----
135 °C	30 min	30 min	5 hrs	5 hrs.
150 °C	15 min	15 min	1 1/2 hrs.	1 1/2 hrs.
175 °C	5 min	5 min	30 min	30 min
300 °C	15 sec.	15 sec.	----	----

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6. Nanopoxy 60 (用于纳米尺寸导电环氧材料)
Electrically Conductive Epoxy for Nanoscale Applications

DESCRIPTION

Nanopoxy 60 is a two component, epoxy-based conductive adhesive for nanoscale electrical contacts. Nanopoxy 60 provides excellent bond strengths, long pot life, low temperature cure, low resistivity, and minimal outgassing. A micron-scale conductive flake is employed to provide good conductivity for nanotubes and other nano materials. Nanopoxy 60 is ideal for SEM environments, offering long pot life and quick cure for ease of handling.

PROPERTIES

Appearance	Silver filled epoxy paste
Viscosity	80,000 - 100,000 cps
Electrical Resistivity	1 x 10^{-3} ohm-cm
Outgassing (postcure)	< 0.01%/100 hr @ 25 °C
Thermal Conductivity	80 BTU-in/ft^2 hr/°C
Pot Life	48 hrs @ 25 °C
Shelf Life	1 year @ 25 °C
Temp. Stability Range	-65 °C to 175 °C
Thinner	Butyl Cellosolve Acetate

MIXING RATIO (A:B)

by wt. 100:2.5

Part A	**Part B**
1 gram	1 drop
5 grams	4 drops
1 oz (28.35 grams)	24 drops

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CURE SCHEDULE

Temperature	Time
100 °C	10 min.
125 °C	5 min.
150 °C	2 min.

APPLICATIONS

Nanopoxy 60 is designed to facilitate electrical conductivity measurements of nanotubes. With a mean particle size below 3 microns, Nanopoxy 60 is effective at providing electrical contacts even for nanotubes with diameters under 30 nanometers. The epoxy resin system provides excellent adhesion to most nano materials such as carbon or tungsten disulfide nanotubes, nanowires, and other nano device components. Also available as Nanopoxy 50 for faster cure, lower temperature applications.

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7. Gold - Epoxy Paste (用于阻焊的热固性银)
THERMOSETTING GOLD FOR OHMIC BONDING

Produces quality electrical and mechanical contacts for semiconductor and hybrid circuits applications.

GOLD-EPOXY PASTE, TYPE GE-10
One-part system, economical

GOLD-EPOXY PASTE, TYPE GE-20
Two-part system, low temperature cure

GOLD EPOXY PASTE, TYPE GE-30
Two-part system, fast cure

GOLD-EPOXY PASTE, TYPE GE-40
Two-part system, fast cure, long pot life

GOLD EPOXY PASTE
DESCRIPTION

Gold-Epoxy Pastes are gold-filled conductive bonding preparations exhibiting high electrical conductivity and bond strength.

The Gold Pastes are easily applied by manual techniques, machine dispensing or screen printing and cured with relatively low applied heat in bonding operations. Gold-Epoxy Pastes are used to advantage in place of tin-lead solders to avoid flux contamination or exposure of components to excessive heat. The gold products are used in preference to silver-epoxy or other silver preparations to avoid silver migration problems.

Gold-Epoxy Pastes bond well to alumina ceramic substrates, phenolic circuit boards and transistor headers. They are useful in a variety of applications in solid state and hybrid circuits including:

1. Attachment of discrete semiconductor devices and integrated circuits. Ohmic contacts are produced with diodes and transistors, in all package configurations, if the semiconductor surface is first metallized or the surface is highly "doped" and lapped.
2. Bonding of other active devices, heat sinks and capacitor ships.

Top electrodes for crossovers and interconnections for parallel and multipurpose circuits.

Gold-Epoxy Paste, Type GE-10 is more economical to use since it is a one-part system with waste eliminated in actual use. Types GE-20 and GE-30 are two-part systems and cure more rapidly and at lower temperatures. Type GE-30 is especially recommended for repair of microcircuitry. Type GE-40 is formulated for long pot life and fast cure. It is recommended for screen print applications. All of the Gold-Epoxy Pastes are designed for low outgassing and for continuous use up to 175 °C.

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PROPERTIES OF GOLD-EPOXY PASTES

	Gold Epoxy GE-10	Gold Epoxy GE-20	Gold Epoxy GE-30	Gold Epoxy GE-40
Composition	88% Gold	88% Gold	88% Gold	88% Gold
System	One-part epoxy	Two-part epoxy	Two-part epoxy	Two-part epoxy
Viscosity(cps)	175,000	175,000	175,000	175,000
Rheology	Thixotropic paste	Thixotropic paste	Thixotropic paste	Thixotropic paste
Pot Life (25 °C)	6 months	6 hours	2 hours	2 days
Shelf Life	6 months	1 year	1 year	1year
Application	Screen printing or dispensing	Screen printing or dispensing	Dispensing	Screen printing or dispensing
Thinner	Butyl carbitol acetate or butyl cellosolve acetate	Butyl carbitol acetate or butyl cellosolve acetate	Butyl cellosolve acetate	Butyl carbitol acetate or butyl cellosolve acetate
Cure	15 hours. @ 150 °C, or 1 hr. @ 150 °C plus 2 hrs @ 200 °C	4 hrs @ 50 °C, or 2 1/2 hrs @ 75 °C or 2 hrs @ 100 °C	1/2 hr @ 50 °C or 15 min @ 75 °C or 5 min @ 125 °C.	10 min @ 100 °C or 5 min @ 125 °C or 2 min @ 150 °C
Elec. Resist,(Ohm-cm)	4×10^{-4}	7×10^{-4}	7×10^{-4}	6×10^{-4}
Bond Shear Str. (psi)	1000	1000	1000	1000
Outgassing (postcure) 1000 hrs @ 125 °C	0.70%	0.30%	0.35%	0.30%
Serv. Temp Range	-65 ° to + 200 °C	-65 ° to + 175 °C	-65 ° to + 175 °C	-65 ° to + 175 °C
Mixing Ratio (a/b)	----------	(100/1.8)	(100/1.3)	(100/2.7)
		A : B 1.25 gm : 1 drop 10 gm : 7 drops 1 oz. : 22 drops	A : B 2 gm : 1 drop 10gm : 5 drops 1 oz. : 16 drops	A : B 2 gm : 2 drops 10gm : 9 drops 1 oz. : 24 drops

APPLICATION:

Gold-Epoxy Pastes are applied by screening using a 200 mesh stainless steel screen or by other methods of application such as dotting with a needle or by use of automatic dispensing equipment. Parts to be bonded are mounted and pressed lightly, then over-cured under the appropriate conditions of time and temperature.

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8. Polyimide Die Attach Adhesives

Low Mobile Ion, Silver-filled Adhesive for IC Chip Bonding

(Polymide 模固定粘合剂-用于集成电路芯片焊的填充粘合剂)

DESCRIPTION

One-component, silver-filled TRANSENE POLYIMIDE DIE ATTACH ADHESIVES are heat-cured to provide unparalleled high temperature performance (to 500 °C) and excellent electrical conductivity ($< 1 \times 10^{-4}$ ohm-cm). These ultra-pure polyimide-based adhesives exhibit extremely low levels of extractable ionic impurities (Cl, Na, K) less than 10 ppm.

TRANSENE POLYIMIDE DIE ATTACH ADHESIVES maintain high electrical conductivity, high thermal conductivity and outstanding adhesive strengths to 500 °C (375 °C) for 200 hrs. Under severe moisture conditions, the polyimide based adhesives exhibit less corrosivity than epoxies. These polyimide die attach adhesives are fluoride and phosphate free, allowing compatibility with aluminum metallization.

	METHOD	% SILVER	VISCOSITY
TRANSENE PDA S-500	SCREEN/STAMP	72	90,000± 10%
TRANSENE PDA D-500	DOT DISPENSER	68	60,000± 10%

PROPERTIES

Consistency	Soft smooth paste
Filler	Pure silver flake
Resin type	Polyimide
Thermal Conductivity	90 BTU/ft^2/hr/°F/in
Volume resistivity: -35 °C to + 400 °C 300 hrs. @ 370 °C	1×10^{-4} ohm-cm 1×10^{-4} ohm-cm
Bond Shear Strength	ñ 2,000 psi @ 25-150 °C, ñ 1,500 psi @ 300 °C
Ionic Impurities	Cl á 10 ppm, Na á 5 ppm, K á 5 ppm
Operating Temperature	Continuous: -45 to + 375 °C

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	Intermittent: 500 °C
Non-Corrosive	No fluorides or phosphates
Cure	150 °C for 15 min. PLUS 270 °C for 30 minutes
Shelf Life	25 °C -2 months, 0 °C - 6 months

APPLICATION:

TRANSENE POLYIMIDE DIE ATTACH ADHESIVES applications include: IC chip bonding on plastic and ceramic substrates, DIP memory chips and other electronic and aerospace assemblies requiring high temperature capability. Adhesive strengths (@ 300 °C) of greater than 1500 PSI are typically achieved. Subsequent processing temperatures to 500 °C (ceramic package sealing and brazing operations) will cause no adverse effects to die attach performance. Apply PDA adhesive by screen/stamp or "dot" technique. Place die, chip or component in place and commence two-step cure. Initial cure temperature will dissipate solvent, the higher temperature will imidize the resin system.

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9. Surface Mount Adhesives (表面贴装粘合剂)

Low cost, high density packaging of integrated circuits, lead-less chip carriers, and chip component attachment for ceramic substrates and PC Boards

(用于陶瓷衬底和印刷电路的集成电路\无铅芯片载体\芯片元件附件低成本,高密度封装)

TRANSENE SMA EPOXY ADHESIVES are formulated specifically for precision mounting of flat pack semiconductor devices, chip capacitors and resistors in the production of complex hybrid circuits. Preliminary physical attachment (staking) prior to wave soldering leaded devices or the direct mounting of discrete components and microwave devices (dual-in-line pack) is feasible for both electrically conductive and non-conductive attachment.

TRANSENE SMA EPOXY ADHESIVES include 1 and 2 part systems, color coded as required, supplied in customized packages to interface application techniques for auto-dispensing or screen printing. The various formulations offer non-corrosive systems with good handling characteristics: thixotropy resistant to trailing/stringing and adequate body to fill gaps and crevices. Quick cure, good adhesion, ability to withstand mechanical and thermal stress, wave soldering temperatures and clean-up solvents provide for wide application.

Color customizing available

PROPERTIES OF SURFACE MOUNT ADHESIVES

	SMA-100	SMA-200	SMA-300	SMA-400	SMA-500	SMA-600	SMA-700
Feature	High Thermal Conductiviy	Low Moisture absorbtion	Staking Compound-Quick Cure	High Termal Low Temp Cure	Standard	Low Temp Cure	Long Pot Life
Application	Auto-Dispensing	Auto-Dispensing	Dispense	Auto-Dispense	AutoDispense-Screen Print	Auto Dispense	Auto Dispense Screen Print
Composition	1 part/filled	1 part/filled	2 part/unfilled	2 part/filled	1 part	2 part	2 part
Color	Red	Green	Amber	Black	Smooth silver paste	Smooth silver paste	Smooth silver paste
Viscosity	100,000 cps	90,000 cps	20,000 cps	70,000 cps	80,000 cps	90,000 cps	90,000 cps
Shelf-Life @ 25 °C	6 months	6 months	6 months	6 months	6 months	12 months	12 months
Thermal Cond. BTU/hr/ft^2/in/°F	12	4	--	10	75	80	80
Coef. of thermal exp(in/in/°Cx10^{-6})	23	30	--	20	50	60	60
Lap shear	1500 psi	2000 psi	2000 psi	2000 psi	1500 psi	1500 psi	1500 psi
[illegible]	0.14%	0.05%	--	0.17%	--	--	--

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Absorption							
(7 day imm.@ 25 °C							
Vol resistivity(ohm/cm)	1 x 10^{-16}	1 x 10^{-15}	1 x 10^{-15}	1 x 10^{-15}	1 x 10^{-4}	1 x 10^{-4}	1 x 10^{-4}
Dielectric strength v/mil	500	450	400	450	---	---	---
Mix Ratio	---	---	1:1	100:7	---	100:3.6	100:2.5
CURE	115 °C-30min	115 °C-30 min	25 °C-1hr	50 °C-20 min	125 °C-1hr	50 °C-30 min	100 °C-10 min
	135 °C-1 min	135 °C-15min	----	75 °C-10min	150 °C-5min	75 °C-15min	125 °C-5min
Pot Life	---	---	10 min	3 hrs	---	2 hrs	40 hrs

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10.CONDUCTIVE VIA FILL CVF-6030

DESCRIPTION:

Conductive Via Fill CVF-6030 is a two-part filled epoxy system designed to provide electrical and thermal conductivity in PWB and PBGA applications. Applied via stencil, CVF-6030 is an effective, economical fill for vias. When planarized, CVF-6030 is receptive to plating and soldering. Because the via fill exhibits no shrinkage, electrical and thermal conductivity are retained during curing. Vias up to 0.75 mm diameter may be filled with excellent results. The long pot life of CVF-6030 enhances clean-up while its fast cure reduces processing time. Because CVF-6030 is a two-part system, material may be left at room temperature for extended periods, further enhancing processing.

APPLICATION:

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 $[In(H_2O)_6]^{3+}$ while tin forms a $[SnCl_6]^{2-}$ anion.

PROPERTIES:

System	Two-Part
Composition	Silver filled epoxy
Viscosity	110,000-140,000 cps
Thinner	CVF-6030 Thinner
Electrical Resistivity	nominal 3 x 10^{-4} ohm-cm
Shelf Life	>100 BTU / ft^2 / hr. / °F. / in.
Outgassing	< 0.01% / 100 hours @ 125 °C/hr.
Stencil Type	3-4 stainless steel
Aspect Ratio (depth:diameter)	6:1
Clean-up Solvent	*Iso*-propyl alcohol; acetone
Temperature Stability Range	-65 °C to + 175 °C
Storage	Room Temperature
Shelf Life	1 year @ 25 °C
Pot Life Mixing Ratio	48 hours @ 25 °C

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Mixing Ratio	4 drops (0.124 grams) Part B per 10 grams Part A
Cure Schedule	100 ^{o}C for 30 minutes *Or* 125 ^{o}C for 20 minutes *Or* 150 ^{o}C for 15 minutes

INSTRUCTIONS:

CVF-6030 may be applied via stencil to drilled, plated through holes and is then cured as instructed. The stencil heads of the cured via fill may be removed by planarazation to yield a smooth, uniform surface. It is then possible to electroplate prior to printing and etching or proceed directly to the print and etch process.

Special Thinner included

11.RADIATION CURABLE MATERIALS (防辐射粘合剂)

TUV-100 Adhesive and TUV-200 Conformal Coating are solvent-free, single component liquids which cure to hard solids when exposed to ultraviolet (UV) radiation. TUV-100 is a high T_g adhesive with fast cure and excellent adhesion to a wide range of materials. Curable up to 20 mil thick, TUV-100 tolerates wave soldering without degradation. TUV-100 is ideal when a secondary heat cure is desired.

TUV-200 is a hard, transparent coating with excellent environmental properties, resistant to thermal and electrical shock as well as impact. TUV-200 is wave solderable and responds to UV light over a range of wavelengths.

PROPERTIES:

	TUV-100	**TUV-200**
Viscocity	14,800 cp @ 25°C	7,200 cp @ 25°C 550 cp @ 60°C
Tensile Strength (psi)	1620	3640
Elongation (%)	0.7	6
Tg (°C)	303	260
Durometer, Shore D	85	78
Water Immersion	No effect	60 min @ 25°C
Cure Thickness	To 20 mil	To 20 mil
Cure Time	< 1 to 20 seconds	< 1 to 30 seconds
Wavelength response (nm)	240-250, 320-335, 360-365, 405	240-250, 320-335, 360-365, 405
Secondary Heat Cure	30 min @ 110°C	----
Heat Stability	Wave Solderable Stable 1 hr @ 100°C	Wave Solderable Stable 1 hr @ 100°C
Performance	Hard, clear, hybrid cure	Thermal, electrical, impact reisistant

APPLICATION:

TUV-100 may be applied via syringe and cured in 1-20 seconds depending on lamp intensity. High viscosity allows for delay between application and cure. Secondary cure may be effected by heating at 110°C for 30 minutes.
TUV-200 may be applied by syringe or flood coating, particularly when warmed to 50-60°C. Cure requires 1-30 seconds depending on thickness and lamp intensity.

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

FEATURES

- Controlled etch rates
- Selective etching: will not attack SiO_2 or Si_3N_4
- Offers high resolution with minimal undercutting
- Eliminates smut formation
- Economical; reusable

ALUMINUM ETCHANTS
DESCRIPTION:

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

	TYPE A	TYPE D
Appearance	clear colorless	light green/yellow
pH	1.0	1.0
Boiling Point	> 100 °C	150 °C
Freezing Point	< 0 °C	< 0 °C
Sp. Gr. @ 25 °C	1.45	1.50
Flash Point	Non-flammable	Non-flammable
Solubility	Miscible with H_20	Miscible with H_20
Etch Rate at		
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	----------
Note: Etch rate slightly variable upon purity of aluminum.		

APPLICATION:

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.

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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

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

Liquid.....	Colorless, odorless
Boiling Temp. (with evolution of H_2O).....	180 °C
Specific gravity 20 °C	1.757
Etch Rates - 180 °C:	
Aluminum oxide.....	120 Å/min
Silicon nitride.....	125 Å/min

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Gallium nitride.....	80 Å/min
Silicon dioxide.....	1 Å/min
Silicon.....	1 Å/min

APPLICATION:

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:

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 (SiO_2) 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
Highest etch rate for thermally grown silicon dioxide films. Also suitable for deposited SiO_2.

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 SiO_2 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 SiO_2 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
- Excellent process reproducibility
- Does not undercut masked oxide
- Will not stain diffused silicon surfaces
- Avoids contamination on silicon surfaces
- Photoresist compatibility

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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 HF + F + 2(HF_2) for a two-ligand mononuclear complex and the charge balance is (H^+) - (F) + (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	Clear liquid
Nitrate	Absent
Sp. Gr.	1.12
Buffer Etch Capacity	65 mg. SiO_2/ml
PH	5.0
Etch Rate @ 20 °C.	800 Å / minute*
free HF	10^5 M
Storage	Room Temperature Crystallization occurs below 10 °C.
Principal Ion	HF_2 ligand
Heavy Metals	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 SiO2) 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: 4HF + SiO_2 -> SiF_4 + $2H_2O$

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

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-SiO_2 SYSTEMS

An improved buffered etch formulation for delineation of phosphosilica glass - SiO_2 (PSG), and borosilica glass - SiO_2 (BSG) systems, in the passivation of transistor surfaces. BD Etchant has a low PSG/SiO_2 ratio, minimizing the undercutting of the PSG passivating film.

ETCH CHARACTERISTICS OF BD ETCHANT

	20 °C	**25 °C**	**30 °C**
Dielectric Material	Å/sec.	Å/sec	Å/sec
Thermally grown SiO_2	0.87	1.22	1.72
PSG (6 mole % P_2O_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.

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APPLICATION:

Employed as a dip etch to remove SiO_2 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 SiO_2

Modified HF Buffer solution specific for etching deposited silica (SiO_2) films in semiconductor microelectronics.

FEATURES

- Specific for etching SiO_2 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

Siloxide Etchant is the preferred etchant for deposited SiO_2 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

Appearance	Clear liquid
Specific Gravity	1.1
pH	5.0
Heavy metals	< 1 ppm
Etch rate at 25 °C	40 Å/second
Buffer etch capacity	20 mgs. SiO_2/mL.
Operating temperature	25 °C
Compatible photoresist	Neg & Pos type
Storage	Room temperature

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APPLICATION

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

ETCH TIME	DEPOSITED SiO_2 THICKNESS	REFLECTED COLOR
SECONDS	(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

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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

Appearance	Clear solution
pH	5.5
Operating Temperature	25 °C
Flash Point	Not Flammable
Solubility	Miscible with water
Etch Rate	1.5 Å/second; 90 Å/minute
Shelf Life	1 Year
Storage	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.

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

4000 Å / minute @ 22 °C

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.

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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

CHROMIUM ETCHANT 1020AC
Slower etch rate to eliminate undercutting and for broader compatibility

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:

- High purity
- 0.2 micron filtration
- Excellent photoresist compatibility
- Uniform etch rates and patterns.

Chromium Etchants
1020 and 1020AC

DESCRIPTION:

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.

PROPERTIES:

	1020	**1020AC**
Appearance	Clear, orange	Clear, orange
Specific Gravity	1.127-1.130	1.127-1.130

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Filtration	0.2 micron	-----
Operating Temperature	Variable	Variable
Etch Rate, 40 °C	40 Å / sec	32 Å / sec
Storage	Room Temperature	Room Temperature
Rinse	Deionized Water	Deionized Water

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

- 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

Etch rate	800 Å/min at 25 °C
	2400 Å/min at 40 °C
Etch capacity	30 mgs chromium/ml etchant
Operating Temp	25 °C
Miscibility	Water
Storage	Room Temp.
Shelf Life	Unlimited

APPLICATIONS

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.

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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)

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

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

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

PRINTED CIRCUIT COPPER ETCHANTS
DESCRIPTION
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

	CE-100	**CE-200**	**APS-100**
Etchant type	Immersion	Spray	Immersion/Spray
	Dip or Spray		
Operating Temperature	40-60 °C	40-60 °C	30-40 °C
Etch Rate@ 40 °C	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	19 oz. Cu/gal.	14 oz Cu/gal.	10 oz Cu/gal.

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APPLICATION:

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.

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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:
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

	GA Etch-100	GA Etch-200	GA Etch-300
Appearance	Clear, colorless liquid	Clear, colorless liquid	Clear, colorless liquid
PH	< 2	>10	6-7
Storage Temperature	40-50°F	40-50°F	40-50°F
Shelf Life	3 months	2 months	3 months
Etch Rate	100 nm/sec @ 40°C	20 Å/sec @ 5°C	22 Å/sec @ 25°C
Chemistry	Sulfuric-peroxide	Hydroxide-peroxide	Citric acid-peroxide

APPLICATION:

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.

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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

- 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:

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 SiO_2 masks show minimal attack.

PROPERTIES OF GALLIUM PHOSPHIDE ETCHANT

Appearance	Amber liquid
Boiling point	> 100 °C
pH	13 - 14
Solvent Rinse	H_2O
Etch Rates at 80 °C in Microns/hour	
P-Type <100>	210

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N-Type <100>	210
P-Type <111>	
A Face (Gallium)	115
B Face (Phosphorus)	210
Compatible Dielectric Material	Sputtered or Silane SiO_2
Compatible Masking Material	SiO_2, Ti, Au, KMER
Compatible Beam Lead Materials	Ti, Pd, Au, Cr, Pt
Recommended Oper. Temp.	70-80 °C
Etch Capacity	12 grams/liter

APPLICATION:

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 SiO_2 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.

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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.
- Room-temperature operated.
- Uniform etch rates
- Economical

GOLD ETCHANT TFA / GE-8148

DESCRIPTION:

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.

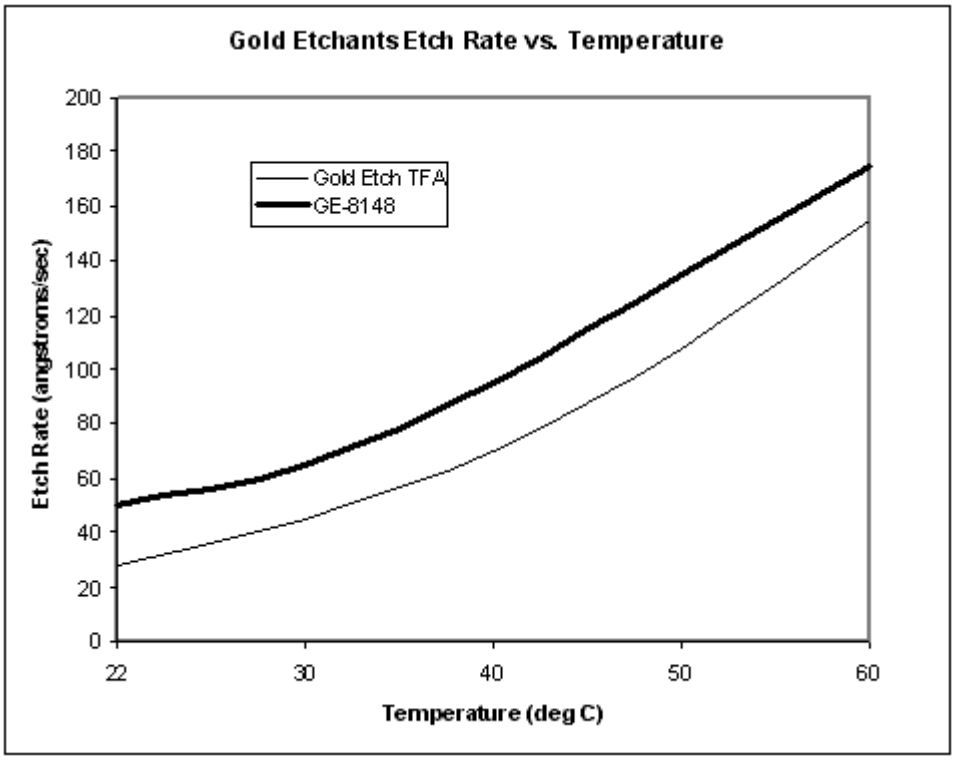
High purity, low sodium and 0.2 micron filtration for semiconductor and microelectronics applications.

Gold Etchant TFA - Cyanide free for standard applications.
GE-8148 - Cyanide free, no attack of nickel films.

	TFA	GE-8148
Operating Temperature	Room Temperature	Room Temperature
Ventilation	Hood recommended	Hood recommended
Agitation	Work agitation; Speed accelerates etch rate	Work agitation; Speed accelerates etch rate
Tank	Glass	Glass
Etch Rate @ 25 °C	28Å/sec.	50Å/sec.
Composition	Ready -to - use liquid Contains KI-I_2 complex	Ready -to - use liquid Contains KI-I_2 complex - Phosphate compound
pH @ 20 °C		8.15 0.2
Density @ 20 °C		1.265 0.01
Etch Capacity gm/gal	100	100

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Resist Compatibility	Neg & Pos.	Neg. & Pos.
Rinse	Distilled, Dionized Water	
Waste Disposal (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/I_2) 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:

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

IMPURITY	**SPEC. PPM (MAX)**
MAX-IMPURITY PPM	
Sodium (Na)	40
Chlorine & Bromides (Cl)	100
Lead (Pb)	5
Iron (Fe)	3
Sulfur (as sulfates)	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.

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GOLD ETCHANT TFAC
FOR INTERMETALLIC SUBSTRATES

DESCRIPTION:

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:

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

APPLICATION:

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.

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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:

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 $[In(H_2O)_6]^{3+}$ while tin forms a $[SnCl_6]^{2-}$ anion.

PROPERTIES:

Appearance	Dark amber
Etch Rate @ 25 °C	15-20 Å / sec (immersion)
Operating Temperature	40-50 °C
Rinse	Deionized Water
Storage	20-25 °C
Shelf Life	1 year at 15-25 °C

10.Iron Oxide Mask Etchant(氧化铁掩模蚀刻剂)

Fabrication of Fe_2O_3 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, Fe_2O_3 becomes insoluble in dilute acids. CVD material produced at over 180 °C exhibits insolubility. Therefore, for ease of etching, the temperature of formation of Fe_2O_3 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

	ME-10	**ME-30**
Description	Liquid - light green	Liquid-clear
Etch Rate	50 Å/sec	25 Å/sec. (with Fe_2O_3)
@ room temperature		deposited @ 155 °C
Rinse	Water	Water
Shelf Life	6 Months	1 Year
Flash Point	None	None
Compatibility	Neg & Pos. Photoresist	Same
Pinhole Density	Zero Defects	> 0
Resolution	< 1 micrometer	1 micrometer

APPLICATION

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

I. Immerse ferric oxide-coated plates in etchant @ 25 °C.

II. Provide mild mechanical agitation or solution movement.

III. After complete removal of exposed oxide film, rinse in deionized water bath.

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11.Kapton Polymide Film Etchant

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

ETCH RATE	
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.

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12.Moly Etchant - TFM
Tungsten Etchant - TFW

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	Amber, aqueous solution	Amber, aqueous solution
pH	10.0	8.0
Dilution	Distilled Water	Distilled Water
Compatible Photoresists	Negative: PKP (Transene) KMER,KTFR,KPR	Negative & positive
Rinse	Distilled Water	Distilled Water
Flash Point	Non-Flammable	Non-Flammable

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

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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 ETHCANT TFN

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

FEATURES:

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

NICHROME ETCHANTS TFC AND TFN

DESCRIPTION:

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:

	TFC	**TFN**
Appearance	Clear orange	Clear orange
Chemistry Base	Ceric Sulfate	Ceric Ammonium Nitrate
Specific Gravity	1.09-1.10	1.127-1.130
Filtration	0.2 microns	0.2 microns
Operating Temperature	25 °C	40 °C
Etch Rate	30 Å /sec @ 25 °C	50 Å /sec @ 40 °C
Etch Capacity	168g/gal	------
Rinse	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.

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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 Echtant 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

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

NICKEL ETCHANTS
DESCRIPTION:

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:

Etchant Type	**TFB**	**TFG**
Operating Temperature	25 °C	40 °C
Etch Rate	30 Å/sec	50 Å/sec
Nickel Deposition	Evaporated / sputtered	Electroless / Electroplated
Etch Capacity	270 grams / gal	100 grams/gallon
Typical Film Thickness	1500 Å/ 5-50 micro inches	-------
Tank	Glass	Glass

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APPLICATION:

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:

Operating Temperature	30-60 °C
Tank	Glass
Rinse	Water
Etch Rate- Ni	3 mil/hr @ 40°C
Etch Rate- Ni-Fe	400 Å/sec @ 50°C
Etch Rate- Stainless Steel (AISI 316 grade)	45 Å/sec @ 30°C 105 Å/sec @ 25°C
Etch Rate- Stainless Steel (AISI 304 grade)	500 Å/sec @ 45°C
Etch Rate- Fe2O3	50 Å/sec @ 50°C
Etch Rate- Cu	1 mil /min @ 40°C
Agitation	Continuous, mild

APPLICATION:

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.

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

DESCRIPTION:

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:

Etchant Type	Nickel Vanadium NiV 28-23
Operating Temperature	25 °C
Etch Rate (varies with ratio)	25-35 Å/sec
Alloy Deposition	Evaporated / sputtered
Etch Capacity	220 grams / gal
Typical Film Thickness	1500 Å/ 5-50 micro inches
Tank	Glass

APPLICATION:

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.

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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:

Appearance	Dark Amber Aq. Sol.
pH	< 1
Flash Point	Non-Flammable
Storage	Room-Temperature
Shelf/Life	1 year
Toxicity	Acid

OPERATION:

Tank	Glass/Pyrex/PVC
Temperature	40-60 °C
Etch Rate	110Å/Sec @ 50°C
Rinse	Water
Compatible Resists	Pos. & Neg.
Metallization	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:

Appearance	Transparent Solution
pH	< 1
Temperature	25-30 °C
Power	10 V DC
CathodeShelf Life	Graphite
Shelf Life	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.

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17.Preferential Silicon Etchants(选择硅蚀刻剂)

Anisotropic etching of silicon on the < 100 > and < 110 > crystal orientation planes.

PREFERENTIAL SILICON ETCHANT - PSE-200

Alkali based - for < 110 > crystal orientation - etches with vertical walls.

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

Ethylenediamine based - for < 100 > crystal orientation.

PREFERENTIAL SILICON ETCHANTS DESCRIPTION

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

	PSE-200	**PSE-300**
Appearance	Odorless, colorless liquid	Clear liquid
Composition	Alkali-based	Ethylenediamine-based
Boiling Point	> 100 °C	118 °C
Oper. Temp	75-100 °C	100 °C
Preferred Operation	< 110 > direction	< 100 > direction
Other Common Orientations **< 111 > Plane**	----	< 110 > can be used < 111 > negligible
Etch Rate	1 mil/3 min. @ 100 °C	25 /hr. < 100 >
Etch Rinse	Water	Water
Metallization **SiO_2**	Attacks Al; does not attack Au; mild attack on Ag Will attack Use as mask	No attack on Au, Ta; Attacks Al, Cu; mild attack on Ag Negligible

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APPLICATION

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

Product No:	Etchant	RT Etch Rate:
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.

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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:

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	Room Temperature
Ventilation	Hood recommended
Agitation	Work agitation; Speed accelerates etch rate
Tank	Glass
Etch Rate @ 25 °C	200Å/sec.
Composition	Ready -to - use liquid Contains KI-I_2 complex
pH @ 20 °C	
Density @ 20 °C	
Resist Compatibility	Neg & Pos.
Rinse	Distilled, Dionized Water

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Waste Disposal (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)

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

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

DESCRIPTION:

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:

	Tantalum Etch SIE-8607	**Tantalum Etch 111**
Appearance	Clear	Clear
Solubility	Infinite in water	Infinite in water
Filtration	0.2 microns	0.2 microns
Operating Temperature	25 °C	25 °C
Etch Rate (Ta), 25 °C	70-80 Å / sec	30-40 Å / sec
Storage	Room Temperature	Room Temperature
Shelf Life	1 year	1 year
Mask Materials	Gold; Positive or Negative Photoresists	Gold; Positive or Negative Photoresists
Rinse	Deionized Water	Deionized water

APPLICATION:

Etch times vary depending on material type (Ta, TaN, or Ta_2O_5) 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.

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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 SiO_2 substrates. TFTN does not contain hydrofluoric acid.

PROPERTIES:

	TFT	TFTN
Appearance	Clear Aqueous Solution	Clear Aqueous Solution
pH	1	1
Flash Point	Non-Flammable	Non-Flammable
Storage	Room Temperature	Room-Temperature
Shelf/Life	1 year	1 year
Toxicity	Strong Acid	Strong Acid

OPERATION:

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

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

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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:

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:

Appearance	Water white
Shelf Life	2 months @ 25 °C 6 months @ 0 °C
Storage	0 °C
Rinse	Deionized Water
Etch Rate @ 25 °C	10-15 Å / sec (immersion)
Operating Temperature	25-40 °C

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22.Moly Etchant - TFM
Tungsten Etchant - TFW

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	Amber, aqueous solution	Amber, aqueous solution
pH	10.0	8.0
Dilution	Distilled Water	Distilled Water
Compatible Photoresists	Negative: PKP (Transene) KMER,KTFR,KPR	Negative & positive
Rinse	Distilled Water	Distilled Water
Flash Point	Non-Flammable	Non-Flammable

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

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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	TRANSENE ETCHANTS	OPERATING RANGE	RECOMMENDED RESIST	APPLICATION
Al	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
Al_2O_3	TRANSETCH N	120 Å/sec @ 180 °C	SiO_2	Semiconductor Devices
BOE	BUFFERED OXIDE ETCHANT	Variable	Negative* & Positive	Semiconductor & Integrated Circuits
Cr	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	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	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
Ga_2O_3	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	GERMANIUM	250 Å/sec @ 20 °C	Negative* & Positive	Semiconductor Devices
GaN	Gallium Nitride	80 Å/min @ 180 °C	SiO_2	Semiconductor and Integrated Circuits

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Au	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
In_2O_3 ITO	INDIUM OXIDE INDIUM TIN OXIDE	30 min @ 25 °C	Negative	Microelectronic Circuits
InP	INDIUM PHOSPHIDE	30 mins @ 25 °C	Negative	Microelectronic Circuits
Fe_2O_3	IRON OXIDE MASK ETCHANT ME-10 ME-30	 50 Å/sec @ 25 °C 25 Å/sec @ 25 °C	Negative* & Positive	Microelectronic Circuits
Polyimide	KAPTON POLYIMIDE ETCHANT	0.013 mil/min @ 40 °C 0.07 mil/min @ 60 °C	Negative* & Positive	Polyimide/Copper Clad Laminates
Mo	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	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	PALLADIUM ETCHANTS Pd Etch 1:1 TFP	 110 Å/sec @ 50 °C	Negative* & Positive	Semiconductor & Thin Film Circuits
Pt	PLATINUM ETCHANT 1:1	10 Å/sec @ 25 °C	Positive	Semiconductor & Thin Film Circuits
	REAGENT SEMICONDUCTOR ETCHANTS (RSE)			
Ru	RUTHENIUM ETCH	50 Å/sec @ 20 °C	Negative&Positive	Microelectronics
	SEMICONDUCTOR DEFECT DELINEATION ETCHANTS			
Si	REAGENT SEMICONDUCTOR ETCHANTS (RSE) SILICON SLOW ETCH SILICON MESA ETCH	Variable Variable Variable	 KMER PKR Type I	Semiconductor Devices Semiconductor Devices

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	PREFERENTIAL SILICON ETCHANTS PSE 200 PSE 300 SOLAR CELL ETCHANTS SCE-200 SCE-300 WRIGHT ETCHANT WRIGHT-JENKINS ETCHANT SIRTL ETCHANT	 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	 <110> <100> <110> <100> N/A N/A N/A	MEMS Semiconductors Solar Cells Semiconductor Testing Semiconductor Testing Semiconductor Testing
SiO_2	BUFFER HF IMPROVED BD ETCHANT SILOXIDE ETCH TIMETCH SILOX VAPOX III BUFFERED OXIDE ETCHANTS (BOE)	800Å/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
Si_3N_4	TRANSETCH N	125 Å/min @ 180 °C	SiO_2 (Silox)	Semiconductor & Integrated Circuits
Ag	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 Ta_3N_5 Ta_2O_5	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	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	TI-TUNGSTEN ETCHANT TiW-30	20-30 Å/sec	Negative* & Positive	Thin Film Circuits 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/金属兼容表)

	Al	Au	Cr	Cu	Ni	Si	Si_3N_4	SiO_2	Ti	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 = surface corrosion

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SILICON NITRIDE ETCHING APPARATUS(氮化硅蚀刻仪器)

Transene's Etching Apparatus is precision made glassware for etching with Transetch N, tetramethylammonium hydroxide solutions (TMAH), EDP solutions such as PSE-300 and PSE-300F, and other materials requiring operation at the boiling point.

ETCHING APPARATUS SIZES:

MODEL NUMBER	FOR SLICES UP TO:	BEAKER DIMENSIONS:
800	1 3/4" diameter (24 slice capacity)	4 1/16" x 6" (Inner Diameter x Height)
2500	140 cps	5 3/16" x 8 1/2" (Inner Diameter x Height)
4000	2 1/4" diameter (30 slice capacity)	6" x 8 1/2" (Inner Diameter x Height)
5000	3 1/4" diameter (34 slice capacity)	6 3/8" x 8 1/2" (Inner Diameter x Height)
8000-4	4 " diameter (24 slice capacity)	8" x 8 1/2" (Inner Diameter x Height)
10,000	6 " diameter (24 slice capacity)	10 1/8" x 10" (Inner Diameter x Height)

* Custom sizes available on request.

NOTE: Slice capacity listed above may be doubled by arranging wafers back-to-back in the basket. Glassware is fabricated from quartz. Baskets, supports, and handles are fabricated from fluoropolymer. Available as complete sets or individual components.



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Preferential Silicon Etchants(选择硅蚀刻剂)

Anisotropic etching of silicon on the < 100 > and < 110 > crystal orientation planes.

PREFERENTIAL SILICON ETCHANT - PSE-200

Alkali based - for < 110 > crystal orientation - etches with vertical walls.

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

Ethylenediamine based - for < 100 > crystal orientation.

PREFERENTIAL SILICON ETCHANTS DESCRIPTION

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

	PSE-200	**PSE-300**
Appearance	Odorless, colorless liquid	Clear liquid
Composition	Alkali-based	Ethylenediamine-based
Boiling Point	> 100 °C	118 °C
Oper. Temp	75-100 °C	100 °C
Preferred Operation	< 110 > direction	< 100 > direction
Other Common Orientations **< 111 > Plane**	----	< 110 > can be used < 111 > negligible
Etch Rate	1 mil/3 min. @ 100 °C	25 /hr. < 100 >
Etch Rinse	Water	Water
Metallization **SiO_2**	Attacks Al; does not attack Au; mild attack on Ag Will attack Use as mask	No attack on Au, Ta; Attacks Al, Cu; mild attack on Ag Negligible

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APPLICATION

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

Product No:	Etchant	RT Etch Rate:
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.

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TRANSETCH-N

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

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

Liquid.	Colorless, odorless
Boiling Temp. (with evolution of H_2O)	180 °C
Specific gravity 20 °C	1.757
Etch Rates - 180 °C:	
Aluminum oxide	120 Å/min
Silicon nitride	125 Å/min

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Gallium nitride	80 Å/min
Silicon dioxide	1 Å/min
Silicon	1 Å/min

APPLICATION:

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:

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.

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TETRAMETHYLAMMONIUM HYDROXIDE - TMAH (四甲基铵 氢氧化物)

DESCRIPTION:

Transene tetramethylammonium hydroxide (TMAH) is available as 25%, 10%, and 5% standard aqueous solutions. TMAH is an effective etchant and chelating agent ideal for removing residue and contaminants from semiconductor and electronic components.

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Photoresist Materials
(光刻胶,其他译名:光致抗蚀剂\感光性树脂\光阻材料)

1. PKP II Photoresist-Purified Kodak Photoresist----------P2
精炼柯达光刻胶

2. NPD Negative Resist Developers----------P7
负性光刻胶显影剂

3. Negative Resist Remover----------P9
负性光刻胶去除剂

4. Negative Resist Chemicals----------P10
负性光刻胶化学品

5. Positive Resist Removers----------P11
正性光刻胶去除剂

6. Photomask Coating-For Use in Photolithography----------P14
影印石版光掩膜涂料

7. Hexamethyldisilazane (HMDS) ----------P16

8. ELECTRONICS GRADE PROCESS SOLVENT (电子生产溶剂)----------P17



注:"-----2"页码标注从本页是第 1 页算起

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1. PKP(精炼柯达光刻胶)
Purified Kodak Photoresist

Stable, purified kodak photoresist materials with improved performance in resolution, adhesion, etch resistance, and low pinhole density - for use in advanced planar semiconductor technology and microelectronics.

PKP - Type II

Purified KTFR photoresist for superior adhesion

PKP PURIFIED KODAK PHOTORESISTS DESCRIPTION

PKP photoresist product is a stabilized solution of purified Kodak "KTFR." This purified photoresist offers improved resolution, adhesion, etch resistance, low pinhole density and best all-around properties available for negative-working resists. The need for membrane filtration of the photoresist in use is not essential. Resolution in the micron range is practical, while photoresist procedures will be found consistently reproducible in production. PKP resist is produced under conditions which assure high quality and comply with the critical and exacting requirements essential for advanced integrated circuit technology.

KTFR product is purified by special processing based on a centrifuging technique under controlled isothermal conditions. The purification process yields photoresist material with excellent quality. The polymeric composition (cis-polyisoprene) shows uniformity in molecular weight and size distribution. In effect the centrifuging technique is a fractionation process with the very high molecular weight polymers removed. Consequently, resist films obtained from the purified products reveal very low pinhole density.

PKP-Type II (Purified KTFR)

PROPERTIES OF PKP PHOTORESIST

PKP Solutions	Type II
Solvent	Xylenes
% Solids (by wt.)	28 ± 0.8
Viscosity (cps - 25 °C)	500 ± 35
Cannon-Fenske	
Sp. Gr. (25 °C/4 °C	0.897
Flash Point (°F)	84
Surface Tension(dynes/cm)	29.2

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Polymeric Composition	cyclized cis-polyisoprene
Aver. Mol. Wt. Membrane Osmometry	65,000 ± 5,000
Sensitizer * 2,-6-Bis-(p-Azido Benzylidene)-4-methylcyclohexanone)	
Peak Spect. Sens. (mu)	355
Spectral Absorb Range (mu)	310-480
Thresh. Expos. Intensity(joules/cm^2)	0.01
Shelf-Life	4
PKP Films (exposed)	
Thermal Elongation (%/°C)	.04
Coef. Therm. Expan. (in/in/°F)	4.5×10^{-5}
Dielectric Constant (1 mc)	2.4

PROPERTIES OF PKP CONTINUED

Water absorb. (25 °C)	nil
Vol. Resistivity (25 °C) (ohm-cm)	5×10^{14}
Equatorial Spacing (A) at phase transition temp.	
158 °C	2.9 A
148 °C	3.9
146 °C	4.0
118 °C	4.9
100 °C	5.4

NOTE: For optimum adhesion of photoresist the equatorial spacing should correspond to lattice constant of substrate material: (Aluminum -4.0 A: Silicon 5.4 A; SiO_2 - 4.9 A)

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PKP II INSTRUCTIONS

INTRODUCTION:

The use of Purified Kodak Photoresist (PKP) has significantly eliminated many problems inherent in photoresist work. Through the Transene process of thermally controlled centrifugal filtration, a more uniform photoresist material relatively free of conglomerates has emerged. However, application and processing of photoresist films remain to some degree an empirical art. The following pages form a general outline of procedure for photoresist technology used throughout the industry. Yet, because environmental and equipment differences exist, it is usually, necessary to adjust conditions and process parameters until satisfactory results are obtained.

ENVIRONMENT:

Several precautions are worthy of note:

1. Dust and lint cause pinholes. These can be minimized by the use of clear-flow liquids.
2. Relative humidity must be controlled between 30 - 50%.
3. Appropriate lighting of gold fluorescent, yellow incandescent, or white fluorescent with yellow or orange filters must be used.
4. Adequate ventilation is necessary because of solvent fumes.

STORAGE:

PKP materials are purified expressly for your order. To remain conglomerate free, precautions must be taken:

1. PKP materials should be refrigerated to minimize polymerization. Allow PKP to warm to room temperature before opening.
2. PKP materials should be stored away from light sources and not be removed from shipping bottles until used.

PROCESSING PROCEDURE:

I. ***Substrate Preparation***
Clean and prebake 20-30 min. @ 120-130°C

II. ***Photoresist Application***
Motor-driven rotary spinning

III. ***Prebake***
20 min. @ 82°C

IV. ***Photoresist Exposure***
1-10 sec. minimum light source 10mW/cm^2

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V. ***Photoresist Develop***
10-60 sec. spray (PKP II Developer) followed by isopropyl alcohol rinses followed by compressed air or nitrogen blow-off.

VI. ***Postbake***
Minimum 10 min. 120°C (max. 148°C)

VII. ***Photomask Remover***
Transene Negative Resist Remover NRR-001 at 50-60 °C effectively removes PKP II photoresist.

PHOTORESIST TECHNIQUE

I. ***Substrate Preparation:***
Only if the substrate is perfectly clean and dry prior to resist application will a well-defined etch pattern free from defects be developed. Removal of surface particles and organic residues is accomplished by cleaning with solvent such as trichloroethylene followed by baking at temperature between 120°C - 200°C for up to 20 minutes.

II. ***Application:***

The standard technique of spinning a substrate on a motor driven rotary vacuum chuch yields the most uniform and reproducible thickness. Under this program centrifugal forces distribute a uniform coating of resist without significant solvent evaporation or excess resist being thrown off at the substrate edges. Begin by flooding substrate with photoresist. Never apply resist to substrate while spinning. An uneven distribution may result.

Square or rectangular substrates are best coated at low rpm (50-1000 rpm). Undiluted resist at 75 rpm yields about 2.5 µ coatings, the substrate edges and corners being thicker.

Circular substrates (the most common) are coated at high speed between 2,000 - 5,000 rpm, resulting resist thickness being determined by resist viscosity, rpm and acceleration. RPM speed > 5,000 has little effect on resist thickness. The lower the viscosity of a resist, the less revolution speed (rpm) affects coating thickness. Time of acceleration to peak rpm is generally regarded to be the determinant of thinner and more uniform thickness across the substrate. Also, the slightly thicker resist coating at the edge of the substrate is reduced. The optimum acceleration time to attain peak rpm is 0.1 sec.

Resist film thickness used for thin film circuits vary from 0.3 to 2 µ. At lower thickness limits, dilution of resist can cause a discontinuous film. Thick films (1-2 µ) give added protection against etch penetration and pinhole formation at the expense of less resolution. A better approach of spinning two thin coats results in assured quality and desired thickness of resist films.

III. ***Prebaking:***
Evaporation of residual solvents results in maximum adhesion of resist to substrate. Resist coatings not thoroughly baked will have variable exposure requirements because residual solvents will inhibit cross linking of functional groups. Excessive baking may also create problems such as fogging and decomposition of resist material. Bake-out time is dependent upon film thickness.
KTFR - 20 min. @ 82°C (above 104°C will affect adhesion)

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IV. ***Exposure of Photoresists:***

Photoresists may be exposed with any light source having output in the near UV spectrum. Large-area light sources are used only for coarse (50 µ or 0.002 inch or larger) lines. To resolve fine details a less diffused light source is necessary. Generally, for fine lines patterns point sources (carbon arc, high pressure mercury vapor or Xenon flash lamps) are used at a point remote from substrate.

This will insure uniformity of light intensity across substrate. Proper exposure of KTFR requires light energies of about 100mW/cm^2. Correct exposure is dependent upon thickness and processing variables. An exposure of 1-10 seconds is sufficient providing the light source is capable of yielding minimum irradiation intensity of 10mW/cm^2 at substrate surface.

For good fine-line definition and reproducibility, the exposure energy must be controlled within 10% of the optimum value. Light intensity at the substrate surface should be monitored. Due to diffraction effects of resist material, overexposure produces cross linking of resist under the mask, the effect being line broadening to as much as 2.5 µ.

Underexposure resulting in cross-linking only at the surface of the resist film can cause the pattern to be washed off when the image is developed. Line broadening can also be the fault of substrate irregularity and/ or insufficient contact between mask and resist surface. The use of a vacuum to hold the mask against a perfectly smooth substrate will solve this problem.

The KTFR sensitizer decomposes without cross-linking the polymer if exposure takes place in the presence of oxygen. This reaction is limited only to the surface of the film, which remains soluble in the developer. This oxygen effect will not be noted in working with resist coatings of > 1 µ. Film coatings of 0.5 µ or less may be affected greatly, not offering enough protection in the subsequent etch operation.

V. ***Photoresist Developement:***

In general, the best procedure involves a 10 to 60 second spraying of the developer onto the coated substrate. Follow this with several non-aqueous rinses (isopropyl alcohol). Using pure compressed air or nitrogen residual solvent is blown off the surface. Transene PKP II Developer is recommended.

VI. ***Postbaking:***

Post baking of the developed resist will evaporate residual solvents, enhance chemical stability of the polymer coat, and further enhance adhesion. Post baking temperature should never exceed 148°C. Recommended postbake is 10-20 min. at 120°C.

VII. ***Photoresist Removal:***
Transene Negative Resist Remover NRR-001 is recommended for removal of PKP II photoresist.

2. NPD Negative Resist Developers(负性光刻胶显影剂)

DESCRIPTION:

Transene NPD Negative Photoresist Developers are high purity organic solutions for developing exposed negative photoresist.

A broad range of proprietary blends of solvent developers are offered for various negative photoresists. They are formulated to complement the resist system being used. The developers are selected based upon the activity levels required for specific processing conditions. All negative working developing chemicals are sold as working solutions.

Product	Xylene: Stoddard Solvent Ratio
NPD 4001	NA
NPD 4030	0:100
NPD 4032	100:0
NPD 4033	1:2
NPD 4040	NA
NPD 4050	1:1
PKP II Developer	NA

DEVELOPMENT:

During the development cycle, the unexposed photoresist is removed by a developer/rinse system, spray or immersion, leaving the substrate protected according to the exposed image. To obtain very fine line resolution, it is recommended that spray development be used. Immersion development is adequate for less critical geometries, i.e.7μ or greater line widths and spacings, especially if mechanical or nitrogen bubbling is used. A typical spray cycle and immersion cycle are shown in the tables below.

Typical Spray Cycle

Solution	Time (seconds)
Developer; Xylene; Stoddard Solvent	10 to 15
Rinse; n-Butyl Acetate	10 to 15
Nitrogen Dry	15 to 20

Typical Immersion Develop Cycle

Solution	Time (seconds)
Developer; Xylene; Stoddard Solvent	60 to 75
Rinse; n-Butyl Acetate	20 to 30
Nitrogen Dry	15 to 20

HARD BAKE (PRE-ETCH):

During hard bake the developing solvents are removed and strengthening of the adhesion between the resist and substrate is accomplished at a bake temperature of $140^{o} \pm 5^{o}C$ for 25 ± 5 minutes in a convection oven. During infra-red baking, the temperature at the surface of the water should be maintained at $140^{o} \pm 5^{o}C$. It should be noted that infra-red energies affect different substrates with a varying degree of temperature. A maximum elapsed time of four (4) hours between hard bake and etch is recommended.

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ETCHING:

Photoresists are compatible with both acid and alkaline metal etchants and buffered hydrofluoric acid. The etch rate is determined by temperature, agitation, and mixture of etch. Due to the proprietary nature of different etches used in the semiconductor industry, it is not possible to describe all the different effects on photoresist.

REMOVAL:

Photoresist can be removed in any common conventional chemical system. A number of removal solutions are commercially available; some require heating, and some manual scrubbing.

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3. NEGATIVE RESIST REMOVER NRR-001(负性光刻胶去除剂)

DESCRIPTION:

Negative Resist Remover NRR-001 is a ready to use, low pH formulation composed of a proprietary mixture of aromatic ingredients. NRR-001 is formulated to remove (strip) common negative working photoresists baked onto various substrates (for example, gallium arsenide, silicon, chrome) and is non-corrosive to various metal and oxide surfaces under proper usage. Polyimide is not attacked by NRR-001.

NRR-001 remover does not contain phosphates, chromates, phenol, or chlorinated hydrocarbons. NRR-001 performs well at room temperature or elevated temperatures and exhibits an extended bath life. The shelf-life of NRR-001 is one year when stored in a cool area away from direct sunlight.

CHEMICAL AND PHYSICAL PROPERTIES:

Appearance	Red liquid with aromatic odor
Specific Gravity (@68°F)	0.95 - 1.05
Shelf Life	1 year
pH (@ 68°F)	< 2

APPLICATION:

Bath Make-Up:	Full strength for all semiconductor operations, by a spray or immersion process.
Rinse:	Aromatic solvent if necessary.
Bath Life:	Bath replacement should take place when removal time exceeds 15 minutes.
Use:	NRR-001 has broad applicability for PC boards, chrome photomasks, thin film and hybrid integrated circuits, and MCM devices. Removal of greases, oils, inks, and other organics is also accomplished with NRR-001. NRR-001 is an effective stripping agent for Transene PKP II photoresist.

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4. NEGATIVE PHOTORESIST CHEMICALS(负性光刻胶化学品)

DESCRIPTION:

Negative photoresist chemicals are available for all phases of photolithographic operation. High purity solvents and solvent blends are filtered to 0.1 µ absolute and are supplied with a certificate of analysis.

- **NPR 4040 - Negative Photoresist Rinse** is an effective rinse for unexposed negative photoresist.

- **PKP II Thinner** is a thinning solvent for PKP Type II photoresist.

- **PKP II Rinse** is specifically formulated for use with PKP Type II photoresist.

- **Stoddard Solvent** is specifically formulated for use with PKP Type II photoresist.

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5. POSITIVE RESIST REMOVERS(正性光刻胶去除剂) PRR-001 and PRR-002

PRR-001

DESCRIPTION:

Positive Resist Remover PRR-001 is composed of a proprietary mixture of water miscible and biodegradable ingredients. PRR-001 is formulated to remove (dissolve) all the common positive working photoresists baked onto various substrates (ex: gallium aresenide, silicon, chrome) and is non-corrosive to various metal and oxide surfaces under proper usage.

PRR-001 Remover does not contain phosphates, chromates, phenol, chlorinated hydrocarbons, nor sulfonic acids, and no special handling precautions are necessary. PRR-001 works well at room temperature with a bath life of approximately 2000 wafers/gallon. At elevated temperatures removal of polyamide can be achieved. The cost per wafer is less than one penny. The shelf-life of PRR-001 is one year when stored in a cool area away from direct sunlight.

CHEMICAL AND PHYSICAL PROPERTIES:

Appearance	Light yellow liquid
Specific Gravity (@68°F)	0.99 +/- 0.01
Refractive Index (nD 26.0°C)	1.4271 +/- 0.0005
pH (@ 68°F)	12.60 +/- 0.05

APPLICATION:

Bath Make-Up:

Full strength for all semiconductor operations, by a spray or immersion process.

Bath Operations:

For immersion work, 3 to 5 minutes at room temperature with agitation. Solution can be at elevated temperatures (70-90°C). Use of two tank systems for immersion removal or conveyorized equipment for spray removal.

Rinse:

PRR-001 is completely miscible with water: only D.I. water rinse is necessary.

Bath Life:

Bath replacement should take place when removal time exceeds 15 minutes or when quantity stripped exceeds 2000 wafers/gallon.

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PRR-002

DESCRIPTION:

Positive Resist Remover PRR-002 is composed of a proprietary mixture of water miscible and biodegradable ingredients. It is specially formulated to remove (dissolve) all common positive working photoresists treated with deep UV for ion implant, ion milling or plasma etch systems on various metal substrates. PRR-002 is non-corrosive to various metal and oxide surfaces under proper usage.
PRR-002 Remover does not contain phosphates, chromates, phenol, chlorinated hydrocarbons, nor sulfonic acids, and no special handling precautions are necessary. PRR-002 is compatible with all teflon, polypropylene and polyethylene materials. PRR-002 works well at room temperature or at slightly elevated temperatures for difficult stripping situations. Use of PRR-002 will result in noticeable cost saving per wafer. PRR-002 should be stored in a cool area away from direct sunlight. The recommended shelf-life is six months.

CHEMICAL AND PHYSICAL PROPERTIES:

Appearance	Light yellow liquid
Specific Gravity (@68°F)	0.97 +/- 0.01
Refractive Index (nD 22.5°C)	1.4271 +/- 0.0005
pH (@ 68°F)	Above 12.0
Filtration	0.2µ

Appearance	Light yellow liquid
Specific Gravity (@68°F)	0.99 +/- 0.01
Refractive Index (nD 26.0°C)	1.4271 +/- 0.0005
pH (@ 68°F)	12.60 +/- 0.05

APPLICATION:

Bath Make-Up: Full strength for most semiconductor operations.

Bath Operations:

A two-tank system is recommended.

1. For standard resist processing (90°- 140°C): 55°C for 3-5 minutes.
2. For deep UV and hardened resist processing (150°- 200°C): 55° to 90° for 5-10 minutes per tank.

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Rinse: PRR-002 is completely miscible with water; only D.I. water rinse (5 min.) is necessary.

Bath Replenishment / Replacement:

Bath replacement should take place when removal time exceeds 15 minutes or when quantity stripped exceeds 2000 wafers/gallon.

1. Replenishment should be made to maintain capacity levels as needed.
2. Bath replacement should be done when removal time exceeds 20 minutes per tank.

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6. Photomask Coating(影印石版光掩膜涂料) For Use in Photolithography

A reliable protective coating for emulsion photomask to prevent sticking and pinhole formation. Increases semiconductor device yield and extends the life of resist masks.

FEATURES

- Mask lubricant and protective coating - prevents sticking
- Reduces pinhole formation - minimizes electrical shorts and poor definition
- Increases semiconductor device yield
- Simple to apply - no special equipment needed
- Safe and economical

PHOTOMASK COATING - 2060

DESCRIPTION

Transene Photomask Coating -2060 is a protective polymer coating designed to increase photomask life and to decrease its defect density. Device yields, for a given number of contacts, are increased significantly with negative photoresists. Yield improvement with positive resists can also be realized, although it is not as substantial as with negative resists.

Device yields and mask life are reduced when pinholes are produced in the mask due to the sticking of photoresists to the mask emulsion when the two are separated. The pinholes lead to possible electrical shorting and poor definition in the device, reducing yields. Coating the mask with Transene Photomask Coating protects the mask and reduces pinholes. The coating is formulated using a lubricating polymer and a non-toxic, hydro-alcohol solvent system.

PROPERTIES

Appearance	Colorless liquid
Solvent System	Non-Toxic Hydro-alcohol
Viscosity (RT)	140 cps
Specific Gravity	.917
Coating Thickness	6 microns (Nom.)
Surface Area Coated	50 sq. ft. / qt.
Optical Transmission	
Visible	99%
U.V.	98%
Shelf Life	6 months

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APPLICATION:

Clear coatings of approximately 6 microns can be obtained by dip-coating. Filtering may be necessary if the solution becomes contaminated with dust or other foreign particles after initial use. A 30-minute cure at 85 °C is required. However, curing under cacuum is recommended to prevent the possible formation of bubbles. For subsequent recoating, the previous mask coating may be removed by washing in hot water.

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7. HEXAMETHYLDISILAZANE - HMDS

DESCRIPTION:

Electronic grade hexamethyldisilazane (HMDS) is available in 100%, 20% and 10% standard concentrations. HMDS promotes adhesion of photoresist to silicon dioxide and other difficult-to-adhere-to surfaces.

APPLICATION:

Apply by spin coating to silicon wafers prior to application of photoresist. Dilute concentrations should be allowed to release solvent before photoresist is coated. Transene HMDS is a high purity, electronic grade product which does not require filtration.

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8. ELECTRONICS GRADE PROCESS SOLVENT(电子生产溶剂)

DESCRIPTION:

Commonly used high purity electronics grade process solvents provide a range of options for various operating requirements. All solvents are filtered to 0.1µ and packaged in certified class 10 clean rooms. Certificates of analysis are supplied with each shipment.

SPECIFICATIONS:

Appearance	Assay	Evaporation Residue	Water Content
Acetone	99.5% min	5 ppm max	500 ppm max
n-Butyl Acetate	99.5% min	1 ppm max	500 ppm max
Iso-Propyl Alcohol	99.5% min	5 ppm max	500 ppm max
Methyl Alcohol	99.5% min	5 ppm max	500 ppm max
Methyl Ethyl Ketone (MEK)	99.5% min	3 ppm max	300 ppm max
Xylenes	99.5% min	5 ppm max	200 ppm max

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Printed Circuit Board Manufacturing Materials (印刷电路板制造材料)

1. Copper Cleaner-For Printed Circuit Boards----------P2
   印刷电路板铜清洗剂
2. COPPER OXIDE REMOVER - COR-100 ----------P3
   氧化铜去除剂
3. Bright Electroless Tin ----------P4
   光亮无电镀锡
4. Bright Electroless Gold----------P6
   光亮无电镀金
5. PC Electroless Copper----------P8
   印刷电路板光亮无电镀铜
6. Electroless Nickel Strike-For Copper, Brass and Copper Alloys----------P10
   无电镀镍触击
7. Tin-Lead Plating----------P11
   锡铅电镀
8. Printed Circuit Copper Etchants- CE-100/200----------P13
   印刷电路板铜蚀刻剂
9. Solder Flux
   焊料助焊剂
10. Silicoat®SILICONE COATING FOR PRINTED CIRCUIT ASSEMBLIES----------P15
    用于印刷电路装配的硅树脂涂料
11. Hybrisil™Conformal Coatings for Thin Film/Thick Film----------P17
    薄膜/厚膜保形涂料
12. CONDUCTIVE VIA FILL CVF-6030----------P23

13. Radiation Cure Coatings----------P25
    防辐射涂料



注:"-----2"页码标注从本页是第 1 页算起

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1. Bright Copper Cleaner(印刷电路板铜清洗剂) For Printed Circuit Boards

Removes tarnish from copper and copper-alloy surfaces. Simultaneously forms a thin, protective film, highly resistant to corrosion. Recommended for cleaning copper circuit boards and to maintain boards free of oxide.

FEATURES

- Rapid, economical cleaning of circuit boards.
- Produces a molecular-bonded physical barrier layer, stable to 280 °C.
- Monomolecular barrier film makes copper corrosion resistant; does not wipe or dissolve off. Protection is lasting.
- Enhances fluxing, soldering and coating operations of circuit boards.
- No adverse electrical effects.

APPLICATION

PC Boards should be degreased first, if necessary.

Tank	Pyrex glass, fiberglass, polypropylene, etc.
Temperature	140 °F - 175 °F
Immersion Time	20-30 seconds
Rinse	Water

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2. COPPER OXIDE REMOVER - COR-100(氧化铜去除剂)

DESCRIPTION:

Removes tarnish from copper and copper-alloy surfaces without leaving a residue. COR-100 is recommended for cleaning copper films or copper circuit boards immediately prior to further processing.

FEATURES:

- Rapid, economical cleaning of circuit boards.
- Enhances fluxing, soldering and coating operations of circuit boards.
- No adverse electrical effects.
- Mild pH.
- Compatible with most metals.
- Non-aggressive formulation

APPLICATION:

PC Boards should be degreased first, if necessary. Use with agitation.

Tank	Pyrex glass, fiberglass, polypropylene, etc.
Temperature	20-50 °C
Immersion Time	30-60 seconds
Rinse	Water

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3. Bright Electroless Tin(光亮无电镀锡)

Simple immersion technique for bright electroless tin plating process. Deposit pure tin onto copper, brass, other copper-based alloys, gold and lead-tin electroplate.

FEATURES:

- Plates pure tin rapidly
- Plating exhibits fine-grain tin structure
- Affords unusual resistance to humidity and salt-spray
- Excellent solderability
- Process simple to operate and maintain

BRIGHT ELECTROLESS TIN DESCRIPTION:

Bright Electroless Tin is a well-developed formulation based upon the reduction characteristics of chelated tin in the divalent state. Under proper conditions reduction to pure tin occurs readily. A grain-refining agent, free of phosphorus, is present as well as an activator and buffers for pH control.

The deposited tin, in addition to good chemical resistance, exhibits excellent adhesion and is very solderable even after exposure to extreme humidity testing. Bright Electroless Tin is therefore used to provide corrosion protection to copper and lead-tin electroplate. A minimum of 25 millionths of an inch of tin deposit is required.

Bright Electroless Tin is recommended to preserve solderability of printed circuit boards, either copper or lead-tin electroplate. It is also used for plating electronic parts such as diodes or leads and for the corrosion protection of die stampings and machined copper or brass parts.

PLATING FORMULA

To prepare the electroless tin plating solution use 5 lbs. Part A with one-half gallon Part B, and add 4 gallons water. Stir. All material will dissolve when plating solution is operated at 180 °F.

PLATING RATE (on copper)

Time in minutes	Thickness in Microinches
(@ 180 °F)	(10^{-6} inches)
5	40
10	65
15	80
30	100

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PLATING YIELD

Bright Electroless Tin will deposit 25 millionths of an inch over 100 sq. ft. of copper/gallon of plating solution.

Available in

Part A - (Powder)
1 lb. container 1/2 gal container
5 lb. container 1 gal container
50 lb. container 5 gal container

Part B - (Liquid)
1/2 gal container
1 gal container
5 gal container

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4. Bright Electroless Gold(光亮无电镀金)

A gold plating solution for depositing thin, uniform layers of 24 karat gold by an electroless immersion process - for printed circuit boards, transistor headers, electrical connectors, diode leads, lamps and other electronic parts.

FEATURES

- Economical gold plating
- Plates bright gold on copper, kovar, brass, nickel, tin-lead solders and indium antimonide
- Excellent solution stability
- Operates with simple control of plating solution
- Ready-to-use - no mixing required.

BRIGHT ELECTROLESS GOLD
Description

Bright Electroless Gold is formulated as a trouble-free gold plating solution designed to plate gold on metal parts by an electroless immersion process. This process operates by the electroless displacement of base metals by gold brought about by a difference in EMF potentials.

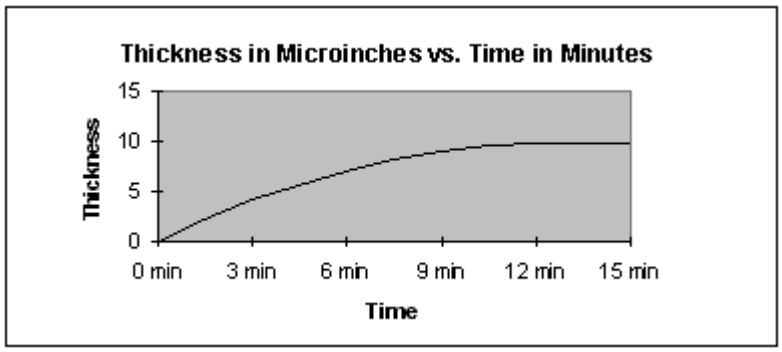
Bright Electroless Gold as normally supplied is ready to use without further modifications. This product is also available, when specified, as a concentrate to reduce shipping costs.

Bright Electroless Gold will deposit gold on most common metals and alloys including copper, commercial brass, kovar, nickel, tin-lead solders, pure-tin, iron, and indium antimonide.

PROPERTIES OF BRIGHT ELECTROLESS GOLD-Type I

Gold content per gallon	1/3 tr. oz.
Plating Coverage/gal.	175 sq.ft./1.25 x 10^{-6} in. thick
pH	7 - 9
Operating temperature	50 - 90 °C
Copper, nickel, kovar, etc.	90 °C
Tin-lead solders, pure-tin	50 °C
Plating time	10 min (Cu), 15 min (Ni)
Tank	Pyrex glass
Bath Life	unlimited until gold is depleted
Storage	Room Temperature

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APPLICATION

Metal parts to be plated should be thoroughly cleaned before use. The normal cleaning procedures for electroplating are adequate.

The solution of Bright Electroless Gold will show a decrease in pH with use. The pH should not be allowed to deviate from the normal conditions for plating since inferior deposits result. Adjustment of pH can be conveniently accomplished by the addition of small amounts of ammonium hydroxide to raise pH or citric acid to lower it.

The recommended plating temperature is 90 °C for most metals. However, for tin-lead solders and pure-tin an optimum temperature of 50 °C is recommended.

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5. PC Electroless Copper(印刷电路板光亮无电镀铜)

Adherent copper deposition system for thru-hole plating, printed circuit boards, plastics and other materials.

MATERIALS FOR PLATING NON-METAL, THRU-HOLE PLATED PCB:

Solutions should be used in the following order:

1. Solution C;
2. Solution D;
3. Solutions A & B.

SURFACE SENSITIZING (SOLUTION C)

Immerse pre-cleaned copper-clad epoxy/glass laminates in Solution C for 2 minutes. Do not stir or agitate the solution. Avoid contamination from metal objects. Use glassware and plastic-coated tweezers or transfer racks for handling. Remove surface sensitized pieces; after water rinse, transfer to next solution.

ACTIVATOR (SOLUTION D)

PC boards should be allowed to stand in Solution D for 2 minutes. Again, do not agitate or stir. Finally, remove work and thoroughly rinse in distilled water.

PC ELECTROLESS COPPER BATH (SOLUTIONS A & B)

Bath Make Up: Mix A & B in equal volumes.

Operation of Bath: Use at 30-45 °C (not over 50 °C). Bath should be held at optimum operation temperature of 40 °C for uniform plating thickness. Continuous mild agitation of work. Nominal plating rate 0.2 mil/hour. PC Electroless Copper is used for depositing thin layers of copper, up to 0.5 microns. For thicker films, Transene Copper Plating Acid Type should be used after initial electroless copper deposition.

Thru-Hole Plating Instructions

CLEANING PROCEDURE

1. Solvent Decrease - Removes oil and grease; followed by vigorous water rinse.
2. Pumice Powder - Wet or dry, removes oxides, heavy soils (and/or vapor-blasting); followed by thorough water rinse.
3. Alkali Soak (5 Min) - Hot 150o to 180 oF to further clean copper surface; condition laminate; improve surface wetting. Followed by warm water rinse.
4. Persulfate Etch (2 min) - Produces matte pink copper surface: ammonium persulfate - 200 gm/L; sulfuric acid - 10 ml/L. Followed by water rinse.
5. 10% Sulfuric Immersion (2 min) - Removes insoluble salts (Step #4). Followed by water rinse.
6. 33% HCL Immersion (2 min) - To protect from harmful drag-in.

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PROCEED DIRECTLY TO SENSITIZER

COPPER DEPOSITION

1. Sensitizer Solution C (2 min. immersion) - Seeds epoxy/glass laminate. Followed by water rinse.
2. Activator Solution D (2 min. immersion) - Activates an autocatalytic layer for copper deposition. Followed by thorough water rinse.
3. 5% Sulfuric Dip (3-5 min. immersion) - Speeds electroless copper deposition, protects from drag-in contamination. Followed by water rinse.
4. Electroless Copper Parts A & B (5-10 min. typical) - Immerse in plating bath and agitate slowly. Operate @ 30-45 oC. Followed by water rinse.
5. 5% Sulfuric Dip - Neutralizes surface. Follow by water rinse.
6. 20% HCl Acid Dip (10-60 sec.) - Followed by water rinse.
7. Electroplate Copper - To build up desired copper thickness.

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6. Electroless Nickel Plating Strike(无电镀镍触击) For Copper, Brass and Copper Alloys

An electroless nickel plating process designed for electroless nickel plating on copper, brass and copper alloys.

PROPERTIES:

Appearance	Green solution
Operating Temp.	85 °C – 95 °C
PH	3.2 optimum
Plating Rate	20 x 10^{-6} in./min.
Deposition	Nickel 90%/Phosphorus 10%
Plating Capacity (50% depletion)	6,750 sq. in. / 20 m in./gal.

CLEANING PROCEDURE FOR COPPER SAMPLES:

1. Clean copper with some physical abrasion.
2. Dip for one minute in alkaline cleaner at 65 °C (150 °F).
3. Rinse with deionized water.
4. Dip for one minute in 30% HCl
5. Rinse with deionized water.

PLATING BATH – USE AND CONTROL

Operate bath at 95 °C. Plate for approximately one minute until surface of sample is completely nickel plated, then rinse with water. For build up of nickel deposit, use Nickelex (Electroless Nickel Plating). Maintain pH of plating solution at 2.8 to 3.5 by adding ammonium hydroxide when pH falls below 2.8.

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7. Tin–Lead Plating Solutions(锡铅电镀解决方案)

Tin, lead and tin – lead alloy plating solutions for corrosion protection provide fine grain structure and minimum operational control.

LEAD – 100%
Maximum corrosion resistance

TIN-LEAD ALLOY 5-95
Recommended for bearings

TIN-LEAD ALLOY 10-90
Special lubrication properties

TIN-LEAD ALLOY 60-40
Standard plating composition

TIN-LEAD ALLOY 80-20
Excellent solderability

TIN-100%
For wire plating applications

TIN-LEAD PLATING SOLUTIONS DESCRIPTION

The tin-lead plating solutions consist of metal fluoborates, addition agents, stabilization additives and proprietary wetting agents. The plating solutions are available in ready-to-use form. Various alloy compositions of tin-lead offer a high degree of uniformity and fine grain structure and require a minimum of operational control. Alloy compositions high in tin provide excellent solderability. High lead alloy compositions are recommended for extreme corrosion resistance and lubricating properties as required for bearings. Pure lead is employed for extreme corrosion resistance while pure tin is recommended for plating wires for solderability.

COMPOSITION (oz./gal. metal)

100% Lead 11.0	Tin-Lead Alloy 60-40 9.0 Sn/ 5.4 Pb
Tin-Lead Alloy 5-95 .8 Sn/12.6 Pb.	Tin-Lead Alloy 80-20 10.0 Sn/2.7 Pb.
Tin-Lead Alloy 10-90 1.34 Sn/12.1 Pb.	100% Tin 11.0

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OPERATING CONDITIONS –For all Plating Solutions

Bath pH	< .5
Temperature (°F)	70-100
Current Density (Amp./Sq.Ft.)	25-30
Voltage (volts)	2-4
Anodes (Polyprop. Bagged)	Same as metal plating compositions
Anode Efficiency (%)	100
Anode to Cathode Ratio	2:1
Agitation (Cathode-Rod)	Mild
Filtration: (Continuous or periodic)	Rubber-lined steel filter presses or Other acid-resistant equipment. Filter Materials can be Terylene, nylon cloth filter paper or paper pulp.

PLATING CONTROL

1. All materials which contact plating solution must be lined with PVC, Koroseal, rubber, Lucite, or polypropylene.
2. Operating temperatures above 100 °F will increase % tin deposited.
3. Cathode current density less than 25 asf will decrease % tin in alloy deposit. Conversely, current density greater than 30 asf will increase % tin in alloy deposit.
4. Air agitation must not be used as it will oxidize tin. Adequate agitation may be provided by a moving work rod.
5. A plating thickness of .001" will be deposited in 17-20 minutes @ current density of 25-30 asf.

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8. Printed Circuit Copper Etchants(印刷电路板铜蚀刻剂)

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

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

PRINTED CIRCUIT COPPER ETCHANTS
DESCRIPTION

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

	CE-100	CE-200	APS-100
Etchant type	Immersion	Spray	Immersion/Spray
	Dip or Spray		
Operating Temperature	40-60 °C	40-60 °C	30-40 °C
Etch Rate @ 40 °C	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	19 oz. Cu/gal.	14 oz Cu/gal.	10 oz Cu/gal.

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APPLICATION:

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.

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10. Silicoat®(用于印刷电路装配的硅树脂涂料)
SILICONE COATING FOR PRINTED CIRCUIT ASSEMBLIES

One-part, flexible, conformal coating for protection of printed circuit boards and other electrical applications.

FEATURES:

- Application versatility – dip, brush, spray
- Rapid room-temperature cure
- Provides protection against moisture
- Maintains electrical Q
- Excellent insulation properties

SILICOAT®
DESCRIPTION:

Silicoat is a flexible, conformal coating based on Transene electronic grade, translastic silicone materials. The product is specially designed to perform as an effective coating for the protection of printed circuit boards against moisture and corrosion . The protective coating also exhibits excellent dielectric properties.

Silicoat is formulated as a one-part system easily applied by brushing, spraying or dipping. Cure is accomplished simply by air drying at room temperature. The cure is moisture catalyzed.

PROPERTIES OF SILICOAT

Physical	
Color	Clear
Viscosity cps	1500 nominal
Flash Point	62 °F
Thinner	Xylene
Thickness per dip	3 mils (approx.)
Tack Free Time	45 minutes (air dry)
Full cure at 25 °C	12 hours
Sp. Gr. (cured)	1.0
Durometer (Shore A)	25
Shelf Life	1 year

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Electrical	
Dielectric Strength (V/mil)	500
Dielectric constant (100 Hz.)	2.65
Dissipation factor (100 Hz.)	0.0037
Volume resistivity (ohm-cm)	1.5×10^{14}
Operating temp. range	-70 °C to 175 °C

APPLICATION:

Silicoat is recommended as a protective coating for printed circuit assemblies and other electrical coating applications. The product is compatible with most copper-clad circuit board laminate materials described under Nema and Mil-P-13949D types of epoxy-glass, epoxy-paper and phenolic-paper. The adhesion of Silicoat is very good to glass, metal, rubber and most plastics. It is not recommended for acrylate or polycarbonate resins.

Moisture resistance may be enhanced by applying two thin coats to avoid pinholes, though the application of a single coat of Silicoat suffices. Test results also show that Silicoat increases the electrical Q of a circuit with further improvement attained by adding coat thickness. The usual effective coat thickness is approximately 3 mils.

See instructions for dilution with xylene and the relationship of the viscosity to the applied coat thickness.

For electrical repair work Silicoat may be removed or stripped by soaking in xylene.

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11.Hybrisil™(薄膜/厚膜保形涂料)
Conformal Coatings for Thin Film/Thick Film

One-part silicone, conformal protective coatings for thin film and thick film resistor networks in microelectronic circuits.

HYBRISIL – 200
High power resistor silicone coating
Elevated temperature cure
Thermal class 350 °C

HYBRISIL™
DESCRIPTION

Hybrisil conformal coating is designed to protect and stabilize thick and thin film resistor networks. The Hybrisil coatings are one-part systems, silicone based and easily applied. These silicone materials provide a low cost yet reliable process for resistor encapsulation. The need for high temperature firings with cermet encapsulations is avoided.

Hybrisil 200 is a silicone-mica filled system which cures at elevated temperature.

PROPERTIES OF HYBRISIL CONFORMAL COATINGS

Uncured	HYBRISIL 200
Composition	One-part silicone filled
Color	Black
Viscosity (cps)	1,500
Thinner	Xylene
Solids	70%
Flash Point	90 °F
Chemical Resistance	Excellent
Shelf Life	6 months
Cure, Activation	Heat
CURED	
Bond Strength (peel lbs./in^2)	125
Durometer	70 (shore D)

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Dielectric Constant (1000 Hz)	4.8
Dissipation Factor (1000 Hz)	.002
Volume Resistivity (ohm-cm)	> 10^{16}
Water Absorption (7 days) ASTM-D570-54T	< 0.1
Temperature Rating (Continuous)	-65 °C to + 250 °C
Max. Oper. Temp.	350 °C

APPLICATION:

Hybrisil conformal coating is conveniently applied by horizontal flooding technique or brushing.

Hybrisil-200 is first baked at 65 °C for 20 minutes then heated for ½ hour at 125 °C followed by a post cure of ½ hour at 220 °C.

Q-Lac®
Radio Frequency Dielectric Lacquer

Extremely low-loss, high Q, radio frequency lacquer for protective coating and insulating electronic components and circuits.

UNIQUE PROPERTIES OF Q-LAC

- Dielectric coating with lowest dissipation factor.
- Highest insulation resistance – reliability against voltage breakdown.
- Stabilizes inductances and capacitances.
- High resistance to humidity – guards against corrosion.
- Cements and bonds for structural strength.

IMPORTANT APPLICATIONS

- General coil dope for VHF-UHF-RF windings- choke coils
- Saturant and impregnant for paper, tape, and fabric materials used in windings.
- High Q lacquer capacitors – filter circuits – printed circuits.
- Coating for moisture sensitive, high frequency electronic components and circuits.

Q-LAC® Radio Frequency Dielectric Lacquer
DESCRIPTION

Q-LAC is a special lacquer composed of a cross polymer of iso-polystyrene, formulated in accordance with the Clausius-Masotti equation as design criteria for a low loss dielectric material. Structurally, the Q-LAC formed film is a non-ionic substance with small atomic polarizabilities

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and no free dipoles. The complete absence of dipoles, either of the bound or free type, as well as any free ions, results in the elimination of ionic conductivity, ordinarily responsible for high loss factor. Excellent electrical properties especially at high frequencies are valuable characteristics of Q-LAC.

Q-LAC coatings are, furthermore, strongly adherent and protective with excellent resistance to moisture. Coatings show high surface resistivity on account of the strong hydrophobic character of the Q-LAC films. Exposure to 98% relative humidity does not alter the surface conductivity. Q-LAC finds important application, therefore, for coils and other electronic components and circuits where circuit Q is important.

PROPERTIES OF Q-LAC FILM

Volume Resistivity	1 x 10^{15} ohm-cm.
Surface Resistivity	5 x 10^{14} ohm
Dielectric Constant	2.53 (1 mc.) 2.52 (50 mc)
Dielectric Strength	2200 volts/mil
Power Factor	.001 (1 mc) .0005 (50 mc.)
Loss Factor	.002 (1mc) .001 (50 mc.)
Dissipation Factor	.0001 (1000 c.p.s.)
H_20 Absorbtion Coefficient	< .01
Temperature Range	-40 °C to + 100 °C.

APPLICATION TECHNIQUE

All parts to be coated should be thoroughly dry, preferable by preheating at 110 °C. Q-LAC is then applied by brushing or dipping, either air dried for 30 minutes or oven baked at 60 °-90 °C. A film thickness of about 1 mil can be expected from a single brush application or dipping. Dilution with xylene or toluene in a 1:1 ratio will film to approximately half thickness. A minimum film thickness of 1 mil is recommended.

Resistor Coatings
High Temperature Conformal Coatings

Solution type insulation coatings formulated with dielectric aluminum silicates in a special silicone base – for power resistors, capacitors and other electrical components.

RESISTOR COATING – TYPE 100

Thermal Class – 350 °C
For very high temperature applications

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RESISTOR COATING – TYPE 150
Thixotropic modification of type 100
For single coat application

RESISTOR COATING – TYPE 200
Thermal class – 250 °C
For applications requiring very high adhesion and chemical resistance

RESISTOR COATING – TYPE 250
Thixotropic modification of type 200
For single coat application

FEATURES:

- Single component systems
- High insulation resistance
- High reliability performance
- Moisture resistant
- Fire resistant

RESISTOR COATINGS
DESCRIPTION

Transene conformal resistor coatings are specially formulated from insulation materials designed to pass rigid, high reliability performance standards for military and space applications. The coatings are particularly advantageous for precision power resistors as well as for other electrical components used in high temperature applications. The coatings are fire resistant and highly protective towards moisture and ambient.

Transene Resistor Coatings contain modified, high temperature silicone resins combined with dielectric grade aluminum silicate materials. These coatings exhibit excellent insulating properties, notably high dielectric strength and high electrical resistivity. Furthermore, these characteristics are maintained at elevated temperatures- as high as 350 °C continuous. A feature of these resistor coatings is their superior adhesion.

Two basic types of resistor coatings are offered based upon their temperature rating, adhesion, quality and chemical resistance. In addition, thixotropic modification of these two types allows single coat application.

RESISTOR COATING – Type 100 was developed specifically for high temperature application; consequently it demonstrates exceptional thermal stability. Color black or green.

RESISTOR COATING – Type 150 is a thixotropic modification of type 100 to permit single coat application. Color black or green.

RESISTOR COATING – Type 200 is designed to withstand chemical attack. Its resistance to solvents is excellent while adhesion is extremely high. Color black or green.

RESISTOR COATING – Type 250 is a thixotropic modification of type 200 for single coat

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application. Color black or green.

PROPERTIES OF RESISTOR COATINGS

PHYSICAL PROPERTIES	Type 100 and 150	Type 200 and 250
Appearance	Liq Susp.	Liq. Susp.
Color	Black or green	Black or green
Viscosity, cps	200/1300	200/1300
Solids % by wt.	80%	80%
Sp.Gr.	1.21 blk, 1.12 grn	1.18 blk, 1.10 grn
Thinner	Xylene or toluol	Xylene or toluol
Flash Point (solvent)	90 °F	90 °F
Shelf Life	6 months	6 months
Chemical Resistance	Good	Excellent
Temperature Rating (10,000 hrs)	350 °C (cont.)	250 °C (cont.)
Temperature Cycling	-65 °C to + 250 °C	-65 °C to + 250 °C
Coverage/gal/mil/thickness	650 sq. ft.	650 sq. ft.
Bond Strength, peel lbs./in^2	125	225
Lap Shear Strength lbs/in^2	250	> 1000
ELECTRICAL PROPERTIES		
Dielectric Strength (volts/mil)	700	700
Dissipation Factor @ 1 mHz.	.002	.01
Dielectric Constant @ 1 mHz.	4.85	5.25
Volume Resistivity(ohm-cm)	> 10^{16}	> 10^{16}
CURE SCHEDULE		
Air Drying (also between coats)	20 min	20 min

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Bake at 65 °C	20 min	20 min
Cure	½ hr. at 125 °C	½ hr at 150 °C
Post Cure	½ hr at 225 °$^{+}$C	½ hr at 225 °C
Alternate Cure and Post Cure	---------	6 hrs at 135 °C

APPLICATION

Coatings can be applied by dip or roll dip. Type 100 and type 200 yield a coat thickness of about 2 mils on single application. Two or three coatings are recommended. Type 150 and 250 permit single coat application of about 7 mils, permitting greater economy and process simplification.

The coatings should be (1) air dried and baked at 65 °C for 20 minutes followed by (2) one half hour at 125 °C (or 150 °C), then (3) post cured for one-half hour at 220 °C. Alternated lower temperature cure may be used for Types 200 and 250.

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12.CONDUCTIVE VIA FILL CVF-6030

DESCRIPTION:

Conductive Via Fill CVF-6030 is a two-part filled epoxy system designed to provide electrical and thermal conductivity in PWB and PBGA applications. Applied via stencil, CVF-6030 is an effective, economical fill for vias. When planarized, CVF-6030 is receptive to plating and soldering. Because the via fill exhibits no shrinkage, electrical and thermal conductivity are retained during curing. Vias up to 0.75 mm diameter may be filled with excellent results. The long pot life of CVF-6030 enhances clean-up while its fast cure reduces processing time. Because CVF-6030 is a two-part system, material may be left at room temperature for extended periods, further enhancing processing.

APPLICATION:

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 $[In(H_2O)_6]^{3+}$ while tin forms a $[SnCl_6]^{2-}$ anion.

PROPERTIES:

System	Two-Part
Composition	Silver filled epoxy
Viscosity	110,000-140,000 cps
Thinner	CVF-6030 Thinner
Electrical Resistivity	nominal 3 x 10^{-4} ohm-cm
Shelf Life	>100 BTU / ft^2 / hr. / °F. / in.
Outgassing	< 0.01% / 100 hours @ 125 °C/hr.
Stencil Type	3-4 stainless steel
Aspect Ratio (depth:diameter)	6:1
Clean-up Solvent	*Iso*-propyl alcohol; acetone
Temperature Stability Range	-65 °C to + 175 °C
Storage	Room Temperature
Shelf Life	1 year @ 25 °C
Pot Life Mixing Ratio	48 hours @ 25 °C

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Mixing Ratio	4 drops (0.124 grams) Part B per 10 grams Part A
Cure Schedule	100 ^{o}C for 30 minutes *Or* 125 ^{o}C for 20 minutes *Or* 150 ^{o}C for 15 minutes

INSTRUCTIONS:

CVF-6030 may be applied via stencil to drilled, plated through holes and is then cured as instructed. The stencil heads of the cured via fill may be removed by planarazation to yield a smooth, uniform surface. It is then possible to electroplate prior to printing and etching or proceed directly to the print and etch process.

Special Thinner included

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13.RADIATION CURABLE MATERIALS(防辐射涂料)

TUV-100 Adhesive and TUV-200 Conformal Coating are solvent-free, single component liquids which cure to hard solids when exposed to ultraviolet (UV) radiation. TUV-100 is a high T_g adhesive with fast cure and excellent adhesion to a wide range of materials. Curable up to 20 mil thick, TUV-100 tolerates wave soldering without degradation. TUV-100 is ideal when a secondary heat cure is desired.

TUV-200 is a hard, transparent coating with excellent environmental properties, resistant to thermal and electrical shock as well as impact. TUV-200 is wave solderable and responds to UV light over a range of wavelengths.

PROPERTIES:

	TUV-100	**TUV-200**
Viscocity	14,800 cp @ 25°C	7,200 cp @ 25°C 550 cp @ 60°C
Tensile Strength (psi)	1620	3640
Elongation (%)	0.7	6
Tg (°C)	303	260
Durometer, Shore D	85	78
Water Immersion	No effect	60 min @ 25°C
Cure Thickness	To 20 mil	To 20 mil
Cure Time	< 1 to 20 seconds	< 1 to 30 seconds
Wavelength response (nm)	240-250, 320-335, 360-365, 405	240-250, 320-335, 360-365, 405
Secondary Heat Cure	30 min @ 110°C	----
Heat Stability	Wave Solderable Stable 1 hr @ 100°C	Wave Solderable Stable 1 hr @ 100°C
Performance	Hard, clear, hybrid cure	Thermal, electrical, impact reisistant

APPLICATION:

TUV-100 may be applied via syringe and cured in 1-20 seconds depending on lamp intensity. High viscosity allows for delay between application and cure. Secondary cure may be effected by heating at 110°C for 30 minutes.
TUV-200 may be applied by syringe or flood coating, particularly when warmed to 50-60°C. Cure requires 1-30 seconds depending on thickness and lamp intensity.

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Semiconductor Materials
Cleaning and Polishing(清洗剂和抛光剂)

1. Waxcut®----------P2

2. Waxstrip L2X----------P3

3. Transene-100 For Ultra Clean Surfaces----------P4
超清洁表面
4. Transene Ultrasonic Detergent (TUD) ----------P6
超声波去垢剂
5. Lab Glass Cleaner LGC-300----------P7
实验室玻璃制品清洁剂
6. Transene Glass Cleaner- 409----------P8
玻璃制品清洁剂
7. ESP - Electroless Silicon Polish----------P9
无电镀的硅抛光剂
8. Polimet – Alumina Type Polishing Lapping Preparations----------P11
氧化铝抛光研磨
9. Polmet - Alumina Type Polishing and Lapping Compounds----------P13
氧化铝抛光和研磨化合物
10. Sequestrox - Residue Removers for Low K Dielectric and Silicon Devices----------P15
低 K 电介质和硅器件残渣去除剂
11. Ultrapure Water----------P18
超纯水
12. Gold/Silver Cleaner----------P20
金/银去除剂
13. Tetramethylammonium hydroxide (TMAH) ----------P21
四甲基铵-氢氧化物



注:"-----2"页码标注从本页是第 1 页算起

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1. WAXCUT®

DESCRIPTION

Waxcut is an environmentally safe powder compound prepared primarily for the removal of mounting waxes in semiconductor processing. In addition to its ability to solvate waxes and oils, Waxcut can be used for removal of silicones, greases, soils, finishing compounds, and normal contaminants. Waxcut is compatible for use on iron, silicon, glass, aluminum zinc, brass, copper, and magnesium.

APPLICATION

1. Add 6 oz Waxcut (approximately 170 grams) to one gallon of water and allow to dissolve completely.
2. Bring solution to a temperature of 50 o C to 70 o C and immerse parts to be cleaned.
3. Rinse parts thoroughly.

NOTE: Ultrasonic agitation greatly enhances the cleaning process and reduces cleaning time.

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2. WAXSTRIP L2X

DESCRIPTION

Waxstrip L2X is an environmentally safe concentrate prepared primarily for the removal of mounting waxes in semiconductor processing. In addition to its ability to solvate waxes and oils, Waxstrip L2X can be used for removal of silicones, greases, soils, finishing compounds, and normal contaminants. Waxstrip L2X is compatible for use on iron, silicon, glass, aluminum zinc, brass, copper, and magnesium

APPLICATION

1. Combine Waxstrip L2X with deionized water in equal amounts.
2. Bring solution to a temperature of 50 o C to 70 o C and immerse parts to be cleaned.
3. Rinse parts thoroughly.

NOTE: Ultrasonic agitation greatly enhances the cleaning process and reduces cleaning time.

Available in 1 gallon, 5 gallon, or 55 gallon units

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3. Transene 100®(超清洁表面)
For Ultra Clean Surfaces

Removes foreign substances and contaminants from semiconductor surfaces.

FEATURES

- Stabilization of semiconductor devices through clean surfaces
- Overcomes soft reverse characteristics when due to surface contaminants
- Generates higher yield of p-n junction devices
- Useful for final cleaning process before thermal oxidation of silicon, diffusion and after p-n junction etches

TRANSENE 100

What is TRANSENE – 100

TRANSENE-100 is a novel chemical product designed for use in the semiconductor industry to improve quality, yields, and reliability of p-n junction devices. It is especially applicable to transistors, diodes, rectifiers, and integrated circuits. TRANSENE-100 serves to establish clean surfaces and ensure surface stabilization of semiconductor devices when it is properly used.

PROPERTIES OF TRANSENE 100

Boiling point range	75 ° to 101 °C
Specific Gravity	.75
Heavy Metals	< 0.35 ppm
Particulate matter	None (visually)
Acidity	Neutral
Flash Point	70 ° to 75 °F
Contact Hazard	Very slight irritant, not dangerous
MAC	400 parts per million
Fire Hazard	When exposed to flame
Ventilation control	Normal ventilation rate, use of hood preferred
Spontaneous combustion	No
Toxic hazard	Narcotic systemically

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How TRANSENE-100 Works

The primary function of Transene-100 is to remove foreign substances found on semiconductor surfaces. These substances may be loosely held on the surface, or they may be absorbed electrolytes or precipitated metals. Water, alcohol, acetone, and other solvents fail to remove them efficiently or else not at all. TRANSENE-100 is efficient in breaking van der Waals forces responsible for tenacious binding of some foreign substances. TRANSENE-100 is also capable of removing substances absorbed on semiconductor surfaces. In general, much surface contamination can be extracted by use of TRANSENE-100. This product, however, is not a chemical etch, and not intended as a substitute for chemical etching.

Why use TRANSENE-100

Surface cleanliness has a very special meaning in the manufacture of semiconductor products. The presence of foreign material at junction sites may lead to highly localized fields where current is drawn through by Zener tunneling, resulting in high reverse currents. The occurrence, even in minute trace quantities, of ions, electrolytes, or metal impurities on semiconductor surfaces causes poor device electrical characteristics such as hysteresis, flutter, and high leakage current. Mobile ions located anywhere on the active device surface will affect ultimate device reliability, particularly at high temperature operation. With TRANSENE-100 a relatively clean surface characterized by stable surface states is produced.

How TRANSENE-100 is used

AFTER ETCHING – Treatment with TRANSENE-100 is performed after chemical or electrolytic etching is carried out, but prior to the bake out, varnish coating, or final encapsulation and sealing of p-n junction devices.

The semiconductor devices, following the etching and rinsing operations, should be placed in a beaker with sufficient TRANSENE-100 covering them and then heated on a hot plate. Five minutes of gentle boiling generally suffice. The semiconductor devices are then removed. TRANSENE-100 is completely volatile and leaves no residue. In this respect, it is much purer than water or other solvents commonly used. The TRANSENE treated devices are now ready for final bakeout, coating, and sealing as may be customarily performed.

PRE-OXIDATION and DIFFUSION - TRANSENE-100 is especially recommended for the final cleaning treatment before thermal oxidation of silicon and diffusion processes to remove surface contaminants. These contaminants if not removed may lead to pinholes in the oxide passivation layer and faulty diffusions.

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4. TUD®(超声波去垢剂)
Transene Ultrasonic Detergent

A powerful detergent solution for ultrasonic cleaning electronic parts and semiconductor materials.

SPECIAL FEATURES

- All purpose cleaner
- High sequestering power
- Enhanced ultrasonic detergent action
- Good rinsability
- Economical: used as a liquid concentrate

TUD® - Transene Ultrasonic Detergent
DESCRIPTION

Transene Ultrasonic Detergent (TUD) is a general purpose cleaner used for silicon and other semiconductor materials soiled in slicing, lapping or polishing. It is also used to clean electronic parts. The detergent formulation is multiple acting with especially good solvent action. It exhibits high sequestering ability, very strong surface activity, suspension and emulsification properties. Surface contaminants normally resistant to conventional detergents are readily removed.

The detergent power is based on a balanced product formulation. Highly active surfactants reduce surface tension below 35 dynes/cm. An effective hydrophilic-hydrophobic balance is maintained. As a result of the detergent-water interface, which penetrates around soils and surface contaminants, ultrasonic action in cleaning is enhanced.

Phosphates and polyphosphates present as inorganic builders in optimized concentration add to the detergency and provide proper pH and buffer capacity.

Glycol ether solvents blend with water to extend solvent action to a variety of soils and contaminants. This lends the formulation its unique ability to remove wax, scums, greases and other hydrophobic soils.

Chelating agents are purposely added to complex heavy metal impurities. The product is not sensitive to hard water because of the water-softening agent.

Coupling materials or hydrotropes are also added to insure stability over a range of temperature conditions. Finally, a non-ionic water-soluble thickening agent is used to impart the desired viscosity.

APPLICATION

Transene Ultrasonic Detergent (TUD) is supplied as a liquid concentration to be diluted with water – 4 ounces of the concentrate is used to make one gallon of detergent solution. The solution is used hot or at room temperature, preferably ultrasonically, for rapid, efficient cleaning. Excessive sudsing will not be encountered. The detergent is readily rinsed off with demineralized water.

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5. Lab Glass Cleaner LGC-300(实验室玻璃制品清洁剂)

DESCRIPTION:

Transene LAB GLASS CLEANER LGC-300 is specifically formulated for maintenance of semiconductor clean room equipment and glassware. Safe to use on glass, aluminum, copper, stainless steel, silicon, teflon, rubber, and most plastics.

FEATURES:

- VLSI standards 0.2 micron filtration
- Low sodium: < 2.0 ppm
- Non-streaking
- 100% water soluble concentrate
- Soak or spray cleaner

PROPERTIES:

pH	9
Boiling Point	93 °C
Freezing Point	0 °C
Residue	None
Toxicity	Non-toxic/non-flammable

APPLICATION:

TRANSENE LAB GLASS CLEANER LGC-300 is supplied in concentrate form. One pint concentrate added to seven pints distilled water makes one gallon of cleaning solution. Most surfaces may be cleaned simply by application: spray or soak. For more difficult cleaning tasks or small, hard-to-reach areas of labware, an elevated temperature soak followed by a water rinse is recommended.

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6. TRANSENE GLASS CLEANER 409(玻璃制品清洁剂)

DESCRIPTION:

TRANSENE GLASS CLEANER 409 is specifically formulated for maintenance of semiconductor clean room equipment and glassware. Safe to use on glass, aluminum, copper, stainless steel, silicon, teflon, rubber, and most plastics. Transene Glass Cleaner 409 is an excellent general purpose cleaner for any laboratory environment. Glass Cleaner 409 contains a chelating agent to remove metal ionics.

FEATURES:

- Low VOC
- Low sodium: < 2.0 ppm
- Non-streaking
- 100% water soluble concentrate
- Soak or spray cleaner

PROPERTIES:

pH	9
Boiling Point	98 °C
Freezing Point	-5 °C
Residue	None
Toxicity	Non-toxic/non-flammable

APPLICATION:

TRANSENE GLASS CLEANER 409 is supplied ready to use. Most surfaces may be cleaned simply by application: spray or soak. For more difficult cleaning tasks or small, hard-to-reach areas of labware, an elevated temperature soak followed by a water rinse is recommended.

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7. ESP®(无电镀的硅抛光剂)
Electroless Silicon Polish

Chemical-Mechanical Polishing Process for Silicon

FEATURES

- Polishes silicon without use of abrasive
- High speed polishing rates obtainable
- Polished surfaces free of work damage, orange-peel effects, or pitting
- Surfaces are left clean, nearly crystallographically perfect
- Also polishes germanium and other semiconductor materials

ESP® ELECTROLESS SILICON POLISH
DESCRIPTION

ESP is an electroless, silicon-polishing process based on copper-polyfluoride chemistry. It offers a simple yet productive method for the preparation of highly polished silicon. The process is especially useful to obtain silicon substrates for diffusion work and for epitaxial deposition.

The polishing process is accomplished by placing silicon wafers in contact with a polishing wheel covered with a suitable polishing cloth. ESP solution is permitted to saturate the polishing cloth, while silicon atoms undergo chemical displacement by copper ions. The copper deposit is sequentially removed from the silicon surface by wiping action of the polishing wheel. Under optimized polishing conditions, removal of copper takes place as readily as copper deposition occurs. The polishing process is greatly enhanced by the special buffered composition of ESP, containing polyfluoride ions. The overall ionic reaction for the polishing process is
$Cu^{+2} + Si^{o} + 6F^{-} + 2(NH_4)^{+} + 2Cu^{o} + (NH_4)_2SiF_6$.

Polished silicon obtained by the ESP process is of excellent quality, very much superior to conventional chemical or mechanical polishing methods. ESP leaves the surface clean, flat and nearly crystallographically perfect. Furthermore, the polished surfaces are free of work damage, pitting or orange-peel effect. Resistivity rings are also absent as the process is not greatly affected by acceptor or donor impurities present in the silicon material.

PROPERTIES OF ESP

Appearance	Clear, blue solution
pH	5.25 ± .05
Critical Polishing Pressure	2 psi
Working Pressure	2.5 – 3 psi
Polishing Wheel Speed	75 rpm

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Polishing Wheel	Pellon pan W cloth or leather
Operating Temperature	25 °C
Polishing Rates	
@ 25 °C	2 mils/hr.
@ 40 °C.	4 mils/hr.
Shelf Life	4 months

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8. Polimet – Alumina Type(氧化铝抛光研磨) Polishing Lapping Preparations

Metallurgical lapping and polishing with aluminum oxide in a liquid polyol carrier base, special antistatic agent included.

UNIQUE ADVANTAGES

- Facilitates lapping and polishing procedure
- Provides non-drying liquid vehicle
- Accelerates abrasive action
- Eliminates static charge phenomenon
- Affords effective particle size distribution of lapping and polishing compounds for specific requirements and needs
- Scratch-free, polished surfaces

POLIMET Alumina Type
DESCRIPTION

POLIMET lapping and polishing preparations are suspensions of optical finishing grades of pure aluminum oxide powder in a polyol-water base, antistatic agent included. The particle size distribution for the dispersed medium is held extremely close. The polyol-water base, furthermore, is essentially non-drying and the presence of an antistatic agent prevents static charge accumulation during metallurgical polishing. In addition, the preferred and selected crystal structure of aluminum oxide assures rapid cutting, while the polyol-water base provides smooth polish, less damage, and scratch-free surfaces. Also available in paste form.

POLIMET, alumina type, is recommended for metallurgical polishing of metals, semiconductors, glass polymeric materials; etc. The use of POLIMET – A, B, and C produces a very high polish of exceptional quality. POLIMET – D, E, F, G and H are suitable for abrasive cutting and lapping.

POLIMET PREPARATIONS, ALUMINA TYPE

Alumina Type	Micron Size	Crystal Structure	Hardness, Mohs	Purpose
POLIMET –A	0.05	Cubic	8	Polishing
POLIMET –B	0.3	Hexagonal	9	"
POLIMET –C	1.0	"	9	"
POLIMET –D	5.0	"	9	Lapping
POLIMET –E	10.0	"	9	"
POLIMET –F	15.0	"	9	"

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POLIMET –G	20.0	"	9	"
POLIMET –H	25.0	"	9	"

INSTRUCTIONS

Conventional procedures for metallurgical polishing should be followed, through specific instructions can be provided for polishing various materials.

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9. Polmet Alumina Type(氧化铝抛光和研磨化合物) Polishing and Lapping Compounds

Electronic grades of alumina abrasive compounds specially processed to meet requirements for critical surface preparation in lapping and polishing processes.

FEATURES

- High purity alumina with hexagonal crystal structure
- Effective particle size distribution
- Rapid abrasive action
- Ultra high polish
- Meets ASTM requirements

IMPORTANT APPLICATIONS

For lapping and polishing – germanium, silicon, intermetallics, ceramics, ferrites, laser crystals, optical glass lenses, plastic contact lenses, windows, stainless steels, and metallographic specimens.

POLMET Alumina Type
DESCRIPTION

Polmet lapping and polishing products are white, pure, alumina compounds, occuring in the hexagonal crystalline state. These compounds possess a high degree of hardness (9 Mohs) and are further characterized by very uniform particle size distribution. Polmet polishing and lapping compounds are unmatched for critical lapping and polishing operations.

Grades of Polmet compounds are based upon particle size and are offered to meet exacting requirements in surface preparation.

GRADES	MICRON SIZE	**APPLICATION**
Polmet-alpha	.05	High-polish
Polmet-beta	.3	High-polish
Polmet-gamma	1	Polish
Polmet-delta	3	Very fine lapping
Polmet-epsilon	5 (2,500)	Fine lapping
Polmet-zeta	10 (1,250)	Lapping
Polmet-eta	12	Lapping
Polmet-iota	15	Coarse lapping

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Polmet-kappa	20(600)	Coarse lapping
Polmet-lambda	25 (500)	Coarse lapping
Polmet-mu	30 (400)	Coarse lapping

Corresponding mesh size in parenthesis.
Also available in slurry form. See Bulletin No: 116 - Polimet Alumina Preperations

APPLICATION

Polmet aluminas are used in water slurries, paste forms and in oil suspension for lapping and polishing processes. Standard cloths, plastics, and proprietary lapping and polishing plates are in common use.

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10. Sequestrox(低 K 电介质和硅器件残渣去除剂) Residue Removers for Low K Dielectric and Silicon Devices

Effective oxidizing and chelating systems used to remove ash residue from low k dielectric materials and to stabilize etched silicon p-n junction devices by removing etch contaminants.

SPECIAL FEATURES

- Lead to chemically clean surfaces
- No etching of substrate
- Low leakage junction characteristics
- Sharp avalanche breakdown
- Stable, high temperature electrical characteristics
- High product yield
- Non-hazardous
- Water-rinse

Sequestrox Ash Residue Removers for Low K Dielectrics
DESCRIPTION

Sequestrox has been reformulated to support the drive toward sub - 0.25 m technologies. Manufacturers require residue removers to clean vias, metal lines, and trenches of ash or metal etch residues. Residue results from the etch process and can interfere with device yield and performance.

Sequestrox systems employ proprietary chemistry to complex and chelate residue and contaminants. Sequestrox Types I - IV are sodium free, and all systems are readily rinsed with deionized water. No intermediate rinse is required. Sequestrox chemistry is mild and exhibits low etch rates on sensitive metals.

BENEFITS

- Low temperature processing
- Compatible with most low-k films
- Aqueous, non-hazardous
- Low oxide etch rates
- Sequestrox Types I, II, and III are compatible with Ag, Cu, and Ni.
- Sequestrox Type IV is compatible with Mo, W, Ag, Al, Cu, and steel.

APPLICATION

Sequestrox systems are compatible with HDPE, LDPE, PP, rubber, and teflon coated materials.

Sequestrox Type I, II, and III

Step 1. Pre-mix equal volume of Sequestrox - Type I and II solutions. Expose assemblies immediately to the mixture and clean ultrasonically for 1 to 2 minutes.

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Step 2. Add Sequestrox - Type III solution (10 ml to 100 ml mixture of Sequestrox - Type I and Type II as used above) and ultrasonically clean for additional one-half minute. Rinse in deionized water.

Sequestrox Type I & II for copper and nickel

Step 1. Pre-mix equal volumes of Sequestrox - Type I and II solutions. Immediately expose the assemblies to the mixture and clean ultrasonically for 1 to 2 minutes.

Step 2. Rinse in deionized water. Then complete cleaning in acetone ultrasonically or preferably in Transene 100.

Sequestrox Type IV for tungsten and molybdenum

Step 1. Silicon assemblies are exposed to Sequestrox solution Type IV ultrasonically at room temperature for 3 minutes.

Step 2. Rinse in deionized water, then in acetone ultrasonically or Transene 100.

Sequestrox Etching Adjuncts for Silicon Devices
DESCRIPTION

Sequestrox systems are specially formulated electrolyte compositions which are used in conjuction with etch processes in the manufacture of silicon p-n junction devices to improve quality and yield. The standard etch process (nitric-HF-acetic) performs the requisite removal of damaged silicon, though invariably the etching leaves residual surface contaminants. These impurities originate from etch solutions and from various exposed metal parts of the silicon device. The complete removal of these contaminants must be practiced to avoid device failure. This can be accomplished with Sequestrox systems as etching adjuncts.

Sequestrox systems involve the use of agents which effectively oxidize, complex and chelate the surface contaminants occurring on silicon. Sequestrox systems are sodium free and readily removed by rinsing in deionized water. Several systems are offered with selectivity based upon the type of metal parts comprising the silicon device assembly.

SEQUESTROX - Type I, II, and III
Recommended in the etch process for semiconductor assemblies with silver and copper parts, lead-tin or other solders and nickel plated silicon.

SEQUESTROX - Type IV
Recommended in the etch process for semiconductor assemblies with molybdenum and tungsten contacts, silver, aluminum, copper and steel parts.

APPLICATION

In general, the application of Sequestrox systems follows the conventional acid etch performed to remove the mechanically damaged silicon of p-n junction devices. The appropriate Sequestrox system must be selected and used. Typical procedures for using Sequestrox as an etching adjunct follow:

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SEQUESTROX - Type I, II, and III
(Silicon rectifier assemblies with silver leads)

Step 1. Etch assemblies in nitric-HF-acetic acid mixture to remove edge damage. Rinse in deionized water.

Step 2. Pre-mix equal volume of Sequestrox - Type I and II solutions. Expose assemblies immediately to the mixture and clean ultrasonically for 1 to 2 minutes.

Step 3. Add Sequestrox - Type III solution (10 ml to 100 ml mixture of Sequestrox - Type I and Type II as used above) and ultrasonically clean for additional one-half minute. Rinse in deionized water.

Step 4. Complete cleaning process with acetone ultrasonically or preferably with Transene-100.

SEQUESTROX - Type I and II
(Silicon rectifiers, copper stud mounted)

Step 1. Silicon dice pre-etched in nitric-HF-acetic before mounting.

Step 2. Pre-mix equal volumes of Sequestrox - Type I and II solutions. Immediately expose the assemblies to the mixture and clean ultrasonically for 1 to 2 minutes.

Step 3. Rinse in deionized water. Then complete cleaning in acetone ultrasonically or preferably in Transene 100.

SEQUESTROX - Type IV
(Silicon rectifiers with molybdenum contacts)

Step 1. Silicon is pre-etched and mounted, or silicon with the contacts is spin-etched to remove damaged silicon of p-n junctions.

Step 2. Silicon assemblies are exposed to Sequestrox solution Type IV ultrasonically at room temperature for 3 minutes.

Step 3. Rinse in deionized water, then in acetone ultrasonically or Transene 100.

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11. SEMICONDUCTOR GRADE DEIONIZED H_2O (Ultra Pure) (半导体除去离子超纯水)

DESCRIPTION

Transene's Ultra Pure - Semiconductor grade deionized water has been pretreated by a combination of reverse osmosis (RO) and electrodeionization. The water is further purified through carbon cartridges removing dissolved organic contaminants and residual chlorine and a deionizer cartridge removing dissolved inorganic contaminants. A final filter unit removes any microorganisms larger than 0.22 microns.

PROPERTIES:

Resistivity:	18MO.cm
0.2 Micron Filtered	-----

APPLICATION

The high quality water produced is suitable for critical applications in the electronics industry.

Resistivity: 18MO.cm 0.1 Micron Filtered

Transene's Ultra Pure - Semiconductor grade deionized water has been pretreated by a combination of reverse osmosis (RO) and electrodeionization. The water is further purified through carbon cartridges removing dissolved organic contaminants and residual chlorine and a deionizer cartridge removing dissolved inorganic contaminants. A final filter unit removes any microorganisms larger than 0.22 microns.

The high quality water produced is suitable for critical applications in the electronics industry.

TYPICAL TRACE METALS ANALYSIS (ppm)

ANALYSIS		ANALYSIS	
Li	< 0.0001	Cu	0.004
Be	< 0.0005	Zn	0.056
B	0.016	Ga	0.002
Na	0.005	Ge	< 0.001
Mg	0.014	As	0.005
Al	0.026	Sr	< 0.002
K	<0.003	Mo	0.007

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Ca	0.003	Ag	0.003
Ti	0.041	Cd	< 0.0005
V	< 0.0005	Sn	0.012
Cr	0.005	Sb	0.004
Mn	0.004	Ba	0.002
Co	0.003	Au	< 0.005
Ni	0.008	Pb	0.014
Fe	0.002		

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12. GOLD/SILVER CLEANER(金/银去除剂)

DESCRIPTION:

Removes oxides and tarnish from gold, silver, and precious metal alloy surfaces without leaving a residue. Gold/Silver Cleaner is recommended for cleaning metal films immediately prior to further processing.

FEATURES:

- Rapid, economical cleaning
- Enhances fluxing, soldering, etching, plating, and coating
- No adverse electrical effects
- Mild pH
- Compatible with most metals
- Non-aggressive formulation
- Cyanide-free

PROPERTIES:

Tank	Pyrex glass, fiberglass, polypropylene, etc
Temperature	20-50 °C
Immersion Time	30-60 seconds or as needed
Rinse Use with agitation	Water

APPLICATION:

Substrates should be degreased first, if necessary

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13. TETRAMETHYLAMMONIUM HYDROXIDE – TMAH (四甲基铵-氢氧化物)

DESCRIPTION:

Transene tetramethylammonium hydroxide (TMAH) is available as 25%, 10%, and 5% standard aqueous solutions. TMAH is an effective etchant and chelating agent ideal for removing residue and contaminants from semiconductor and electronic components.

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Diffusants (扩散剂)

Solid Diffusants
N & P Diffusol

Solid Diffusants
For Semiconductor Technology

Semiconductor grade phosphorus, arsenic, antimony and boron diffusants for semiconductor devices. Packaged in convenient unit quantities for diffusion work.

DONOR TYPE

Phosphorus Pentoxide (P_2O_5) granular
Arsenic Trioxide (As_2O_3)

ACCEPTOR TYPES

Boric Anhydride (Boron Trioxide B_2O_3) granular
Boric Acid (H_3BO_3) powder

SOLID DIFFUSANTS for Semiconductor Technology
DESCRIPTION

Transene diffusants are hyper-pure semiconductor grade chemicals, dispensed in convenient unit quantities for solid state diffusion processes. Transene diffusants are moisture free with purity far exceeding A.C.S. specifications for chemically pure reagent grade materials. Types offered include boric acid, boric anhydride (acceptor types) and phosphorus pentoxide (donor type) packaged in dry nitrogen.

Transene diffusants function as primary materials for the introduction of impurity atoms by diffusion processes in group IV elemental semiconductors. The uniform particle size of Transene diffusants insures a controllable concentration of diffusant in the carrier gas flowing through the diffusion apparatus. The solid state diffusion processes depend upon chemical reaction of silicon (or germanium) with the vapors of boron and phosphorus compounds occurring at high temperatures. A film formed on the semiconductor surface becomes an infinite diffusion source for boron or phosphorus. Controls for these diffusion processes are easily regulated to obtain p-n junctions and ohmic contacts.

Transene diffusants are used in the manufacture of planar transistors, field-effect devices, diodes, rectifiers, and other silicon and germanium devices. The use of Transene high purity diffusants will assure high reliability and excellent quality of semiconductor devices made by diffusion technology.

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Physical Properties of Transene Diffusants (99.9% Minimum Purity)

Properties	**Boric Acid**	**Boric Anhydride**	**Phosphorus Pentoxide**
Mol. Formula	H_3BO_3	B_2O_3	P_2O_5
M.P.	61.84	64.69	141.96
Heat of Vap. (Kcal./Mole)	--	--	22.7 (P_2O_5)
Ratio Tetrahedral Radii B/Si or P/Si	0.75	0.75	0.93
Impurity Level (In germanium) (In silicon)	 0.0104 0.045	 0.0104 0.045	 0.0120 0.050
Activation Energy (Kcal./Mole) (In germanium) (In silicon)	 105 85	 105 85	 57 85
Preexpon. Diff. Coef.,D_o(cm^2/Sec) In germanium In silicon	 1.6×10^9 10.5	 1.6×10^9 10.5	 2.5 10.5
Diffusion Constant (cm^2/sec) In silicon In germanium	 8.7×10^{-15}@ 950 °C 6.4×10^{-12}@ 1275 °C $.4 \times 10^{-12}$@ 850 °C	 7.7×10^{-15}@ 950 °C 5.0×10^{-12}@ 1235 °C $8 \times 10^{=11}$@ 900 °C	
Surface Conc. (atoms/cm^3) In silicon	 8×10^{21} @ 950 °C 1×10^{21} @ 1275 °C	 2.5×10^{21} @ 950 °C 6×10^{20} @ 1235 °C	

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N and P-Diffusol
For Semiconductor Technology

For Solid State Silicon Devices, Transistors, Rectifiers, Diodes

N-DIFFUSOL®

A new n-type diffusant preparation for making n+ contacts and p-n junctions in silicon.

P-DIFFUSOL®
A p-type diffusant preparation for making p-n junctions and p+ contacts.

SPECIAL FEATURES

- Uniform diffusion, spiking eliminated
- Preserves silicon lifetime characteristics
- Yields high surface concentration [N s]
- Produces low resistance ohmic contacts
- Permits simultaneous p and n diffusions
- Simplifies diffusion technology
- Ready to use - allows stacking of wafers during diffusion - at air ambient -lowest cost.

N- and P-DIFFUSOL®
DESCRIPTION

N-DIFFUSOL is a stabilized liquid preparation containing an n-type diffusant with a diffusion coefficient similar to that of elemental phosphorus. Diffusion occurs at elevated temperature up to 1300 °C in air. The diffusion is extremely uniform. An adjunct component serves to neutralize trapping centers in the silicon crystal lattice during the diffusion process. Degradation of lifetime characteristics of silicon is thus avoided.

P-DIFFUSOL is a stable liquid preparation containing a p-type diffusant with a diffusion coefficient, which approximates that of N-DIFFUSOL. Uniform diffusion occurs in air up to 1300 °C.

Diffusion Constants (cm^2/sec) for N- and P-DIFFUSOL

1000 °C	3.0×10^{-14}
1100 °C	3.5×10^{-13}
1200 °C	3.0×10^{-12}
1300 °C	1.5×10^{-11}

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INSTRUCTIONS

APPLICATION

N-Diffusol should be mixed well before using. If necessary, use a glass rod to disperse sediment which may form.

Diffusol preparations are applied by paint-on technique using camel's hair brush with coverage within 1.6 mm of the edge of the wafer. Allow to dry. N-Diffusol dries more slowly, and use of a heat lamp is desirable. Wafers should be stacked horizontally in a quartz boat, n-painted sides against each other. Likewise, p-painted sides are stacked against each other. Simultaneous n- and p-diffusion may be performed using N-Diffusol and P-Diffusol on opposite sides of stacked wafers.

When applicable, Diffusol preparations may be applied by dipping.

It is important that the silicon used for diffusion be pre-cleaned. Soak in HF prior to application of N- or P-Diffusol is recommended.

N- and P- Diffusol preparations may be diluted when lower surface concentration of diffusants is desired. Methyl alcohol may be used to dilute P-Diffusol, and ethylene glycol monoethyl ether may be used to dilute N-Diffusol.

DIFFUSION

Diffusion temperature is a matter of choice. An effective operating temperature is 1275-1300 °C with time determined by device requirements. An open, alundum furnace tube with ends blocked off with quartz wool is recommended for the high temperature diffusion process.

Diffusion constants provided in the data sheet for N- and P-Diffusol may be used to calculate junction depth for exact conditions used in diffusion. N- and P-Diffusol applied to silicon serves an infinite diffusant source.

After diffusion, the stacked wafers are separated by a prolonged soak in hydrofluoric acid (HF) for at least 24 hours.

REMOVAL OF EXCESS DIFFUSOL

After completion of diffusion, excess Diffusol preparations are removed from the silicon surfaces by prolonged soaking in HF. The removal of excess Diffusol when deep diffusions are used may also be accomplished by light lapping, preferably with the use of an S.S. White abrasive unit employing dolomite (CaCO3) as the abrasive material. The latter process removes material on the surface without removal of silicon itself.

Another useful technique is based on heating the separated, diffused wafers in an oxygen atmosphere at about 500 °C. The diffusant material on the silicon surface then becomes more readily soluble in HF.

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Heat Sinks and Vacuum Oil (吸热设备和真空油)

Vacuum Oil
XTherm Heat Sink
XTherm AG Electrically Conductive Heat Sink
Tech Wax Mounting Wax

Vacoil®
Ultrahigh Vacuum Diffusion Pump Fluid

Produces exceptionally high vacuum of 10^{-10} torr (mm. Hg) without use of liquid nitrogen - in conventional vacuum systems.

VACOIL-S
General purpose high vacuum applications.

UNIQUE ADVANTAGES

- Eliminates need for liquid nitrogen refrigeration.
- Produces ultrahigh vacuum
- Chemically stable - oxidation resistant
- Unaffected by exposure to air
- Rapid pump down - speed up vacuum operations
- Reduce backstreaming - avoid system contamination
- Very low fluid consumption - economical
- Trouble-free operation of vacuum systems

VACOIL® Ultrahigh Vacuum Diffusion Pump Fluid
DESCRIPTION

VACOIL-S is a novel carbon-siloxane compound designed to perform as an ideal diffusion pump fluid in vacuum systems. Its chemical constitution and atomic structure result in very low vapor pressure characteristics, as well as in oxidation-resistant properties. When used as the diffusion pump fluid, VACOIL-S will produce ultrahigh vacuum without need for auxiliary cooling with liquid nitrogen. Conventional water-cooled devices suffice. The product resists oxidation; fouling and formation of tars and carbon do not occur. The inherent heat stability of VACOIL-S allows systems to be opened and exposed to air without decomposition. It is unnecessary to cool diffusion pumps before releasing the vacuum.

PROPERTIES OF VACOIL

Liquid	Clear Water-white liquid
Freezing Point	¯16 °C
Boiling Point (0.2 torr)	225 °C
Vapor Pressure (torr @ 20 °C)	1×10^{-10}

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Heat of Vaporization	(225 °C) 30 Kcal. / mole 22 Kcal. / mole
Back Streaming a. with trapping b. without trapping	Nil (gm/cm2/min) 10-6 gm 10-6 gm

APPLICATIONS

VACOIL products are recommended as replacements for conventional diffusion pump fluids to obtain more efficient, economical, and trouble-free operation of vacuum systems. Exceptionally high vacuums of l0 $^{-10}$ torr are obtainable. Typical vacuum systems in which VACOIL is applicable include: vacuum evaporators and metallizers; vacuum tube exhaust stations; space simulation chambers; vacuum sputtering; vacuum furnaces; electron beam equipment; thin film microcircuits; optical coatings and specialized instrumentation. The operation and care of these vacuum systems are very much simplified with VACOIL as the diffusion pump fluid. The use of liquid nitrogen is eliminated and the inadvertent exposure to air will not alter the diffusion fluid.

VACOIL products are especially recommended, because of rapid pump down, for vacuum systems which must be opened frequently. VACOIL is particularly useful also in microelectronics vacuum work and thin film device work to eliminate contamination which often results from diffusion oil vapor.

INSTRUCTIONS

VACOIL is used with standard heater input. No change in equipment is needed. The operating temperature is 225 °C to 250 °C. Baffle cooling is obtained in the conventional manner with flowing water; liquid nitrogen need not be used.

XTherm® / XTHERM AG
Heat Sink for Electronic Applications

Thermally conductive heat sink grease applied to the base and mounting stud of transistors, diodes and rectifiers - as a coupling agent - to reduce thermal contact resistance.

Contains alumina in laminar crystallographic orientation, dispersed in a special silcone base material.

FEATURES

- Excellent heat flow properties-insures proper dissipation of heat.
- High quality dielectric properties - bulk resistivity 10 ohm-cm and dielectric strength 400 volts per mil.
- Wide temperature range of operation - -60 °C to 200 °C.
- Will not dry, harden or bleed.

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DESCRIPTION:

XTHERM is a thermally conductive material specially produced to serve as an efficient coupling agent and to reduce thermal contact resistances. Ideal for sputter target applications. XTHERM contains alumina, grown in a laminar form and dispersed in a high temperature, silicone based material. Available as XTherm AG for thermal and electrical conductivity. The special type of alumina used and the silicone material selected enhance the thermal conductance properties of this product, as well as provide high insulation resistance and good dielectric strength.

XTHERM has the consistency of a paste, easily applied between semiconductor power devices and heat sinks, power resistors and chassis mount, thermostats and mounting surfaces. It is likewise applicable to thermoelectric devices and radiators. Properly used, it forms a conductive path between the heat generating circuit element and the heat sink mount. XTHERM thus serves as a heat sink compound in electronic applications where the efficient transfer and removal of heat are necessary. The heat removed is often ten times better with XTHERM than with dry plate mountings.

XTHERM AG is a silver filled, electrically conductive heat sink paste for applications requiring both thermal and electrical conductivity. A high loading of proprietary silver flake provides excellent electrical conductivity properties.

XTHERM and XTHERM AG are ideal for mounting sputter targets where thermal or thermal plus electrical conductivity are needed. XTHERM will not outgas in the sputter chamber and is easily wiped off the back of the target after use.

PHYSICAL PROPERTIES:

Color	Light Gray
Consistency	Paste
Specific Gravity	2.3
Viscosity	1.4×10^6 cps.
Volume Resistivity	10^{16} ohm-cm
Dielectric Strength	400 volts/mil
Operating Temp. Range	-60 ° to + 200 °C
Thermal Conductivity	1.75×10^{-3} gram cal./cm^2/sec./°C/cm
Bleed Characteristics	None (under normal usage)

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Tech - Wax®

Superior general purpose wax with high adhesive strength. Thermally stable and chemically resistant - for laboratory and production applications. Semiconductor materials easily mounted for cutting, slicing, dicing or etching.

PROPERTIES:

- Strong polar bonding for adhesive strength
- Easily applied and removed
- Readily soluble in trichloroethylene
- Will not polymerize from excessive strong acid etching.
- Economical to use
- Adaptable to a variety of applications
- Melts at 90 °C.

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Junction Coatings(结合涂料)

1. SES-Low Viscosity Silicone Elastomer for Semiconductors----------P2
   用于半导体的低粘性硅树脂橡胶
2. SES Black-Modified Silicone Elastomer For Light Absorption----------P4
   改良的光吸收硅树脂橡胶
3. SSE-Self-Catalyzed Silicone Elastomer----------P6
   自催化硅树脂橡胶
4. Translastic S-2007-Silicone Junction Coating For Rectifiers----------P8
   整流器硅树脂结合涂料
5. MBS-Moisture Barrier Silicone----------P10
   防潮硅树脂
6. Junction Coating Type I----------P12
   Silicone Elastomer Systems for Protection and Passivation of Semiconductor Junctions
   用于半导体结合的保护和钝化硅树脂橡胶



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1. SES(用于半导体的低粘性硅树脂橡胶)
Low Viscosity
Silicone Elastomer for Semiconductors

Protective coating designed to stabilize semiconductor junctions and surfaces for use in device technology of diodes, rectifiers, transistors and integrated circuits – also for thin film and hybrid microelectronics circuits.

FEATURES

- Permits –60 °C. to 250 °C. continuous operation
- High voltage capability 1000 volts
- Electrical stabilization-minimize leakage current and control surface effects
- Good high frequency characteristics
- Mechanical stabilization against shock, vibration, acceleration
- Protection against weld flash and contamination
- Compatible with epoxy encapsulation
- Simple and economical to use

SES® Silicone Elastomer for Semiconductors
DESCRIPTION OF SES

SES is a thick, white liquid processed from a highly purified special siloxane derivative, which is partially condensed and polymerized. It is ready to use with addition of a trace of catalyst to produce the solid silicone elastomer with excellent electrical and physical properties. Its chemical formula shows covalent bonding of all elements without free dangling valence bonds and in general a non-polar molecular structure.

CHEMICAL STRUCTURE OF SES

SES adheres or bonds to silicon, germanium, glass, and metals. It provides a lasting, neutral, protective coating for semiconductor junctions and surfaces. The uncured SES has a storage life in excess of 5 months. Typical viscosity is 10,000 cps for the uncatalyzed products; customized viscosities ranging from 7,500 to 14,000 cps are also available.

PROPERTIES OF CURED SES

Color	White
Flexibility	-60 °C. to 250 °C.
Heat Resistance	Up to 300 °C.
Specific Gravity	1.2
Resistivity	1 x 10^{15} ohm-cm.

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Dielectric Constant	3.5 (1mc.)
Dielectric Strength	850 volts/mil
Dissipation Factor	5×10^{-3} (1 mc.)
Thermal Conductivity	0.2 btu/ft/hr/ft^2/°F
Durometer Shore A	45
Coefficient of Thermal Expansion	14.1×10^{-5} in/in °F (0-350°F)

APPLICATION OF SES

SES is simple to use and requires an air drying oven (200 °C.) for equipment. SES should first be thoroughly mixed with catalyst provided (0.25%) or less; this mixture has a useful potlife of about 5 hours. Application is made by transfer or dipping, with the coated semiconductor devices gradually heated or the temperature raised in steps to 200 °C. Vacuum heat treatment may also be used. The coated devices can be stored in the oven until packaged. Uncured material can be removed with xylene as a solvent; cured material requires commercial strippers.

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2. SES – Black(改良的光吸收硅树脂橡胶)
Modified Silicone Elastomer
For Light Absorption

SES-BLACK is a high purity siloxane formulated with special inert fillers to impart light absorption and eliminate light transmission. SES-BLACK is designed as a protective coating for light sensitive semiconductor devices; other applications requiring light shielding of component arrays and digital displays are appropriate.

Catalyst SES-BLACK will cure at room temperature to a solid silicone elastomer with excellent electrical and physical properties. Elevated temperature curing will optimize electrical properties. The following products are offered:

SES-BLACK 75	VISCOSITY 7,500 CPS
SES-BLACK 150	VISCOSITY 15,000 CPS
SES BLACK 350	VISCOSITY 35,000 CPS
SES BLACK 700	VISCOSITY 70,000 CPS

Please be sure to specify viscosity of each product when ordering. Customized viscosity available.

Physical Properties	
System	Two-part
Color	Black
Solids	100%
Durometer (Shore A)	40
Catalyst (by weight)	0.1 to 0.45%
Pot Life (0.3% catalyst)	4 hours
Flexibility	-60 °C to 250 °C
Heat Resistance	Up to 300 °C
Specific Gravity	1.3
Thermal Conductivity	0.2 btu/ft/hr/ft^2/°F
ELECTRICAL PROPERTIES	

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Resistivity	1 x 10^{15} ohm-cm
Dielectric Constant	3.5 (1mc)
Dielectric Strength	500 volts/mil
Dissipation Factor	5 x 10^{-3} (1 mc)

INSTRUCTIONS:

1. Add catalyst 0.3% and mix well: SES – BLACK CATALYST
   25 gms. 3 drops
   100gms 12drops
2. Deaerate (necessary for molding thick sections).
3. Cure: 24 hrs. @ 25 °C, or 3 hrs. @ 90 °C, or 1 hr. @ 125 °C
4. Post-cure recommended for optimum electrical properties: 1 hr @ 200 °C.

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3. SSE®(自催化硅树脂橡胶)
Self-Catalyzed Silicone Elastomer

Protective coating designed to stabilize semiconductor junctions and surfaces. For use in device technology of diodes, rectifiers, transistors and integrated circuits. Ideal also for potting sensitive electronic components.

UNIQUE ADVANTAGES

- Simple and economical to use – no catalyst needed
- Customized viscosities available
- Permits –65 °C. to 275 °C operation
- High voltage capability
- Electrical stabilization – minimizes leakage current and controls surface effects
- Good high frequency characteristics
- Mechanical stabilization against shock, vibration, acceleration
- Protection against weld flash and contamination
- Compatible with epoxy encapsulation

SSE – Self Catalyzed Silicone Elastomer
DESCRIPTION

SSE is a high viscosity silicone elastomer prepared from purified siloxane derivatives by novel condensation reactions. The chemical purity is monitored to maintain sodium (Na), potassium (K) and mobile ions at lower levels. The product is available in a pre-polymerized state, ready for application. It cures very quickly simply be heating without the addition of catalyst, due to the unique, self-catalyzing properties of SSE. The cured product is a white, resilient, dielectric material that is highly protective, heat stable, and waterproof. In addition, SSE serves as an excellent coating to obtain rapid dissipation of heat. The shelf life of SSE is approximately 6 months stored at 40 °F or below. Typical viscosity of uncured SSE is 250,000 cps. Customized viscosities are available from 100,000 to 400,000 cps.

PROPERTIES:

Viscosity	250,000 cps
Flexibility	To –75 °C.
Heat Resistance	Up to 300 °C.
Specific Gravity	1.3
Bulk Resistivity	5 x 10^{14} ohm-cm
Dielectric Constant	3.5 (1mc.)
Dielectric Factor	1.5 x 10^{-3}(1 mc.)

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Dielectric Strength	550 volts/mil
Thermal Conductivity	5.5 x 10^{-4}cal/cm/sec/cm^2/°C
Durometer Shore A	45
Shelf Life @ 40 °F or lower	6 months

APPLICATION:

FOR SEMICONDUCTOR USE - Application is easily made by means of transfer dipping. An air oven is used to cure SSE after it is applied to the semiconductor devices. The recommended curing temperature is 200 °C. for 4 hours, preceded by 1 hour at approximately 75 °C. Longer curing periods are beneficial and desirable. To stop the flow or drip after applying SSE the coated devices should be set immediately upon a hot plate (100 °C.) At this temperature SSE starts to set quickly, and the flow virtually ceases.

FOR POTTING ELECTRONIC COMPONENTS – Many sensitive electronic components and circuit modules are usually potted with SSE either by transfer, dipping, or by vacuum impregnation. The latter method for encapsulating is desirable for irregular shaped bodies to insure elimination of trapped air. The best procedure for vacuum impregnation requires that the electronic parts and SSE be placed in a vacuum chamber and evacuated. The electronic parts can then be lowered and completely immersed in SSE while still under vacuum. The vacuum is finally broken and the parts are removed and allowed to drain. The SSE coated parts are cured in an air oven at 200 °C for at least 4 hours. The curing may also be performed at a lower temperature (160 °C.) but for a longer period of time.

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4. Translastic ® S-2007(整流器硅树脂结合涂料)
Silicone Junction Coating For Rectifiers

Dielectric coating or encapsulating material for electrical components, electronic units and semiconductor rectifiers.

FEATURES

- Uniform and heat-stable
- Waterproof
- Resistant to oxidation and weathering
- Rapid heat dissipation
- Easy to apply
- Superior flow characteristics
- Fast cure
- No preliminary vulcanization

TRANSLASTIC ® S-2007
DESCRIPTION

Translastic S-2007 is an excellent dielectric coating or encapsulating material for electrical components, electronic units and semiconductor rectifiers.

Translastic S-2007 cures to form a resilient jacket which is uniform, heat-stable, waterproof and highly resistant to oxidation, ozone and weathering. Its high thermal conductivity permits rapid dissipation of heat. The excellent dielectric properties and resistance to moisture assure reliable operation under the most adverse humidity conditions.

Supplied as a solvent free, low consistency, silicone rubber composition, Translastic S-2007 is suitable for dipping or vacuum impregnation. It is virtually as easy to apply to intricately shaped parts as to simple shapes. Its flow characteristics enable it to uniformly cover all contours. It is fast curing and does not require preliminary vulcanization.

PROPERTIES OF TRANSLASTIC S-2007

Uncured	
Color	White
Specific Gravity	1.3
Viscosity (cps.nominal)	200,000
Cure Temperature	150 °C (minimum)
Shelf Life @ 25 °C	3 months
@ 10 °C	6 months

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Cured	
Durometer (Shore A)	45
Tensile Strength psi	450
Elongation %	150
Dielectric Strength, volts per mil	500
Dielectric Constant at 10^2 cycles	3.52
Dielectric Constant at 10^6 cycles	3.48
Power Factor at 10^2 cycles	0.0035
Power Factor at 10^6 cycles	0.0015
Volume Resistivity, ohm cm	17.2×10^{13}
After 7 days at 100% rel. humidity	$8.6\ 10^{13}$
Surface Resistivity, ohms	2.82×10^{13}
After 7 days at 100% rel. humidity	0.5×10^{13}
Viscosity can be modified to suit custom applications	

APPLICATION

Translastic S-2007 may be applied under pressure through a hypodermic needle. However, the geometry and size of the component part may determine the most suitable technique for the application of the material, such as transfer, dipping or by vacuum impregnating.

The temperature and time for curing the material can be varied. Curing is done in an air oven. It is preferable to cure at a lower temperature first, about 90 °C for ½ hour, followed by a higher temperature cure, up to 200 °C or higher. The final temperature for the cure should be 200 °C for at least 4 hours.

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5. MBS®(防潮硅树脂)
Moisture Barrier Silicone

Single component, silicone elastomer coating designed to stabilize semiconductor junctions and surfaces and for the environmental protection of electronic components – used for diodes, transistors, integrated circuits, thick film and thin film microelectronic circuits modules.

FEATURES:

- Single component self-catalyzed system- simple and economical to use
- Unaffected by humidity
- Excellent electrical characteristics
- Wide operating temperature range - -65 °C to 275 °C (continuous)
- Useful as protective coating, encapsulant or potting

MBS Moisture Barrier Silicone Description

MBS, Moisture Barrier Silicone, is a medium viscosity translastic product specially processed from highly purified siloxane compounds. This product is particularly formulated to provide greater protection against humidity in electronic applications. MBS possesses self-catalyzing properties and cures as a single component system to form a tough protective coating impervious to moisture. Significantly, the additions of curing agents, catalysts or accelerators are not needed to effect the silicone polymerization. Furthermore, the coating shows good mechanical and electrical characteristics over a wide range of ambient conditions.

MBS is supplied at a viscosity of 45,000 cps ± 10%. Specific viscosities of 20,000 to 100,000 are available upon request.

Properties of MBS

Cured	
Appearance	White, opaque
Viscosity @ 25 °C	45,000 cps nominal
Density @ 25 °C	1.25
Cure	15 minutes @ 125 °C (minimum)
Post Cure	4 hrs. @ 150 °C (minimum)
Shelf Life (under refrigeration) +5 °C (40 °F) -10 °C (15 °F)	 3 months 6 months

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Uncured	
Physical Appearance	White, Flexible
Density	1.3
Durometer, (Shore A)	35-40
Tensile Strength (psi)	250
Elongation (%)	150
Operation Temp. Range °C	75° to + 300° (275° cont)
Dielectric Constant (mc)	3.5
Dielectric Strength (volts/mil)	500
Dissipation Factor (mc)	.001
Thermal Conductivity (cal/cm/sec/cm^2/°C)	6 x 10^{-4}
Volume Resistivity (ohm-cm @ 25 °C)	> 10^{14}
Water Absorption	Nil
Bulk Resistivity (10 days @ 100% rel. humidity)	10^{14}

APPLICATION:

MBS is recommended as a protective, moisture barrier coating for semiconductor devices and as an encapsulant for sensitive microelectronic circuits and other electronic components. MBS is applied by any convenient method and cured at 125 °C for 15 minutes followed by 4-hour cure at 150 °C. The post cure can be accelerated by heating at 250 °C for two hours or longer.

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6. Semiconductor Junction Coating

Silicone Elastomer Systems for Protection and Passivation of Semiconductor Junctions

(用于半导体结合的保护和钝化硅树脂橡胶)

Translastic Semiconductor Junction Coatings, Types 3811 and 3812, are high purity, 100% solids, siloxane systems designed for passivation coating transistor, diode and rectifier junctions. Demanding production procedures and rigid quality control requirements guarantee ionic purity levels of 1 ppm (maximum). Typical applications include conformal coatings to provide mechanical and electrical insulation prior to plastic molding; protective coatings over hybrid integrated circuits to prevent chip damage during potting; and other ultra-pure, hermetic-type passivations.

Type 3811 and 3812 Junction Coatings will prevent electrical breakdown, minimize junction surface leakage, stabilize peak inverse voltage, and provide environmental protection for high temperature performance and thermal cycling.

PROPERTIES	TYPE 3811	TYPE 3812
System	One-Part	Two-part
Solids	100%	100%
Appearance	Clear	Clear
Viscosity	7,500 cps	5,000 cps
Shelf Life	3 months	12 months
Storage Temperature	40 °F or below	Room Temperature
Specific Gravity	1.03	1.03
Mix Ratio	------	10 to 1
Pot Life	------	> 48 hours
Durometer (shore A)	30	30
Tensile Strength (psi)	400	350
Elongation (%)	130	140
Dielectric Strength	> 450	> 450
Dielectric Constant @ 10^6 Hz	3.50	3.50
Volume Resistivity ohm/cm	10^{15}	10^{15}
Dissipation Factor @ Imc	0.001	0.001

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METALLIC IMPURITY (by spectographic analysis)

Metal	ppm Max.	Metal	ppm Max.
Aluminum (Al)	1.0	Lead (Pb)	1.0
Antimony (Sb)	1.0	Magnesium (Mg)	1.0
Chromium (Cr)	1.0	Nickel (Ni)	1.0
Copper (Cu)	1.0	Potassium (K)	1.0
Iron (Fe)	1.0	Sodium (Na)	1.0

CURE:

Electrical performance of junctions coated with these elastomers is influenced by both temperature and duration of cure. Longer post-cures and higher temperatures generally improve device characteristics.

CURE SCHEDULE:

1/2 hour @ 80 °C + (optional)
1 hour @ 135 °- 150 °C (cure)
2 hours @ 200 °-225 °C (post cure-minimum)

Semiconductor Junction Coating - Type I

Low cost, heat stable, moisture resistant, high purity silicone resin for semiconductor applications. Designed specifically for environmental protection of transistors, diodes and rectifiers.

PHYSICAL PROPERTIES:

System	One-part; rigid
Base	Silicone resins
Appearance	Light amber
Specific Gravity	1.03
Viscosity	350 cps
Flash Point	90°F
Thinner	Xylene
Solids	50%

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Shelf Life	5 months @ 25°C
Thermal Life 250°C	> 10,000 hours

CHEMICAL SPECIFICATIONS:

Sodium	< 1 ppm
Potassium	< 1 ppm

ELECTRICAL:

Dielectric Strength	> 2500 (v/mil)
Dielectric Constant	2.75 (1 mc)
Volume Resistivity	> 1016 ohm-cm
Dissipation Factor	0.001 (1 mc)

APPLICATION:

Dip, paint, spray or transfer.

CURE:

Air dry for 20 minutes. Bake at 65°C for 20 minutes, then at 125° for 1/2 hour. Postcure at 225°C for 1/2 hour, or at 200°C for 5 hours.

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