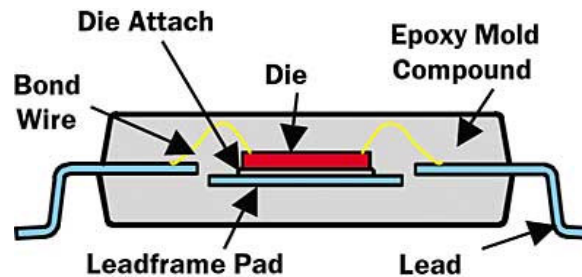


**For LQFP48L (7x7) Pb-free device**
**Part Number: DM6580EP, DM9161EP/9161AEP/9161BEP/9161BIEP,  
DM9000AEP/9000BEP/9000BIEP/9000CEP/9000DEP, DM9008AEP, DM9331AEP**

Total mass of part	Unit								
189.22	mg								
Section	Supplier Name	Item No.	Substance constituting section	CAS No.	Composition (%)	Weight (mg)	Total Material Weighting (mg)	Total Material Weighting (%)	MSDS Page#
Die	UMC	8-inch wafer	Si	7440-21-3	100.00%	1.067000	1.067000	0.563906	2
Ink (Top Marking)	TAI-EE	TPC410	Tampondruckfabre	Trade Secret	49.50%	0.000050	0.000100	0.000001	5
			Solvent Naphtha	64742-94-5	23.00%	0.000023			
			Butyl Cellosolve	111-76-2	15.00%	0.000015			
			Benzyl Alcohol	100-51-6	5.00%	0.000005			
			Epoxy Resin	25068-38-6	3.70%	0.000004			
			2-Methylpropan-1-Formaldehyde	78-83-1	3.70%	0.000004			
			50-00-0	0.10%	0.000000				
1,2,4-Trimethylbenzene	95-63-6	0.50%	0.000001						
Lead & Leadframe pad	ASM	C7025	Ni	7440-02-0	4.20%	1.687140	40.170000	21.229701	14
			Si	7440-21-3	1.20%	0.482040			
			Mg	7439-95-4	0.30%	0.120510			
			Cu	7440-50-8	94.30%	37.880310			
Epoxy Mold Compound	SUMITOMO	EME-7372	Silica Fused	60676-86-0	80-95%	127.925850	147.550000	77.979647	18
			Epoxy Resin	Trade Secret	1-5%	4.426500			
			Epoxy, Cresol	29690-82-2	1-5%	4.426500			
			Phenol Resin	Trade Secret	3-8%	8.853000			
			Antimony Trioxide	1309-64-4	0.1-0.9%	0.737750			
			Brominated Epoxy Resin	40039-93-8	0.1-1.0%	0.737750			
Die Attach Material	SUMITOMO	CRM-1033BF	Silver	7440-22-4	60-100%	0.038080	0.059500	0.031446	23
			Epoxy Resin	9003-36-5	15-40%	0.016065			
			t-Butyl phenyl glycidyl ether	3101-60-8	5-10%	0.004165			
			Phenolic resin	92-88-6	0.5-1.5%	0.000595			
			Butyl cellosolve acetate	112-07-02	0.5-1.5%	0.000595			
Bond Wire	MK ELECTRON	2N	Au	7440-57-5	100.00%	0.001000	0.001000	0.000528	28
Plating on Lead	SHENMAO	H99.99S	Sn	7440-31-5	100.00%	0.368439	0.368439	0.194719	41

Update: 12/02/2008



# Material Safety Data Sheet

## 1. IDENTIFICATION OF THE SUBSTANCE / PREPARATION AND OF THE COMPANY / UNDERTAKING

Product name : Finished Wafer

Catalogue No : NA

Manufacturer/supplier : UMC

Address : No. 3, Li-Hsin Rd. II, Hsinchu Science Park, Taiwan 300, ROC

Emergency telephone No / Fax : 886-3-5782258 ext: 33224

## 2. COMPOSITION/INFORMATION ON INGREDIENTS

ELEMENT	CAS NUMBER	CONTENT (% Weight)
Boron (B)	7440-42-8	0.001800
Aluminum (Al)	7429-90-5	0.143300
Titanium (Ti)	7440-32-6	0.033100
Tungsten (W)	7440-33-7	0.015600
Silicon (Si)	7440-21-3	99.805775
Arsenic (As)	7440-38-2	0.000100
Magnesium (Mg)	7439-95-4	0.000016
Potassium (K)	7440-09-7	0.000001
Calcium (Ca)	7440-70-2	0.000042
Iron (Fe)	7439-89-6	0.000036
Copper (Cu)	7440-50-8	0.000004
Zinc (Zn)	7440-66-6	0.000067
Sodium (Na)	7440-23-5	0.000068
Phosphorus (P)	7723-14-0	0.000070
Fluorine (F)	7782-41-4	0.000020

## 3. HAZARDS IDENTIFICATION

Principal hazards : NA

Environments effect : NA

Physical and chemical hazards : NA

Specifics hazards : NA

Principal symptoms : NA

Hazard class : NA

## 4. FIRST AID MEASURES

Inhalation : NA

# Material Safety Data Sheet

Contact with skin : Flush with water  
Contact with eyes : Flush with water  
Ingestion : NA

## 5.FIRE-FIGHTING MEASURES

Extinguishing media : NA

Unsuitable extinguishing media : NA

Specific hazards : NA

Protection measures : NA

## 6.ACCIDENTAL RELEASE MEASURES

Personal precautions : NA

Environmental precautions : NA

Methods for cleaning up : Use dustless method (vacuum) and place into closable container for disposal, or flush with water.

## 7.HANDLING AND STORAGE

Handling : NA

Storage : NA

## 8.EXPOSURE CONTROL / PERSONAL PROTECTION

Technical measures : TLV: 0.1 mg/m<sup>3</sup>

Personal : NA

Respiratory : Use NIOSH approved dust respirator.

Hands : Impervious gloves

Eyes : Safety or chemical tight goggles

Skin and body : NA

## 9.PHYSICAL AND CHEMICAL PROPERTIES

Appearance : Solid	Color : Iron grey
pH value : NA	Odor : None
Melting point : NA	Boiling point / range : 2230°C
Auto ignition temperature : NA	Flash point : NA °F NA °C
Vapor pressure (air=1) : NA	Explosion limits : NA
Relative vapour density : NA	Solubility in water : Insoluble in water
density : 2.2 (specific gravity)	evaporation : NA

## 10.STABILITY AND REACTIVITY

Stability : Stable

Conditions to avoid : Contact with powerful oxidizing agents such as Fluorine, Chlorine Trifluoride, Oxygen Difluoride, may cause fires.

Materials to avoid : Strong oxidizing agents.

# Material Safety Data Sheet

**Hazardous decomposition products : Silicon will dissolve in Hydrofluoric acid and produce a corrosive gas- Silicon Tetrafluoride.**

## 11.TOXICOLOGICAL INFORMATION

Acute toxicity :	NA
Locals effects :	NA
Irritation :	NA
Corrosiveness of skin :	NA

## 12.ECOLOGICAL INFORMATION

Resolvability :	NA
stockpiling :	NA

## 13.DISPOSAL CONSIDERATIONS

Waste disposal :	Landfill or recycle in accordance with local pollution regulation.
caution :	NA

## 14.TRANSPORTATION INFORMATION

Transportation information :	NA
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## 15.REGULATORY INFORMATION

Fire fighting law :	NA
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## 16.OTHER INFORMATION

other information :	NA
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# Material safety Data Sheet 91/155/EWG



Tradename: TPC 410  
PAD PRINTING INK  
Revised on: 05.10.00 Revision: 1.0.0 Print Date : 21.05.2001

## 01. Identification of substance, preparation and company

### Product name:

TPC 410  
TAMPON-DRUCKFARBE - PAD PRINTING INK

### Manufacturer/Supplier

TECA-PRINT AG

### Street/P.O.Box

Bohlstrasse 17, Postfach

### Country code/Postal code/Town/City

CH - 8240 Thayngen/Schweiz

### Telephone / Telefax

+41 (0)52 645 20 00 / +41 (0)52 645 21 01

### Emergency information

Schweiz. Toxikologisches Infozentrum  
24 Stunden täglich Telefon : +41 (0) 1 251 51 51

## 02. Composition/information on ingredients

### Hazardous components

2-BUTOXYETHANOL ; CAS-No. : 111-76-2

Percentage : 5 - 10 %  
Classification : Xn ; R 20/21/22 Xi ; R 37

BENZYL ALCOHOL ; CAS-No. : 100-51-6

Percentage : 1 - 5 %  
Classification : Xn ; R 20/22

REACTION PRODUCT:BISPHENOL A-(EPICHLORHYDRIN) ; CAS-No. : 25068-38-6

Percentage : 1 - 5 %  
Classification : R 43 Xi ; R 36/38

ISO-BUTANOL ; CAS-No. : 78-83-1

Percentage : 1 - 5 %  
Classification : Xi ; R 41 Xi ; R 37/38 R 67

XYLENE ; CAS-No. : 1330-20-7

Percentage : 1 - 5 %  
Classification : Xn ; R 20/21 Xi ; R 38

FORMALDEHYDE ... % ; CAS-No. : 50-00-0

Percentage : <0,5 %

# Material safety Data Sheet 91/155/EWG



Tradename: TPC 410  
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Classification : T ; R 23/24/25 C ; R 34 Carc. Cat.3 ; R 40 R 43

SOLVENT NAPHTHA (PETROLEUM), HEAVY AROM. ; CAS-No. : 64742-94-5

Percentage : 0,5 - 1 %

---

## 03. Hazards identification

### Hazard designation

Flammable · May cause sensitization by skin contact

---

## 04. First-aid measures

### General

In all cases of doubt, or when symptoms persist, seek medical attention. Never give anything by mouth to an unconscious person. Unconsciousness: lateral position - call a physician.

### After inhalation

Remove concerned person out of danger area. Take the casualty into the fresh air and keep warm. Irregular breathing/no breathing: artificial respiration.

### After skin contact

Wash away with soap and water and rinse. Do NOT use solvents or thinners.

### After eye contact

Remove contact lenses, keep eyelids open. Flush with plenty of water (10 - 15 min.). Call a physician.

### After ingestion

Do not induce vomiting - call a physician. Keep at rest.

---

## 05. Fire-fighting measures

### Suitable extinguishing media

Alcohol resistant foam, CO<sub>2</sub>, powders, water spray.

### Unsuitable extinguishing media

Waterjet.

### Special risk posed by the substance or by the actual preparation, its combustion products or gases discharged

Fire will produce dense black smoke. Exposure to decomposition products may cause a health hazard.

### Special protective equipment

Appropriate breathing apparatus may be required.

### Additional information

Cool endangered containers with water in case of fire. Do not allow the quenching water into the sewage system.



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## **06. Accidental release measures**

### **Personal precautions**

Remove ignition sources. Provide for sufficient ventilation. Refer to protective measures listed in sections 7 and 8.

### **Environmental precautions**

Do not empty into drains. If the product contaminates lakes, rivers or sewages, inform appropriate authorities in accordance with local regulations.

### **Methods for cleaning up/collecting**

Contain and collect spillage with non-combustible absorbent materials, e.g. sand, earth, vermiculite, diatomaceous earth and place in container for disposal according to local regulations (see section 13). Clean preferably with a detergent; avoid use of solvents.

---

## **07. Handling and storage**

### **Information for safe handling**

Prevent the creation of inflammable or explosive concentrations of vapour in air and avoid vapour concentrations higher than the OEL (=Occupational Exposure Limit). Additionally, the product should only be used in areas from which all naked lights and other sources of ignition have been excluded. Comply with the health and safety at work laws.

### **Information about protection against explosions and fires**

Vapours are heavier than air and may spread along floors. Vapours may form explosive mixtures with air.

### **Requirements to be met by storerooms and containers**

Containers which are opened must be carefully resealed and kept upright to prevent leakage.

### **Information about separation of incompatible products**

Keep away from oxidizing agents, from strongly alkaline and strongly acid materials.

### **Further information about storage conditions**

Always keep in containers of same material as the original one. See also instructions on the label. Avoid heating and direct sunlight.

---

## **08. Exposure controls and personal protection**

Provide adequate ventilation. Where reasonably practicable this should be achieved by the use of local exhaust ventilation and good general extraction. If these are not sufficient to maintain concentrations of particulates and solvent vapour below the OEL (=Occupational Exposure Limit), suitable respiratory protection must be worn.

### **Components with critical values that require monitoring at the workplace (exposure limits)**

2-BUTOXYETHANOL ; CAS-No. : 111-76-2

# Material safety Data Sheet 91/155/EWG



**Tradename:** TPC 410  
**PAD PRINTING INK**  
**Revised on:** 05.10.00 **Revision:** 1.0.0 **Print Date :** 21.05.2001

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Specification : threshold limit value ( GB )  
Value : 25 ml/m<sup>3</sup> / 120 mg/m<sup>3</sup>  
Remarks : H  
Version date : 01.01.89

ISO-BUTANOL ; CAS-No. : 78-83-1

Specification : Short term exposure limit ( GB )  
Value : 75 ml/m<sup>3</sup> / 225 mg/m<sup>3</sup>  
Version date : 01.01.89

Specification : threshold limit value ( GB )  
Value : 50 ml/m<sup>3</sup> / 150 mg/m<sup>3</sup>  
Version date : 01.01.89

XYLENE ; CAS-No. : 1330-20-7

Specification : Short term exposure limit ( GB )  
Value : 150 ml/m<sup>3</sup> / 650 mg/m<sup>3</sup>  
Version date : 01.01.89

Specification : threshold limit value ( GB )  
Value : 100 ml/m<sup>3</sup> / 435 mg/m<sup>3</sup>  
Version date : 01.01.89

FORMALDEHYDE ... % ; CAS-No. : 50-00-0

Specification : threshold limit value ( GB )  
Value : 2 ml/m<sup>3</sup> / 2,5 mg/m<sup>3</sup>  
Version date : 01.01.89

## Personal protective equipment

### Respiratory protection

If workplace limits are exceeded, a gas mask approved for this purpose must be worn.

### Hand protection

Solvent-resistant protective gloves must be worn. After washing hands replace lost skin fat by fat containing skin creams.

### Eye protection

Use safety glasses.

### Body protection

Personal should wear antistatic clothings made of natural fiber or of high temperature resistant synthetic fiber. All parts of the body should be washed after contact. Use appropriate skin protection cream before work.

---

## 09. Physical and chemical properties

### Image

**Form :** Pasty to liquid.

# Material safety Data Sheet 91/155/EWG



Tradename: TPC 410  
PAD PRINTING INK  
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Colour : Coloured.  
Odour : Like solvent.

## Relevant safety data

Boiling point / range :	( 1013 hPa )		86 - 205 °C	literature
Flash point :		ca.	35 °C	
Ignition temperature :		ca.	200 - 300 °C	
Lower explosion limit :			0,6 % b.v.	literature
Upper explosion limit :			10 % b.v.	literature
Vapour pressure :	( 50 °C )	<	1000 hPa	
Dampfdruck :	( 20 °C )	ca.	28 hPa	literature
Density :	( 20 °C )		1,05 - 1,5 g/cm <sup>3</sup>	
Solvent-separation test :	( 20 °C )	<	3 %	
Flow time :	( 20 °C )	>	90 s	DIN-cup 4 mm

---

## 10. Stability and reactivity

### Conditions to avoid

Stable under recommended storage and handling conditions(See section 7).

### Materials to avoid

Keep away from oxidizing agents, strongly alkaline and strongly acid materials in order to avoid exothermic reactions.

### Hazardous decomposition products

When exposed to high temperatures may produce hazardous decomposition products such as carbon monoxide and dioxide, smoke, oxides of nitrogen.

---

## 11. Toxicological information

### Experience on practice

This product is unlikely to harm health, given normal and proper handling and hygienic precautions. Prolonged inhalation of vapours in high concentrations may lead to headache, giddiness and nausea. In case of contact with the product: danger of resorption through the skin, irritation of skin/mucous membranes.

### Additional toxicological information

The product was classified in toxicological terms on the basis of the results of the calculation procedure outlined within General Directive on Preparations (88/379/EEC).

---

## 12. Ecological information

### Additional ecological information

#### General ecological information

# Material safety Data Sheet 91/155/EWG



Tradename: TPC 410  
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Do not empty into waters or drains. Toxic effect on fishes and micro-organismes.

## 13. Disposal considerations

### Product

Do not empty into waters or drains. Can be taken to a suitable incineration centre in observance of local regulations.

#### Waste key

ABFALLSCHLÜSSEL nach EAK/EWC 08 03 06 Druckfarbenschlämme, die keine halogenierten Lösemittel enthalten

### Contaminated packaging

#### Recommendation

Empty containers should be scrapped or reconditioned. Containers, which have not been emptied properly must be treated as special waste.

## 14. Transport information

### Land transport ADR/RID and GGVS/GGVE

#### Classification

Class :	3 31 c	Kemlercode :	30
Substance number :	1210	Margin-Number :	2301

Containers with a capacity  $\leq 450$  l are subject only to the regulations of Rn 2314 (remarks under E of Rn 2301).

#### Proper shipping name

INK

#### Packaging

Tremcard : 3

### Maritime transport IMDG/GGVSea

#### Classification

IMDG-Code :	3.3	IMDG - Page :	3377-1
UN number :	1210	Marine Poll. :	-
MFAG-Table :	311	EmS number :	3-05

#### Proper shipping name

INK

#### Packaging

Packaging group : III

# Material safety Data Sheet 91/155/EWG



Tradename: TPC 410  
PAD PRINTING INK  
Revised on: 05.10.00 Revision: 1.0.0 Print Date : 21.05.2001

---

Tremcard : 3

## Air transport ICAO-TI and IATA-DGR

### Classification

Class : 3  
UN number : 1210

### Proper shipping name

PRINTING INK

### Packaging

Packaging group : III  
Tremcard : 3

---

## 15. Regulatory information

### Classification according to EEC directives

#### Danger symbol and danger designation



Xi ; Irritant

#### Hazard-determining components of labelling

REACTION PRODUCT:BISPHENOL A-(EPICHLORHYDRIN) ; CAS-No. : 25068-38-6

#### R-phrases

10 Flammable  
43 May cause sensitization by skin contact

#### S-phrases

51 Use only in well-ventilated areas.  
37 Wear suitable gloves  
24 Avoid contact with skin

#### Special designation for certain preparations

92 Contains epoxy constituents. See information supplied by the manufacturer.

---

## 16. Other information



**Tradename:** TPC 410  
**PAD PRINTING INK**  
**Revised on:** 05.10.00 **Revision:** 1.0.0 **Print Date :** 21.05.2001

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## Further information

The details in this material safety data sheet satisfy national and EU legislation. We have no knowledge or control over the user's working conditions however. The product may not be used for any purpose other than that specified in chapter 1 unless written consent has been obtained. The user is responsible for the observance of all required statutory provisions.

### R-Phrases of components

20/21	Harmful by inhalation and in contact with skin
20/21/22	Harmful by inhalation, in contact with skin and if swallowed
20/22	Harmful by inhalation and if swallowed
23/24/25	Toxic by inhalation, in contact with skin and if swallowed
34	Causes burns
36/38	Irritating to eyes and skin
37	Irritating to respiratory system
37/38	Irritating to respiratory system and skin
38	Irritating to skin
40	Possible risks of irreversible effects
41	Risk of serious damage to eyes
43	May cause sensitization by skin contact
67	Vapours may cause drowsiness and dizziness

---

These data are based on our present knowledge. However, they shall not constitute a guarantee for any specific product features and shall not establish a legally valid contractual relationship.

# Material safety Data Sheet 91/155/EWG

**Tradename:**

**TPC 410**

**PAD PRINTING INK**

**Revised on:** 05.10.00

Revision: 1.0.0 **Print Date :** 21.05.2001



## Material Safety data Sheet

Product name : 1L02005 (Ag plated  
C7025 Leadframe)  
Date prepared : 4/23/08

### 1. Product Identification

Product name	1L02005 (Ag plated C7025 Leadframe)
Chemical family	Ag plated leadframe
Manufacturer	ASM Assembly Materials Ltd. 4/F, Waston Centre, 16 Kung Yip St., Kwai Chung, Hong Kong. Phone: (852) 2619 4262
Emergency assistance	ASM Technology Singapore Pte Ltd 2 Yishun Avenue 7, Singapore 768924 Phone: (65) 67526311

### 2. Composition / Information of ingredients (% by weight)

Constituent	C7025
Cu	BAL
Fe	-
Co	-
Si	0.25-1.20
Mn	-
Ni	2.2-4.2
Pd	-
Au	-
Zr	-
Sn	-
P	-
Zn	-
C	-
Mg	0.05-0.30
Cr	-
Pb	-
Ag	0.5-0.8

### 3. Physical properties

## Material Safety data Sheet

Product name : 1L02005 (Ag plated  
C7025 Leadframe)  
Date prepared : 4/23/08

Freezing point	Not applicable
Vapor pressure (mmHg)	Not applicable
Melting point / Boiling point	Not applicable
Solubility in water	Insoluble in water
Vapor density (Air=1)	Not applicable
Evaporation rate	Not applicable
Appearance	Solid
Odor	No odor

#### 4. Fire, explosion, stability and reactivity information

Flash point	None
Flammable limits	None (LFL: not applicable, UFL: not applicable)
Extinguishing media	Leadframe is noncombustible. Use extinguishing media appropriate to the surrounding fire
Chemical stability (conditions to avoid)	Leadframe is a stable material
Incompatibility (Materials to avoid)	Strong Acid (hydrogen gas involved if contact)

#### 5. Health hazard information

Inhalation	Not applicable
Ingestion	Not applicable
Skin	Skin contact with this material may cause, in some sensitive individuals, an allergic response if element such as copper and nickel are present.
Eye	Particulate metal (dust) may be dangerous to the eye and surrounding tissue.
Toxicity	There is no information on the toxicity of this material. Under normal handling and use of the solid form of this material there are few health hazards.

#### 6. Emergency and first aid procedures

Inhalation	Breathing difficulty caused by inhalation of dust requires remove to fresh air. If breathing has stopped, perform artificial respiration and obtain medical assistance at once.
Ingestion	Swallowing metal powder or dust can be treated by having the affected person swallow large quantities of water and attempting to induce vomiting if conscious. Obtain medical assistance at once.

## Material Safety data Sheet

Product name : 1L02005 (Ag plated  
C7025 Leadframe)  
Date prepared : 4/23/08

Skin	Skin cuts and abrasions can be treated by standard first aid. Skin contamination with dust or powder can be removed by washing with soap and water. If irritation persists, obtain medical assistance at once.
Eye	Dust or powder should be flushed from the eyes with copious amounts of clean water. If irritation persists obtain medical assistance. Contact lenses should not be worn if working with metal dusts and powders.

### 7. Exposure control / Personal protection

Ventilation	Good general ventilation should be sufficient for most conditions.
Respiratory protection	For most conditions, no respiratory protection should be needed; however, in dusty atmospheres, wear a NIOSH approved respirator to protect from dust.
Eye protection	Wear safety glasses when risk of eye injury is present, for example, metal powder handling.
Skin protection	Wear clean body covering clothing. Wear gloves to prevent metal cuts and skin abrasions.

### 8. Handling and storage

Handling	Good housekeeping in order to prevent the accumulation of dust
Storage	Store in original vacuum sealed packing. Storage condition: 19 to 25 °C and relative humidity <= 60%

### 9. Environmental protection information

Waste disposal method	Prior to disposal consider if the material has recovery value. Dispose of materials in compliance with governmental regulations
Environmental hazards	In solid form this material poses on special environmental problems.

### 10. Transportation information

Transportation and hazardous materials	Not a hazardous material for shipping
--	---------------------------------------

Additional Information

## Material Safety data Sheet

Product name : 1L02005 (Ag plated  
C7025 Leadframe)  
Date prepared : 4/23/08

This information in this document is believed to be correct as of the date issued. However, no warranty of merchantability, fitness for any use, or any other warranty is expressed or is to be implied regarding the accuracy or completeness of this information, the results to be obtained from use of this information or the product, the safety of this product, or the hazards related to its use. This information and the product are furnished on the condition that the person receiving them shall make their own determination as to the suitability of the product for their particular purpose and on the condition that they assume the risk their use thereof.

# SAFETY DATA SHEET

PRODUCT NAME : "SUMIKON" EME-7372  
MSDS NO. : MSDS-EME-504  
DATE PREPARED : Apr. 2,2004 according to 2001/58/EC

## 1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME : EME-7372

CHEMICAL NATURE : EPOXY MOLDING COMPOUND

MANUFACTURER : SUMITOMO BAKELITE CO.,LTD.  
TENNOZ PARK SIDE BLDG., 5-8, HIGASHI-SHINAGAWA 2-CHOME,  
SHINAGAWA-KU, TOKYO, 140-0002 JAPAN PHONE: 81-3-5462-4267

SUPPLIER : SUMITOMO BAKELITE CO.,LTD.  
TENNOZ PARK SIDE BLDG., 5-8, HIGASHI-SHINAGAWA 2-CHOME,  
SHINAGAWA-KU, TOKYO, 140-0002 JAPAN PHONE: 81-3-5462-4267

EMERGENCY ASSISTANCE(Please contact any of manufacture's following sales offices)

NAME & EMERGENCY PHONE NUMBER	ADDRESS
SUMITOMO PLASTICS AMERICA, INC. PHONE: 408-243-8402 (USA)	900 LAFAYETTE STREET SUITE#510 SANTA CLARA, CA 95050
SUMITOMO BAKELITE SINGAPORE PTE.LTD. PHONE: 6755-5550 (SINGAPORE)	1 SENOKO SOUTH ROAD SINGAPORE 758069
SUMITOMO BAKELITE EUROPE B.V. PHONE: 020-691-10-86 (THE NETHERLANDS)	NEW AMSTERDAM BUILDING HOEKENRODE 2, 1102 BR AMSTERDAM
CHEMTREC PHONE: 800-424-9300 (USA) 24 hours EVERYDAY	

## 2. COMPOSITION/INFORMATION ON INGREDIENTS

COMPONENTS	(CAS NO.)	BY WEIGHT (%)
Silica Fused	(60676-86-0)	80 - 95
Epoxy Resin	(Trade secret)	1 - 5
Epoxy, Cresol Novolac	(29690-82-2)	1 - 5
Phenol Resin	(Trade secret)	3 - 8
Antimony Trioxide	(1309-64-4)	0.1 - 0.9
Brominated Epoxy Resin	(40039-93-8)	0.1 - 1.0
Carbon Black	(1333-86-4)	0.1 - 0.5

Labeling according to EC directives  
No symbol and risk phrase are required.

## 3. HAZARDS IDENTIFICATION

--- EMERGENCY OVERVIEW ---

Black pellet with slight antiseptic odor. Prolonged exposure may cause skin irritation.  
Self extinguishing and not ordinarily an emergency problem. Epoxy Resin is a substrate known to be positive by Ames test. Water, foam, carbon dioxide and dry chemicals can be used on fire.

# SAFETY DATA SHEET

PRODUCT NAME : "SUMIKON" EME-7372  
MSDS NO. : MSDS-EME-504  
DATE PREPARED : Apr. 2, 2004 according to 2001/58/EC

## POTENTIAL HEALTH EFFECTS:

- EYE : Solid or dusts may cause irritation or corneal injury due to mechanical action.
- SKIN : Prolonged exposure may cause skin irritation.  
A single, Prolonged exposure is not likely to result in the material being absorbed through skin in harmful amounts.
- INGESTION : Small amounts swallowed during normal handling operations are not likely to cause injury; swallowing amounts larger than that may cause injury.
- INHALATION : May occur rhinitis, allergic dermatitis ( $Sb_2O_3$ ) and may cause bronchitis ( $SiO_2$ ).

## 4. FIRST AID MEASURES

- EYE CONTACT : Flush affected eyes with large amount of water, also under the eyelids for at least 15 minutes. Get medical attention.
- SKIN CONTACT : Wash immediately with plenty of water or shower with soap.  
If irritation occurs, get medical attention.
- INGESTION : Immediately give plenty of water. Get medical attention.
- INHALATION : Remove to fresh air in case of accidental inhalation of vapors or dusts.  
Get medical attention.
- NOTE TO PHYSICIANS  
: Treat Symptomatically.  
Treatment may vary with condition of victim and specifics of incident.

## 5. FIRE FIGHTING MEASURES

- EXTINGUISHING MEDIA : Suitable for water, foam, carbon dioxide or dry chemicals.
- FIRE FIGHTING EQUIPMENT : Wear full bunker gear including a positive pressure self contained breathing apparatus in any closed space.

## 6. ACCIDENTAL RELEASE MEASURES

- PERSONAL PRECAUTION : Use personal protective equipments. Avoid dust formation.
- ENVIRONMENTAL PRECAUTIONS : Do not flush into surface water or sanitary sewer system.
- METHODS FOR CLEANING UP : Clean contaminated surface thoroughly.

## 7. HANDLING AND STORAGE

- HANDLING : Avoid contact with eyes and skin, and avoid breathing dust or vapors. Provide appropriate exhaust ventilation at places where dust is formed.
- STORAGE : Keep containers tightly closed in a cool, well-ventilated space.  
Keep dry and cool below 5 °C for quality.

# SAFETY DATA SHEET

PRODUCT NAME : "SUMIKON" EME-7372  
MSDS NO. : MSDS-EME-504  
DATE PREPARED : Apr. 2,2004 according to 2001/58/EC

## 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

### EXPOSURE LIMITS:

COMPONENTS	EXPOSURE GUIDELINES (mg/m <sup>3</sup> )	
	ACGIH (TLV-TWA)	OSHA (PEL)
Silica Fused	0.1 (Respirable)	80
Epoxy Resin	Not listed	Not listed
Epoxy, Cresol Novolac	Not listed	Not listed
Phenol Resin	Not listed	Not listed
Antimony Trioxide	0.5 (as Sb)	0.5 (as Sb)
Brominated Epoxy Resin	Not listed	Not listed
Carbon Black	3.5	3.5

### ENGINEERING MEASURES:

Ensure adequate ventilation, especially in confirmed areas.

### PERSONAL PROTECTIVE EQUIPMENTS:

Respiratory protection - For most conditions, no respiratory protection should be needed; however, in dusty atmospheres or insufficient ventilation, wear a suitable respiratory equipment or NIOSH// OSHA approved respirator to protect from dust.

Hand protection - Impervious gloves (chemical-resistant gloves).

Eye protection - Safety glasses with side shields.

Skin and body protection - Chemical-resistant apron.

## 9. PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE	: Black pellet with slight antiseptic odor.
PH	: Not applicable
BOILING POINT	: Not applicable
DECOMPOSITION TEMPERATURE	: (Softening point) 75°C - 95°C
FLASH POINT	: None
AUTOIGNITION TEMPERATURE	: No information available.
EXPLOSION PROPERTIES	: No information available.
VAPOR PRESSURE	: Not applicable
VAPOR DENSITY (AIR=1)	: Not applicable
SPECIFIC GRAVITY	: 1.8 - 2.2
SOLUBILITY IN WATER	: Insoluble in water

# SAFETY DATA SHEET

PRODUCT NAME : "SUMIKON" EME-7372  
MSDS NO. : MSDS-EME-504  
DATE PREPARED : Apr. 2, 2004 according to 2001/58/EC

## 10. STABILITY AND REACTIVITY

### CHEMICAL STABILITY:

Stable under recommended storage condition.

### CONDITIONS TO AVOID:

Keep away from heat, moisture and sunlight for quality.

### MATERIALS TO AVOID:

Oxidizing agents, acids and alkali.

### HAZARDOUS DECOMPOSITION PRODUCTS:

Carbon dioxide. Thermal decomposition can lead to release of irritating gases and vapors such as methane, ammonia, Phenol, carbon monoxide and hydrocarbon compounds.

## 11. TOXICOLOGICAL INFORMATION

ACUTE TOXICITY : Silica fused: orl-rat LD50: 3,160 mg/kg  
Epoxy resin: orl-rat LD50: >5,000 mg/kg  
Antimony trioxide: orl-rat LD50: >34,600mg/kg

LOCAL EFFECTS : No information available.

SENSITIZATION : No information available.

CHRONIC TOXICITY : Potential carcinogen by IARC;  
Silica fused: Group 3  
Antimony trioxide: Group 2B  
Carbon black: Group 2B

## 12. ECOLOGICAL INFORMATION

MOBILITY : No data is available on product itself.

ECOTOXICITY : Waste water from subsequent processing should be given appropriate treatment in line with local regulations.

## 13. DISPOSAL INFORMATION

### WASTE FROM RESIDUES:

Can burn in a chemical incinerator equipped with an afterburner and scrubber in compliance with government or local disposal regulations, also contaminated packaging do so.

## 14. TRANSPORT INFORMATION

Not a hazardous material for DOT (Department of transportation) shipping.

Not dangerous by any mode of international transport.

UN No.: None assigned.

# SAFETY DATA SHEET

PRODUCT NAME : "SUMIKON" EME-7372  
MSDS NO. : MSDS-EME-504  
DATE PREPARED : Apr. 2, 2004 according to 2001/58/EC

## 15. REGULATORY INFORMATION

### TSCA (TOXIC SUBSTANCES CONTROL ACT):

The ingredients of this product are all on the 8(b) inventory list.

### EINECS (EUROPEAN INVENTORY OF EXISTING COMMERCIAL CHEMICAL SUBSTANCES):

This product complies with the provisions of the European Inventory.

EINECS No.	Silica Fused	262-373-8
	Epoxy, Cresol Novolac	Monomers are all on the inventory list.
	Phenol Resin	Monomers are all on the inventory list.
	Antimony Trioxide	215-175-0
	Brominated Epoxy Resin	Monomers are all on the inventory list.
	Carbon Black	215-609-9
ELINCS No.	Epoxy Resin	Notification No.94030295

Labeling according to EC Directives:

No symbol and risk phrase are required.

## 16. OTHER INFORMATION

**DISCLAIMER:** The information present herein was prepared for your reference to be best of knowledge. It is given in good faith but no warranty expressed or implied is made.

**DATA PREPARED BY:** SUMITOMO BAKELITE CO.,LTD.  
QA DEPARTMENT, UTSUNOMIYA PLANT

# SAFETY DATA SHEET

PRODUCT NAME : "SUMIRESIN EXCEL" CRM-1033BF  
MSDS NO. : MSDS-CRM-421  
DATE PREPARED : Jan. 30, 2001 according to 93/112

## 1. PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME : "SUMIRESIN EXCEL" CRM-1033BF  
CHEMICAL NATURE: Preparation. Epoxy Silver paste  
MANUFACTURER : SUMITOMO BAKELITE CO., LTD.  
Tennoz Parkside Bldg., 5-8, Higashi-Shinagawa 2-chome, Shinagawa-ku,  
Tokyo 140-0002, Japan  
Phone: 81-3-5462-4037  
SUPPLIER : SUMITOMO BAKELITE CO., LTD.  
Tennoz Parkside Bldg., 5-8, Higashi-Shinagawa 2-chome, Shinagawa-ku,  
Tokyo 140-0002, Japan  
Phone: 81-3-5462-4037

EMERGENCY ASSISTANCE : (Please contact any of following sales offices)

NAME & EMERGENCY PHONE NUMBER	ADDRESS
Sumitomo Plastics America, Inc. Phone 408-243-8402 (USA)	900 Lafayette Street, SUITE #510 Santa Clara, CA 95050
Sumitomo Bakelite Singapore Pte, Ltd. Phone 65-755-5550 (Singapore)	1 Senoko South Road, Singapore 758069
Sumitomo Bakelite Europe B. V. Phone 020-691-10-86 (The Netherlands)	New Amsterdam Building Hoekenrode 2, 1102 BR Amsterdam
CHEMTREC Phone 800-424-9300 (USA)	24 hours everyday

## 2. COMPOSITION / INFORMATION ON INGREDIENTS

COMPONENT	CAS No.	by weight (%)
Silver	7440-22-4	60~100
Epoxy Resin	9003-36-5	15~40
t-Butyl phenyl glycidyl ether	3101-60-8	5~10
Phenolic resin	92-88-6	0.5~1.5
Butyl cellosolve acetate	112-07-2	0.5~1.5

Labeling according to EC directives:

Hazardous components: none  
Hazard symbol : No symbol and risk phrases are required.  
Risk phrases : none  
Safety phrase : none

## 3. HAZARDS IDENTIFICATION

\*\*\* EMERGENCY OVERVIEW \*\*\*

Silver gray paste and slightly odor.  
The vapor irritates the eyes, the skin and the respiratory tract. Combustible liquid.  
Epoxy Resin is a substrate known to be positive by Ames test.  
Foam, carbon dioxide and dry chemicals can be used on fires.

# SAFETY DATA SHEET

PRODUCT NAME : "SUMIRESIN EXCEL" CRM-1033BF  
MSDS NO. : MSDS-CRM-421  
DATE PREPARED : Jan. 30, 2001 according to 93/112

## POTENTIAL HEALTH EFFECTS

**EYE :** Cause irritating to eyes.  
**SKIN :** May cause harmful if absorbed through the skin.  
**INGESTION :** Small amounts (teaspoonful) swallowed during normal handling operations are not likely to cause injury; swallowing amounts larger than that may cause injury.  
**INHALATION :** Heated product may produce generate vapors. May be harmful for respiratory tract if inhaled.

## 4.FIRST-AID MEASURES

**INHALATION :** Immediately remove to the victim from the contamination to fresh air.  
**SKIN CONTACT :** Wash off thoroughly the affected areas under flowing water or shower with soap. If irritation occurs,get medical attention.  
**EYE CONTACT :** Immediately flush eyes with large amounts of water for at 15 minutes. Get medical attention.  
**INGESTION :** Do not induce vomitting. Rinse mouth with plenty of water and immediately give the victim milk or water. Get medical advice.  
**NOTE TO PHYSICIANS :**  
Treat symptomatically. Treatment may vary with condition of victim and specifics of incident.

## 5.FIRE-FIGHTING MEASURES

**EXTINGUISHING MEDIA:**  
Use foam, carbon dioxide or dry chemicals  
**PROTECTION OF FIREFIGHTERS:**  
Wear full bunker gear inducing positive self-contained breathing apparatus in any closed space.

## 6.ACCIDENTAL RELEASE MEASURES

**PERSONAL PRECAUTION:**  
Use personal protective equipments.  
**ENVIRONMENTAL PRECAUTIONS:**  
Do not flush into surface water or sanitary sewer system.  
**METHODS FOR CLEANING UP:**  
Ventilate spilled area. Remove all sources. Take up with absorbent,inert material (e.g. paper towel, sand) with suitable protective equipment and place in suitable, closed impervious container.

## 7.HANDLING AND STORAGE

**HANDLING :** Use with adequate ventilation. Keep away from heat, sparks and open flames. Avoid contact with eyes and skin, and avoid breathing of vapor if generated. Practice good personal hygiene after using this material, especially before eating, drinking smoking or using the toilet.  
**STORAGE :** Keep container tightly closed in a below -15 degC, well-ventilated dark place for quality separate from strong oxidents, and protect from direct sunlight.

# SAFETY DATA SHEET

PRODUCT NAME : "SUMIRESIN EXCEL" CRM-1033BF  
MSDS NO. : MSDS-CRM-421  
DATE PREPARED : Jan. 30, 2001 according to 93/112

## 8.EXPOSURE CONTROLS/PERSONAL PROTECTION

### EXPOSURE LIMITS:

COMPONENT	EXPOSURE GUIDELINES(mg/m <sup>3</sup> )	
	ACGIH(TLV-TWA)	OSHA(PEL)
Silver	0.1(respirable)	0.01
Epoxy Resin	Not listed	Not listed
t-Butyl phenyl glycidyl ether	Not listed	Not listed
Phenolic resin	Not listed	Not listed
Butyl cellosolve acetate	Not listed	Not listed

### ENGINEERING MEASURES:

Provide general and/or local exhaust ventilation to control airborne levels below the exposure guidelines. Good general ventilation should be sufficient for most conditions. When processing at elevated temperature, provide local exhaust ventilation. Good general ventilation should be sufficient for most conditions.

### PERSONAL PROTECTIVE EQUIPMENTS:

- Respiratory protection - Wear an approved respirator to protect from vapors or fume.
- Hand protection - Chemical-resistant gloves.
- Eye protection - Chemical splash goggles or safety glass with side-shields.
- Skin & body protection - Clean clothing, long sleeves, apron, full-face cover or legs-covering clothing as appropriate.

## 9.PHYSICAL AND CHEMICAL PROPERTIES

- APPEARANCE : Silver gray paste with slightly odor.
- pH : No information available.
- BOILING POINT : 165~170 degC/14mmHg (as t-Butyl phenyl glycidyl ether)  
191.5 degC (as Butyl cellosolve acetate).
- DECOMPOSITION TEMPERATURE : No information available.
- FLASH POINT : 259 degC (as Epoxy Resin)  
71 degC (as Butyl cellosolve acetate)
- AUTOIGNITION TEMPERATURE : 340 degC (as Butyl cellosolve acetate).
- EXPLOSION PROPERTIES : Not applicable.
- VAPOR PRESSURE : 0.31 hPa (as Butyl cellosolve acetate).
- VAPOR DENSITY : 5.5 (Air=1, as Butyl cellosolve acetate).
- DENSITY : 3.4~3.6
- SOLUBILITY : Moderate (1.7 g/100ml at 200 degC, as Butyl cellosolve acetate) in water.

# SAFETY DATA SHEET

PRODUCT NAME : "SUMIRESIN EXCEL" CRM-1033BF  
MSDS NO. : MSDS-CRM-421  
DATE PREPARED : Jan. 30, 2001 according to 93/112

## 10. STABILITY AND REACTIVITY

STABILITY : Stable under recommended storage conditions.

CONDITIONS TO AVOID :

Keep away from heat, open flame, sparks and sunlight for quality.

MATERIALS TO AVOID :

Oxidizing agents or base. Butyl cellosolve acetate reacts with strong oxidants causing fire and explosion hazard.

HAZARDOUS DECOMPOSITION PRODUCTS :

Mainly: Carbon oxide

Slightly: Carbon monoxide, various hydrocarbons and chlorine compounds.  
(over 400 degC)

## 11. TOXICOLOGICAL INFORMATION

ACUTE TOXICITY :	Epoxy Resin ----	orl-rat LD50:	>2,000 mg/kg
		skin-rat LD50:	>400 mg/kg
	t-Butyl phenyl glycidyl ether ---	orl-rat LD50:	3.73 ml/kg
	Phenolic resin ---	orl-rat LD50:	9,850 mg/kg
	Butyl cellosolve acetate ---	orl-rat LD50:	2,400 mg/kg
		skin-rbt LD50:	1,500 mg/kg

LOCAL EFFECTS : Irritating to eyes and skin.

SENSITIZATION : May cause sensitization by skin contact.

CHRONIC TOXICITY: Potential carcinogen

IARC : Not listed

NTP : Not listed

OSHA : Not regulated

## 12. ECOLOGICAL INFORMATION

MOBILITY : No data is available on the product itself.

ECOTOXICITY : May cause long-term adverse effects in the aquatic environment.

## 13. DISPOSAL CONSIDERATION

WASTE FROM RESIDUES :

Can burn in a chemical incinerator equipped with an afterburner and scrubber in compliance with government or local disposal regulations, also contaminated packagings do so.

## 14. TRANSPORT INFORMATION

Not a hazardous material for D.O.T. (Department Of Transportation) shipping.

Not dangerous by any mode of international transport.

UN No. : None assigned.

# SAFETY DATA SHEET

PRODUCT NAME : "SUMIRESIN EXCEL" CRM-1033BF  
MSDS NO. : MSDS-CRM-421  
DATE PREPARED : Jan. 30, 2001 according to 93/112

## 15.REGULATORY INFORMATION

### TSCA(TOXIC SUBSTANCES CONTROL LAW):

The ingredients of this product are all on the 8(b) inventory list.

### EINECS(EUROPEAN INVENTORY OF EXISTING COMMERCIAL CHEMICAL SUBSTANCES)

This product complies with the provisions of the European Inventory.

EINECS No.	Silver:	231-131-3
	t-Butyl phenyl glycidyl ether:	221-453-2
	Phenolic resin:	202-200-5
	Butyl cellosolve acetate:	203-933-3
NLP No.	Epoxy Resin:	500-006-8

### Labeling according to EC Directives:

Hazard symbol: No symbol and risk phrases are required.  
Risk phrases: none  
Safety phrase: none

## 16.OTHER INFORMATION

DISCLAIMER : The information presented herein was prepared for your reference to be best of our knowledge. It is given in good faith but no warranty expressed or implied is made.

### DATA PREPARED BY :

N.OSUGA, QA MANAGER  
UTSUNOMIYA PLANT  
SUMITOMO BAKELITE CO., LTD.



# Material Safety Data Sheet

## Section 1. Chemical product and Company Identification

Common name	Gold Bonding Wire (2N)	Code	Not available
Supplier	MK ELECTRON CO.,LTD	MSDS#	Not available
Synonym	Au Wire, Bonding Wire, Bumping Wire, Gold Wire	Preparing Date	22. Aug, 2007
Trade name	Not available		
Material Uses	Industrial applications : Bonding, Bumping. (Intergate circuit, TR, LED etc.)	<b>In case of</b> <b>Emergency</b>	Korea & International Tel : (82)031-330-1900 Fax: (82)031-338-6817
Manufacturer	MK ELECTRON CO.,LTD 316-2, Kumeu-ri, Pogok-myun, Yongin-si, Kyunggi-do, 449-810, Korea		

## Section 2. Composition and Information on Ingredients

Type of Gold Bonding Wire	Name	CAS#	% by Weight
UB(Super long loop wire)	Gold	7440-57-5	Min 99.99%
	Beryllium	7440-41-7	0.0003-0.0008%
	Calcium	7440-70-2	0.0013-0.0018%
R(Alloy High strength wire)	Gold	7440-57-5	Min 98.99%
	Palladium	7440-05-3	0.95±0.05%
	Beryllium	7440-41-7	0.0003-0.0008%
	Calcium	7440-70-2	0.0004-0.0006%
UR Type	Gold	7440-57-5	Min 99.982%
	Palladium	7440-05-3	Max 0.01%
	Calcium	7440-70-2	Max 0.004%
L (Low loop wire)	Gold	7440-57-5	Min 99.99%
	Beryllium	7440-41-7	0.0003-0.0008%
	Calcium	7440-70-2	Max 0.0005%

## Section 3. Each elements MSDS of Gold Bonding Wire

Name	CAS#	Attach #
Gold	7440-57-5	MKE-01
Palladium	7440-05-3	MKE-02
Beryllium	7440-41-7	MKE-03
Calcium	7440-70-2	MKE-04

Continued on Next Page

**MATERIAL SAFETY DATA SHEET****I. PRODUCT IDENTIFICATION**

Trade Name: Gold  
Chemical Nature: Metal  
Formula Weight: 196.97

Synonym: Gold Metal  
Formula: Au  
CAS #: 7440-57-5

**II. HAZARDOUS INGREDIENTS**

Ingredient: Gold  
% Weight: 100

TLV (Units): None Published

**III. PHYSICAL DATA**

Boiling Point 760 mm Hg: 2970 °C  
Specific Gravity: 19.31  
% Volatiles by Weight: N/A  
Appearance and Odor: Yellow, soft ductile metal, no odor Lump or powder

Melting Point: 1064.76 °C  
Vapor Density: N/A  
Solubility in H<sub>2</sub> O: Insoluble/Negligible

**IV. FIRE AND EXPLOSION HAZARDS DATA**

Flash Point (Method used): N/A  
Flammable Limits: Upper: N/A  
Special Fire Fighting Procedures: None

Autoignition Temperature: N/A  
Extinguishing Media: None  
Unusual Fire & Explosion Hazards: None

**V. HEALTH HAZARD DATA**

Effects of Over Exposure: As a solid no known adverse effects  
Reproductive Effects: None  
Immediate (Acute) Health Hazard: Yes  
Effects of Overexposure:

Carcinogenicity: None identified  
Delayed (Chronic) Health Hazard: No

Inhalation: Coughing sneezing, difficulty breathing, bronchitis, pneumoconiosis and pulmonary fibrosis may occur. A nuisance dust.  
Dermal/Eye Contact: Dermal: Mechanical irritation, dermatitis possible. Contact of gold with the skin may cause an allergic reaction.  
Skin Contact: May cause irritation and allergic reaction.  
Ingestion: No adverse effects expected.  
Other: An equivocal tumorigenic agent.

Medical Conditions Generally Aggravated by Exposure: Respiratory disorders. May aggravate existing dermatitis or other skin ailments.

**EMERGENCY AND FIRST AID PROCEDURES:**

EYES: Flush eyes with lukewarm water for 15 minutes. If irritation persists contact a physician.  
SKIN: Wash Thoroughly. If irritation persists contact a physician.  
INHALATION: Remove to Fresh Air, contact Physician.  
INGESTION: If large quantities are ingested, contact Physician.

*Continued on Next Page*

## **VI. REACTIVITY DATA**

Stability: Generally considered stable.

Incompatibility (Material to Avoid): Gold plus ammonia may produce fulminate-like compounds that explode when dried. Finely divided gold and strong hydrogen peroxide solution may explode.

Hazardous Decomposition Products: Toxic fumes under fire conditions.

Hazardous Polymerization: Is not expected to occur.

## **VII. SPILL OR LEAK PROCEDURES**

Steps to be Taken in Case Material is Released or Spilled: Vacuum or scoop the material into a container for reclamation or disposal.

Waste Disposal Method: In accordance with Local, State and Federal Regulations. Has reclaim value as scrap.

## **VIII. SPECIAL PROTECTION INFORMATION**

Respiratory Protection: If dust, NIOSH approved Schedule 21 or C resp.

Ventilation: Recommended where dusting may occur.

Eye Protection: Safety Glasses

Protective Gloves: For Extended use of powder

Other Protective Equipment: None

## **IX. SPECIAL PRECAUTIONS**

Other Handling and Storage Conditions: Avoid and control operations which create dusting. Wash thoroughly after handling. Keep container closed. Avoid contact with eyes and skin.

US Federal Regulations: SARA 311 and 312 Hazard Categories

Fire Hazard: No Reactivity Hazard: No Sudden Release of Pressure: No

The information in this MSDS should be provided to all who will use, handle, store, transport or otherwise be exposed to this product. This MSDS has been prepared for the guidance of plant engineering, operations, and management and for persons working with or handling this product. The information presented in the MSDS is premised upon proper handling and anticipated uses and is for the material without chemical additions/alterations. We believe this information to be reliable and up-to-date as of the date of publication, but make no warranty that it is.

Prepared by: S Dierks

Dated: March 1994

*Continued on Next Page*

**MATERIAL SAFETY DATA SHEET****I. PRODUCT IDENTIFICATION**

Trade Name: Palladium  
Formula: Pd

Chemical Nature: Metallic Element  
CAS #: 7440-05-3

**II. HAZARDOUS INGREDIENTS**

<u>%</u>	<u>PEL</u>	<u>TLV</u>
100	Not established	Not established

**III. PHYSICAL DATA**

Boiling Point: 3980 °C

Freezing/Melting Point: 1552 °C

Specific Gravity (H<sub>2</sub> O = 1): 12.02

Solubility in H<sub>2</sub> O: Insoluble

Appearance and Odor: Bright metallic solid, odorless.

Vapor Pressure: Essentially 0

**IV. FIRE AND EXPLOSION HAZARDS DATA**

Flash Point (Method used): N/A

Autoignition Temperature: Not Established

Flammable Limits in Air: Lower: N/A Upper: N/A

Extinguishing Media: Flammable in powdered form. Do not use water, Co<sub>2</sub> or halogenated extinguishers. Use dry chemical extinguishing agents, dry and or dry ground dolomite.

Special Fire Fighting Procedures: No special firefighting procedures needed. Use normal procedures which include wearing NIOSH/MSHA approved self-contained breathing apparatus, flame and chemical resistant protective clothing, hat, gloves and boots. If without risk remove material from fire area.

Unusual Fire & Explosion Hazard: As finely divided dust, may explode. Can catalyze oxidation and ignition of hydrogen flammable gases, organic liquids. Palladium dust is a fire and explosion hazard. Flammable Solid.

**V. HEALTH HAZARD INFORMATION**

Effects of Exposure: Acute:

Ingestion: None known. Poorly absorbed by the body when ingested.

Skin Contact: Powder or dust may cause skin irritation. May be a skin sensitizer.

Eye Contact: Powder or dust may cause eye irritation.

Inhalation: Powder or dust may cause irritation.

Chronic: None known.

Medical Conditions, if any, Aggravated by the Chemical: None known.

Most Likely Routes of Entry: Ingestion.

Carcinogenicity: NTP: No

IARC: No

OSHA: No

EPA: No

*Continued on Next Page*

Other: In the laboratory, palladium appears to bind many cell components, blocks the actions of a number of enzymes and interferes with the use of energy by nerves and muscles. Palladium also induces lung malfunction and produces abnormal fetuses. Lethal intravenous doses cause appetite loss, hemolysis, renal deposition and bone marrow damage.

#### **EMERGENCY AND FIRST AID PROCEDURES:**

EYES: Immediately flush eyes, including under eyelids, with large amounts of water for at least 15 minutes. Call a physician.

SKIN: Remove contaminated clothing, flood skin with large amounts of water. If irritation persists seek medical attention.

INHALATION: No specific information available, one should obtain medical attention.

INGESTION: No data available but one should obtain medical attention.

#### **VI. REACTIVITY DATA**

Stability: Stable

Incompatibility (Material to Avoid): Explosive reaction with hydrogen + hydrogen peroxide. Reaction with formic acid or sodium tetrahydridoborate releases explosive hydrogen gas. Violent reaction with isopropyl alcohol, OF 2 S. Under the proper conditions it undergoes hazardous reactions with aluminum, arsenic, carbon, methanol, ozonides and sulfur.

Hazardous Decomposition Products: Palladium oxide.

Hazardous Polymerization: Will not Occur.

Other: Palladium absorbs a considerable amount of hydrogen.

#### **VII. SPILL OR LEAK PROCEDURES**

Steps to be Taken in Case Material is Released or Spilled: Wearing full protective equipment, cover spill with dry sand or ver-miculite. Mix well and carefully transfer to a container.

Waste Disposal Method: Dispose of according to local, state, and federal regulations.

#### **VIII. SPECIAL PROTECTION INFORMATION**

Respiratory Protection (Specify Type): Wear NIOSH/MSHA approved high efficiency particle respirator.

Ventilation: Laboratory fume hood.

Protective Gloves: Rubber.

Eye Protection: ANSI approved safety goggles.

#### **IX. SPECIAL PRECAUTIONS**

Other Handling and Storage Conditions: Keep container tightly closed. Store in a cool, dry, well-ventilated area. Wash thoroughly after use.

Other Precautions: Lab coat and apron, flame and chemical resistant coveralls, eyewash capable of sustained flushing, safety drench shower and hygienic facilities for washing.

Prepared by: S. Dierks

Dated: October 1995

*Continued on Next Page*

**MATERIAL SAFETY DATA SHEET****I. PRODUCT IDENTIFICATION**

Trade Name: Beryllium  
 Formula: Be  
 Synonyms: Beryllium Metal, Metallic Beryllium, Beryllium Metal Powder, Metallic Beryllium Powder.

Chemical Family: Metallic Element  
 CAS #: 7440-41-7

**II. HAZARDOUS INGREDIENTS**

TLV (Units): Beryllium .002 mg/m<sup>3</sup>  
 Occupational Standards and References: NIOSH RTECS#: DS1750000

<u>Component</u>	<u>PEL</u>	<u>Ceiling</u>	<u>Peak</u>	<u>TLV/TLV-STEL</u>
Beryllium 0.002	0.005	0.025	0.002	N/A

\* All concentrations are as elemental Beryllium in milligrams Per Cubic Meter of Air.

**III. PHYSICAL DATA**

Atomic Number: 4  
 Evaporation Rate: N/A  
 Melting Point ( °C ): 1289  
 % Volatiles by Weight: None  
 Physical State: Solid Shape/Powder

Atomic Weight: 9.01  
 Boiling Point 760 mm Hg: 2970 °C  
 Density (g/cc): 1.85  
 Solubility in H<sub>2</sub> O: None  
 Color and Odor: Grey metallic, odorless

**IV. FIRE AND EXPLOSION HAZARDS DATA**

Flash Point (Method used): Non-combustible as a solid. Ignition occurred as a powder layer consisting of 1.0 to 5.0 micron particles between 540 °C and 700 °C. Coarser beryllium powder able to pass through a 74 micron sieve did not ignite like testing. Explosive limits: Not applicable to solids. As a cloud of 1.0 micron diameter powder ignition occurred at 910 °C. Beryllium powder greater than or equal to 2 microns in diameter did not ignite under like conditions. Regardless of powder size tested beryllium did not ignite as a cloud in a spark apparatus.

Extinguishing Media: As a solid, use extinguishing media appropriate to the surrounding fire. Do not use water or carbon dioxide to extinguish beryllium powder fires. As a powder, extinguish by smothering using a Class D fire extinguisher, dry sand, graphite powder, or sodium chloride.

Special Fire Fighting Procedures: None.

Unusual Fire & Explosion: Do not use water to extinguish fires around operations involving molten metal due to the potential for steam explosions. In addition, water may disassociate when in contact with burning beryllium powder or chips releasing flammable hydrogen gas which could burn and result in an explosion. Ventilation duct work which has accumulated a fine coating of beryllium dust on its internal surface poses a potentially serious fire hazard. Extinguishing using Class D fire extinguisher media and shut down or isolate the affected portion of the ventilation system. Because of this potential risk, sources of ignition such as flame, spark, etc. must not be allowed to enter the ventilation duct work. Also, duct work must be made of non-combustible material.

Special Fire Fighting Procedures: If this material becomes airborne as a respirable particulate during a fire situation, pressure-demand self-contained breathing apparatus must be worn by firefighters or any other persons potentially exposed to the metal fumes.

Beryllium powder will ignite at approximately 1200 °F. The powder is not explosive. Smother powder fires with dry sand, graphite powder or sodium chloride. Do not use water or carbon dioxide. Wear self-contained breathing apparatus to protect against airborne beryllium.

*Continued on Next Page*

## V. HEALTH HAZARD INFORMATION

Primary Routes of Exposure: Inhalation: An exposure to airborne beryllium in excess of the occupational standard can occur during routine handling, material transfer, chemical processing or further processing of powdered material and when machining, melting, casting, gross handling, picking, welding, grinding, sanding, polishing, milling, crushing, or otherwise abrading the surface of solid beryllium in a manner which generates finely divided particles.

Machining operations conducted under a flood of liquid coolant usually require local exhaust ventilation. The cycling through a machine of liquid lubricant/coolant containing finely divided beryllium in suspension can result in the concentration building to a point where the particulate may become airborne during use. A filter, centrifuge, or settling chamber can be installed in-line if necessary. The potential for exposures also may occur during repair or maintenance activities on contaminated equipment such as: furnace rebuilding, maintenance or repair of air cleaning equipment, structural renovation, welding, etc.

Ingestion: There are no known cases of illness resulting from ingestion of beryllium. Ingestion can occur from hand, clothing, food, and drink contact with metal dust, fume, or powder during hand to mouth activities such as eating, drinking, smoking, nail biting, etc. This product is not intended for internal consumption. As a standard hygiene practice, hands should be washed before eating or smoking.

Skin: This product is in an insoluble form and does not pose a potential for an allergic dermal response or skin absorption and can be safely handled with bare hands. Skin abrasion may cause irritation.

Eyes: Injury to the eyes can result from particulate irritation or mechanical injury to the cornea or conjunctiva by dust or particulate. Exposure may result from direct contact with airborne particulate (chips, dust, or powder) contact to the eye by contaminated hands or clothing.

Effects of Exposure:

Acute (immediate or near-term health effects): This product is insoluble and does not cause acute health effects.

Chronic (long-term health effects): Overexposure to airborne beryllium particulate may cause a serious lung disease, in certain sensitive individuals, called chronic beryllium disease (chronic berylliosis). Chronic beryllium disease is a condition in which the tissues of the lungs become inflamed, restricting the exchange of oxygen between the lungs and the bloodstream. Symptoms may include cough, chest pain, shortness of breath, weight loss, weakness, and fatigue. Long term effects may include loss of lung function, fibrosis, or subsequent secondary effects on the heart with eventual permanent impairment.

Carcinogenic references: Hazard communication regulations of the U.S. Occupational Safety & Health Administration require that caution labels for materials listed as potential carcinogens in either the International Agency for Cancer Research Monograph Series or the National Toxicology Program Annual Report on carcinogens must contain a cancer warning. Beryllium has also been so listed based principally on animal tests and therefore this material bears a label identifying it as a potential cancer hazard.

Medical Conditions Aggravated by Exposure: Persons with impaired pulmonary function, airway diseases, or conditions such as asthma, emphysema, chronic bronchitis, etc. may incur further impairment if excessive concentrations of dust or fume are inhaled. If prior damage or disease to the neurologic (nervous), circulatory, hematologic (blood), or urinary (kidney) system has occurred, proper screening or examinations should be conducted on individuals who may be exposed to further risk where handling and use of this material may cause excessive exposure.

### **EMERGENCY AND FIRST AID PROCEDURES:**

EYES: Dust or powder should be flushed from the eyes with copious amounts of clean water. If irritation persists obtain medical help. Contact lenses should not be worn when working with metal dusts and powders because the contact lens must be removed to provide adequate treatment.

*Continued on Next Page*

SKIN: Skin cuts and abrasions can be treated by standard first aid. Skin contamination with dust or powder can be removed by washing with soap and water. If irritation persists obtain medical help. Accidental implantation of this material beneath the skin requires it to be removed to prevent infection or development of a corn-like lesion.

INGESTION: Swallowing metal powder or dust can be treated by having the affected person drink large quantities of water and attempting to induce vomiting if conscious. Obtain medical help.

INHALATION: Breathing difficulty caused by inhalation of dust or fume requires immediate removal to fresh air. Although no cases in which a person stopped breathing as a result of exposure are known, if breathing has stopped, perform artificial respiration and obtain medical help.

## **VI. REACTIVITY DATA**

General Reactivity: This material is stable.

Incompatibility (Material to Avoid): Avoid contact with mineral acids and oxidizing agents which may generate hydrogen gas. Hydrogen gas can be an explosion hazard.

Hazardous Decomposition Products: Melting and gross handling or powdering operations can emit airborne dusts or fumes.

Hazardous Polymerization: Will not Occur

\*Oxidation will form on solid shapes when moist. Beryllium with acids may generate hydrogen.

## **VII. SPILL AND LEAK PROCEDURES**

Steps to Be Taken in Case Material Is Released or Spilled: In solid form this material poses no health or environmental risk. If this material is in powder or dust form, establish a restricted entry zone based on the severity of the spill. Persons entering the restricted zone must wear adequate respiratory protection and protective clothing appropriate for the severity of the spill. Cleanup should be conducted with a vacuum system utilizing a high efficiency particulate air filtration system followed by wet cleaning methods. Special care must be taken when changing filters on HEPA vacuum cleaners when used to clean up potentially toxic materials. Caution should be taken to minimize airborne generation of powder or dust and avoid contamination of air and water. Depending upon the quantity of material released, fine powder or dust spills to the environment may require reporting the National Response Center at (800) 424-8802 as well as the State Emergency Response Commission and Local Emergency Planning Committee.

Solid Waste Management: The U.S. Environmental Protection Agency has classified beryllium dust (P015) as a hazardous waste under the Resource Conservation and Recovery Act (RCRA). In section 40 CFR 261.33 (e) of RCRA, beryllium dust is considered hazardous when it is in the form of a "discarded commercial chemical product, off-specification species, container residue and spill residue, thereof." It is our understanding this designation only applies to commercially pure products or manufacturing intermediates in which beryllium is the "sole active ingredient." Due to the limited scope of this definition, we believe the only form of beryllium to which it applies is waste metallic beryllium dust in the form of commercially pure metallic beryllium powder. Beryllium scrap, chips, and powder are normally recycled. In cases where this is not justified, we recommend any off-specification metallic beryllium dust or powder be sealed within two plastic bags and then placed within a DOT container approved for flammable solids. The outer container must be labeled with the appropriate EPA hazardous waste label(s) and shipped under a uniform hazardous waste manifest and hazardous waste container label, also be followed when disposing of dust collector filters contaminated with metallic beryllium dust.

Ambient Air Emissions: Beryllium users involving outplant emissions are subject to the National Emission Standard for Beryllium as promulgated by EPA (40 CFR 61, Subpart C)> The National Emission Standard for Beryllium is 0.01 micrograms/m<sup>3</sup> (30 day average) in ambient air for those production facilities which have been qualified to be regulated through ambient air monitoring. Other facilities must meet a 10 gram per 24-hour total site emission limit. Most process air emission sources exhausting outside a production building will require an air permit from a local and/or air pollution control agency. The use of air cleaning equipment may be necessary to achieve the desired level of control. Tempered makeup air should be provided to prevent excessive negative pressure in a building. Direct recycling of cleaned process exhaust air is not recommended. Plant exhausts should be located so as not to re-enter the plant through makeup air or other inlets. Regular maintenance, inspection and monitoring of air cleaning equipment operating parameters is important to ensure adequate efficiency is maintained.

Wastewater: Wastewater regulations can vary considerably. Contact your local and state governments to determine what conditions apply.

Toxic Substances Control Act: Beryllium (CAS # 7440-41-7) is listed on the TSCA Chemical Substance Inventory of Existing Chemical Substances.

### **VIII. SPECIAL PROTECTION INFORMATION**

Respiratory Protection: When potential exposures are above the occupational limits, approved respirators must be used as specified by an Industrial Hygienist or other qualified professional. Respirator users should be medically evaluated to determine if they are physically capable of wearing a respirator. Quantitative and/or qualitative fit testing and respirator training must be satisfactorily completed by all personnel prior to respirator use in an environment where concentrations of airborne fumes or dusts may exceed the occupational standards. Users of any style respirator must be clean shaven on those areas of the face where the respirator seal contacts the face. Exposure to unknown concentrations of fumes or dusts requires the wearing of a pressure-demand self-contained breathing apparatus. Pressure-demand airline respirators are recommended for jobs with high potential exposures such as changing bags in a baghouse air cleaning device.

Housekeeping: Vacuum or wet cleaning methods are recommended for dust removal. Be certain to de-energize electrical systems as necessary before beginning wet cleaning. Vacuum cleaners with high efficiency particulate air (HEPA) filters are the recommended type. The use of compressed air to remove dusts should be avoided as such an activity can result in unnecessary short-term elevated exposures to dusts.

Ventilation and Engineering Controls: Whenever possible the use of local exhaust ventilation or other engineering controls is the preferred method of controlling exposure to airborne dust and fume to meet established occupational exposure limits. Where utilized, pickups on flexible ventilation lines should be positioned as close to the source of airborne contamination as possible. Disruption of the airflow in the area of a local exhaust inlet, such as by a man cooling fan, should be avoided. Ventilation equipment should be checked regularly to ensure it is functioning properly. Ventilation training is recommended for all users. Powders should be stored and transported in tightly sealed containers and must only be handled under controlled ventilated conditions.

Protective Gloves: Wear gloves to prevent metal cuts and skin abrasions particularly during handling.

Eye Protection: Wear safety glasses, goggles, face shield, or welders helmet when risk of eye injury is present particularly during melting, casting, machining, grinding, welding, powder handling, etc.

Maintenance: During repair or maintenance activities the potential exists for exposures to beryllium in excess of the occupational standard. Under these circumstances, protecting workers can require the use of specific work practices or procedures involving the combined use of ventilation, wet methods, respiratory protection, decontamination, special protective clothing, and when necessary, restricted work zones.

Welding: In accordance with OSHA regulation 29 CFR 1910.252 welding of beryllium is regulated as follows: Welding or cutting indoors, outdoors, or in confined spaces involving beryllium-containing base or filler metals shall be done using local exhaust ventilation and airline respirators unless atmospheric tests under the most adverse conditions have established that the workers' exposure is within the acceptable concentrations defined by 29 CFR 1910.1000. In all cases, workers in the immediate vicinity of the welding or cutting operations shall be protected as necessary by local exhaust ventilation or airline respirators. Please note: Metallic beryllium is not normally welded. Satisfactory welds are only achieved using electron beam welding.

Other Protective Equipment: No protective equipment or clothing is required when handling solid forms. Protective clothing such as fire retardant clothing, and molten metal splash resistant garments (ie: coats, hats, hoods, pants, shoes, gloves) should be worn as necessary to protect from accidental molten metal splash. Protective overgarment or work clothing should be worn by persons who may become contaminated with dusts, fumes, or powders. Contaminated work clothing and overgarment should be managed in such a manner so as to prevent secondary exposure to persons such as laundry operators and to prevent contamination to personal clothing. Never use compressed air to clean work clothing.

Environmental Surveillance: Exposure to beryllium should be determined by having air samples taken in the employee breathing zone, work area, and department. The frequency and type of air sampling should be as specified by an Industrial Hygienist or other qualified professional. Air sample results should be made available to employees.

Medical Surveillance: Periodic lung function tests, chest x-rays, and physical examinations should be used to monitor the potential effects of dust or fume exposure.

## **IX. SPECIAL PRECAUTIONS**

Packaging and Labeling Requirements: The following requirements of the U.S. Dept. of Transportation apply only to beryllium metal powder or dust, not to solid shapes. UN2926 Note: Must be marked on shipping papers and on the outside of the shipping container.

Shipping Name: RQ Flammable Solid, Poisonous, N.O.S. (Beryllium Metal Powder) Note: Must be marked on shipping papers and on the outside of the shipping container.

Hazard Class: Beryllium metal powder and dust are classified as Flammable Solid and Class B Poison. Note: Hazard class must be included on shipping papers.

Label(s) Required: Flammable Solid and Poison (For Beryllium Metal Powder or Dust Only). Note: Place on the outside of the shipping container.

Reportable Quantity: 10 lbs. (4.54). The RQ is limited to particles having a diameter less than 100 micrometers.

DOT Specification Container: Suitable for Flammable Solids. Recommended double overpack when shipping powder.

Other: Emergency response information is provided within this MSDS. This information must be included, in some form, with the shipping papers.

Prepared by: S. Dierks

Dated: November 1992

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**MATERIAL SAFETY DATA SHEET****I. PRODUCT IDENTIFICATION**

Trade Name: Calcium Metal

Synonym: Calcium

Chemical Nature: Alkaline Earth Metal

Formula: Ca

CAS #: 7440-70-2

**II. HAZARDOUS INGREDIENTS**

TLV (Units): No Published Data Percent: 60-100

HMIS Rating: Health: 1

Reactivity: 2

Flammability: 1

Other: F

EPA Hazard: Health: 1

Fire: 1 Reactive: 1

Pressure: 0

Delayed Health: 0

**III. PHYSICAL DATA**

Boiling Point 760 mm Hg: 2,718°F

Specific Gravity: 1.5

Vapor Density: N/A%

Volatiles by Weight: 0

Solubility in H<sub>2</sub>O: Reacts Violently with Water

Appearance and Odor: Gray Metallic Solid, No odor, except when it reacts with water to produce hydrogen.

**IV. FIRE AND EXPLOSION HAZARDS DATA**

Flash Point (Method used): N/A

Autoignition Temperature: N/A

Flammable Limits: Upper: N/A Lower: N/A

Extinguishing Media: Do not use water, foam, or halogenated hydrocarbons such as Halon or carbon tetrachloride to extinguish fire. Use only graphite powder, soda ash, powdered sodium chloride, or an appropriate metal-fire-extinguishing dry powder, such as Met-L-X. For large fires, withdraw from the area and let the fire burn.

Special Fire Fighting: Fire fighters should wear self-contained breathing apparatus (SCBA) with full face piece operated in the pressure-demand or positive pressure mode. Fire fighters should move containers from the fire area if this can be done without risk. Do not use water or foam. Use dry powders only.

Unusual Fire & Explosion: Core material is a flammable solid. It is extremely dangerous when wet. Keep it dry. This material forms Calcium Hydroxide and hydrogen gas (explosion hazard) when wet. This material forms CaO (quicklime) when it burns. It reacts with wet extinguishing agents (ie. Water, halogens, and possibly carbon dioxide).

**V. HEALTH HAZARD INFORMATION**

Exposure Limit Descriptions:

CEIL: Ceiling Exposure Limit: 15 Minutes

PEL: Permissible Exposure Limit: 8 hr TWA

REL: Recommended Exposure Limit: 8 hr TWA

STEL: Short Term Exposure Limit: 15 minutes

TLV: Threshold Limit Value: 8 hr TWA

This material will react with water or moisture causing heat. If this material contacts moisture in the eyes, on the skin, or in the respiratory tract, severe corrosive irritation may result.

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Acute Health Effects:

Inhalation: Inhalation of dust, or fume may cause respiratory irritation, cough, difficulty in breathing, and chemical pneumonitis.

Skin Contact: Contact with skin will cause irritation and possible corrosion damage.

Eye Contact: Substance is severely irritating to the eyes and may injure eye tissue if not promptly removed.

Ingestion: May cause irritation or burns to the mouth, throat, and stomach if swallowed. May cause vomiting.

Medical Conditions Aggravated by Exposure: Pre-existing chronic respiratory, skin or eye diseases.

Symptoms:

Inhalation: Severe irritation of the respiratory tract.

Skin Contact: Severe irritation.

Eye Contact: Severe irritation.

Ingestion: Severe irritation of throat and stomach.

Primary Routes of Exposure: Inhalation, ingestion, skin contact, eye contact.

Target Organs: Eyes, skin, and respiratory tract.

Carcinogenicity: IARC: No

OSHA: No

NTP: No

ACGIH: No

**EMERGENCY AND FIRST AID PROCEDURES:**

INHALATION: Remove to fresh air. If breathing is difficult, give oxygen. Seek immediate medical attention.

SKIN: Remove contaminated material immediately with a dry cloth. Wash with large amounts of water for at least 15 minutes.

EYE: Immediately flush eyes with running water for 15 minutes. Lift upper and lower eyelids occasionally. Get immediate medical attention.

INGESTION: If swallowed, and victim is conscious, give larger amounts of water to dilute the alkali. Do not induce vomiting.

Never give anything by mouth to an unconscious person.

NOTE TO PHYSICIAN: All treatments should be based on observed signs and symptoms of distress in the patient. Consideration should be given to the possibility that overexposure to materials other than this product may have occurred.

**VI. REACTIVITY DATA**

Stability: Unstable when in contact with water or acids.

Incompatibility (Material to Avoid): Water, Alkali-Metal Hydroxides and Carbonates

Hazardous Decomposition Products: Hydrogen, Calcium Hydroxide, Calcium Oxide

Hazardous Polymerization: Will not occur

**VII. SPILL OR LEAK PROCEDURES**

Steps to Be Taken in Case Material is Released or Spilled: Do not touch spilled material. Wear protective apparel. Do not smoke or place flame or ignition sources near a spilled area. Do not allow water to touch spilled material or to get inside containers. Use a cover (plastic sheet) to prevent water or rain from dissolving spilled material or to prevent water or rain from dissolving spilled material or to prevent its spreading. Isolate hazard area and keep nonessential personnel away from spill or leak site. Shovel small dry spills into a dry container and cover it tightly. Move containers away from spill to a safe area. Take up small spills with sand or an absorbent material and contain it as described above. Dike the flow of large calcium metal and water spills with soil, sandbags, or concrete. Keep the waste from entering drains or open sewers. Wear full protective gear.

Waste Disposal Method: Recycle or dispose in sealed containers according to Local State and Federal regulations.

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## VIII. SPECIAL PROTECTION INFORMATION

Respiratory Protection (Specify Type): This material does not have established exposure limits. Wear a positive pressure air-supplied respirator in situations where there may be a potential for airborne exposure.

Ventilation: Provide adequate exhaust ventilation to meet exposure limit requirements. An exhaust filter system may be required to avoid environmental contamination.

Protective Gloves: Impervious gloves

Eye Protection: Goggles or face shields

Other Protective Equipment: Wear rubber apron or other impervious clothing to prevent contact with skin.

## IX. SPECIAL PRECAUTIONS

Other Handling and Storage Conditions: Store in sealed containers away from water, acids, or organic materials. Protect containers against physical damage. Material will generate heat upon contacting water. Avoid damaging container.

## X. TRANSPORTATION INFORMATION

DOT Class: Flammable Solid

DOT Shipping Name: Calcium Metal

DOT Label: Flammable Solid, Dangerous when wet

Packing Group: II

UN Number: UN1401

Additional DOT Requirements: Keep cold and dry. Segregation is the same as for flammable solids, label Dangerous When Wet.

IMO Class: 4.3

IMO Label: Dangerous When Wet

The data and recommendations presented herein are based upon a review of ESPI files, published MSDS's, and standard toxicological reference sources. ESPI makes no guarantee or warranty, either express or implied as to the accuracy or completeness of these data and recommendations.

Issued By: S. Dierks

Date: July 1996

## 1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

<b>Chemical product name:</b> PLATING ANODE BALL	
<b>Other name:</b>	
<b>Product identifier:</b> Sn99.99%-BALL	
<b>Suggest purpose:</b> For plating process or wave soldering process.	
<b>Manufacture:</b> SHENMAO TECHNOLOGY INC.	
<b>Address:</b> No.12-1 Gongye 2 <sup>nd</sup> Rd., Guanin industrial area, Taoyuan County 328, Taiwan	
<b>TEL:</b> (886)3-416-0177	<b>FAX:</b> (886)3-416-0133
<b>Website:</b> <a href="http://www.shenmao.com">http://www.shenmao.com</a>	

## 2. HAZARDS IDENTIFICATION

<b>Goods hazard classification:</b> –
<b>Indication content:</b> –
<b>Other hazard:</b> –

## 3. COMPOSITION, INFORMATION OR INGREDIENT

Pure substances:

<b>Components name:</b> Tin
<b>Other name:</b>
<b>CAS No.:</b> 7440-31-5
<b>Hazards composition (wt. %):</b> 100%

## 4. FIRST AID MEASURES

<b>First aid method in the different exposed way:</b>	
<b>Inhalation</b>	<ol style="list-style-type: none"> <li>1. Moves the patient to the fresh air place immediately.</li> <li>2. If patient stop breathes, gives the artificial respiration.</li> <li>3. Keep the patient to be warm and the rest.</li> <li>4. Send him to the hospital immediately.</li> </ol>
<b>Skin contact</b>	<ol style="list-style-type: none"> <li>1. Use the soap or the neutral cleanser and the water clean the skin immediately.</li> <li>2. If seeps clothes, takes off clothes immediately, and uses the soap or the neutral cleanser and the water to cleans the skin.</li> <li>3. If still had Irritation feeling, take medical treatment immediately.</li> </ol>
<b>Eye contact</b>	<ol style="list-style-type: none"> <li>1. Clean eye by the massive clear water immediately and often opens the eyelid.</li> <li>2. If still had Irritation feeling, take medical treatment immediately.</li> </ol>
<b>Swallowing</b>	<ol style="list-style-type: none"> <li>1. If the patient soberly, drinks the massive water immediately.</li> <li>2. Urges to vomit by the finger insertion throat.</li> <li>3. If the patient is insensible, don't urge to vomit.</li> <li>4. If still had Irritation feeling, take medical treatment immediately.</li> </ol>
<b>Most important symptom and harm effect:</b> Irritation feeling	

**Protection to first-aid personnel:** Should wear the level C protection equipment in the safe area implementation first aid.

**Prompt to doctor:** If the patient swallows, consideration gastric lavage and bowel movement.

## 5. FIRE FIGHTING MEASURES

**Applicable fire-extinguishing:** Water.

**During fire fighting may cause special harm:**

The tin is nonflammable, but in the powder status it is inflammable.

**Fire fighting procedure:**

1. Move the container out to the safe area.
2. Cooling storing or container expose in a fire scene with water.
3. Do not let water enter container.

**The fire fighter's equip:** —

## 6. ACCIDENTAL RELEASE MEASURES

**Person-related safety precautions:**

The man who without wear protect equipping or clothes forbidden enter in the let out area before clean.

**Measures for environmental protection:** Ventilate to the let out area.

**Measures for cleaning/collecting:**

1. Recycle the material or bury with the qualified method in most convenient and safe way.
2. The liquid can be absorbed with the vermiculite, sand, soil or similar material.

## 7. HANDLING AND STORAGE

**Handling:** During work avoids producing the dust.

**Storage:**

1. Storage to suitably container which has the label.
2. Storage it in a coolly, dryly and ventilate well place.
3. Keep the flammable away.
4. Keep the oxidant away, such as chlorine ...etc.

## 8. EXPOSURE CONTROLS AND PERSONAL PROTECTION

**Engineering control:**

1. Partial air exhaust device.
2. Whole air exhaust device.

**Control parameter:**

	TWA	STEL	CEILING	BEIs
Tin	2 mg/m <sup>3</sup>	4 mg/m <sup>3</sup>	—	—

**Personal protection device:**

**Breath protection:** 0~10 mg/m<sup>3</sup>: Dustproof breathing mask.

20 mg/m<sup>3</sup>: 1. Dustproof breathing mask. 2. Air supply type breathing mask.

50 mg/m<sup>3</sup>: 1. Dustproof and air filter breathing mask. 2. Continuous air supply type breathing mask.

100 mg/m<sup>3</sup>: 1. Contain high performance filter and air filter breathing mask. 2. Continuous air supply type breathing mask.

Unknown consistency: Continuous air supply type breathing mask.

Escape: 1. Contain high performance filter and air filter breathing mask. 2. Continuous air supply type breathing mask.

**Hand protection:** Rubber or plastic glove.

**Eye protection:** 1. The safe goggles which can defend splash. 2. Face guard in an all-round way. 3. Don't wear the contact lenses.

**Skin and body protection:** Apron, long sleeves clothes.

## Hygiene measure:

1. Take off the clothes of pollution as soon as possible after the work, wear or abandon after cleaning, and tell the person about the pollutant who washing the clothes.
2. Forbid smoking or diet in the workplace.
3. After work, must wash hands completely.
4. Keep the workplace clean.

## 9. Physics and chemical property

<b>Appearance:</b> Silver gray solid	<b>Smell:</b> Tasteless
<b>Odor Threshold:</b> —	<b>Melting Point:</b> 232°C
<b>pH:</b> —	<b>Boiling point/Boiling Range:</b> 2270°C
<b>Inflammable(in solid, air):</b> —	<b>Flash Point:</b> —
<b>Decompose Temp.:</b> —	<b>Test Method:</b> —
<b>Auto igniting:</b> —	<b>Explosion Limit:</b> —
<b>Vapor Pressure:</b> 0 mmHg @ 20°C	<b>Vapor Density:</b> —
<b>Density:</b> 7.3g/cm <sup>3</sup> ( 20°C)	<b>Solubility:</b> Difficult to mix with water
<b>Log Octanol-Water Partitioning Coefficient:</b> —	<b>Volatility:</b> —

## 10. STABILITY AND REACTIVITY

**Stable:** Stable under the normal state, the powder state will be oxidized in the air.

### Possible danger reacts under the special state:

1. Metal tin and turpentine contact will produce fire and explode.
2. Plastics, rubber.
3. Acid, soda, oxide, sulphur, halogens.
4. When the tin powder mixed with sodium peroxide, contact with the moisture will produces the fire; contact the carbon dioxide or ammonium nitrate (higher than 200°C) will produces explode.
5. Carbon tetrachloride Tetrachloromethane (moisture existence), halide, cupric nitrate solution, potassium peroxide.

**Avoid state:** The powder state will be oxidized in the air.

**Avoid matter:**

1. Metal tin and turpentine contact.
2. Plastics, rubber.
3. Acid, soda, oxide, sulphur, halogens.
4. Tin powder mixed with sodium peroxide, carbon dioxide or ammonium nitrate (higher than 200°C).
5. Carbon tetrachloride Tetrachloromethane (in moisture existence), halide, cupric nitrate solution, potassium peroxide.

**Dangerous products of decomposition:** —

## 11. TOXICOLOGICAL INFORMATION

**Expose way:** —

**Symptom:** —

**Urgent toxicity:**

1. May cause the irritation of eyes, nose, throat, skin.
2. It is nonpoisonous to eat. But it will let the stomach to be uncomfortable by irritation.

**Slow toxicity or long-term toxicity:**

1. The person who has the following conditions is easy to be endangered: Dermatitis, breathe disease chronically.
2. In animal's experiment, it can increase the meat swollen probability.

## 12. ECOLOGICAL INFORMATION

**Ecological toxicity:** —

**Persistent and biodegradable:** —

**Bio-accumulative:** —

**The fluidity in the soil:** —

**Other effect:** —

## 13. DISCARD DISPOSAL METHOD

**DISCARD DISPOSAL METHOD:** Bury with qualified hygiene.

## 14. TRANSORTS INFORMATION

**UN No.:** —

**UN transportation Name:** —

**Transportation hazard classification:** —

**Packing classification:** —

**Marine pollutant (Yes/No):** —

**Specially ships method and notice:** —

## 15. Regulation materials

### Applicable regulation:

1. Labourer's safe health facilities rule.
2. The harmful thing permits concentration standard in the labourer work surrounding air.
3. The undertaking offal stores and purge method and standard.
4. Dangerous thing and harmful thing rule.
5. Safety regulation of the road traffic.

## 16. Other information

<b>Reference</b>	Council of Labor Affairs Material Safety Data Sheets Database	
<b>Prepared By</b>	Department: SHENMAO micro material institute – Alloy Development	
	Add: No.12-1 Gongye 2 <sup>nd</sup> Rd., Guanin industrial area, Taoyuan County 328, Taiwan	
	TEL: (886)3-416-0177	
<b>Author</b>	Title: Manager	Name: Jim Wang
<b>Issued date</b>	2008/6/16	