University of Waterloo

Amorphous Flexible Electronics Technology [AFET] Group

Giga-to-Nanoelectronics Centre

Indium Electroplating SOP

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Contents

1. Purpose

Depositing Indium from an electroplating solution onto samples for die-bonding. The solution used is from Indium Corporation of America and uses their Indium Sulfamate Plating Kit to perform the Indium electroplating.

2. Equipment

Name	Quantity
Fume Hood	1
N2 Gun	1
DI Water Bottle	1
2L Beakers	2
400mL Beaker	1
200mL Beaker	1
1L HDPE Bottle	1
500mL HDPE Bottle	1
Hotplate with Magnetic Stirring	1
Magnetic Stir bar	1
Funnel	1
Insulated Copper Wire	2
Banana Plug Wires	2
Copper Alligator Clips	2
Tweezers kit	1
Custom Sample Holder	1

3. Materials

Name	Quantity
Indium Sulfamate Plating Bath	1L
Indium Anode (30cm x 2.5cm x 1.5mm)	1
Sulfamic Acid	150mL
15-20% HCL	150mL
DI Water	1L
pH Paper Set or pH Meter	1
Clean Room Wipes Pack	1

4. Chemical Hazards

No new chemicals are being introduced into the lab, and the SDS of the chemicals relevant to the experiment are attached with the following SOP.

- Sulfamic Acid
- Indium Sulfamate Plating Bath

5. Safety Procedure

1. Lab apron, rubber gloves, safety goggles, face-shield, and closed-toed shoes must be worn before interacting with any chemicals
2. To avoid spills ready all beakers and bottles under the fume-hood over clean room wipes before opening
3. Use care when opening and pouring chemicals to avoid spills during the preparation and process of the experiment
4. Do not touch your face or exposed skin during the process of the experiment
5. Always wash hands after handling any chemicals or materials
6. Avoid inhaling the mist or vapor of the chemicals, and avoid exposure to eyes and skin
7. Perform the entire experiment under a fume hood

6. Process Flow

1. Prepare the fume hood surface:
   (a) Place clean room wipes on the surface of the fume hood.
   (b) Ensure your name and contact information are visible at the work location in case people need to contact you.
   (c) Chemicals in the beakers should be identified and all beakers should be labeled with what chemicals will be in them.
2. Place the digital hotplate with stirring functionality inside the fume hood.
   (a) Do not place a wipe on the hotplate surface. This interferes with the transmission of heat to the beaker and its contents. It may also present a fire hazard. This is regardless of weather the heating element will be used.
   (b) Do NOT turn on the heating element over the course of this experiment.
3. Set all four beakers (2x 2L, 1x 400mL, 1x 200mL) under the fume hood, and set one 2L beaker on the hotplate. Place the stir bar inside the beaker on the hotplate.
4. Build the Custom Sample Holder and place in the beaker on the hotplate at the appropriate distance for the electroplating process (5cm).

5. Place the indium anode into the beaker on the hotplate, ensure that there is an appropriate distance from the sample and ensure that the electrode is connected to an alligator clip. Be sure to use fresh gloves when handling the indium electrode to avoid contamination.
   (a) Anode/cathode distance may alter grain size and uniformity of electroplating.
   (b) It is essential that the sample is perpendicular to the normal of the anode (indium)
6. Ensure that all PPE is worn appropriately, and no skin is exposed.
7. Acquire the indium sulfamate solution, sulfamic acid, and diluted HCl solutions from the Acids cabinet and transport it to the fume hood.
   (a) Pour the indium sulfamate solution into the beaker on the hotplate.
      i. Ensure that the hotplate is OFF and the beaker is at room temperature to avoid shattering glass
   (b) Pour the sulfamic acid into the 200mL beaker
   (c) Pour the HCl dilution into the 400mL beaker
   (d) Pour 2L of DI water into the remaining large beaker
   (e) Turn on stirring to 300RPM
8. Check the pH of the indium sulfamate solution and verify it is between 1.5 and 2. If the pH exceeds 2 titrate sulfamic acid and mix until the pH enters the range again.
   (a) Titration of sulfamic acid into the indium sulfamate solution can be done using a pipette that is labeled and only to be used for sulfamic acid. Since the exact pH is not important titration with a pipette is sufficient and a buret is not required.
   (b) Note that all tools used in the titration process must be rinsed with DI water and dried with N2.
9. Power should ideally be supplied with a pulsed constant current source and set to values in accordance with current over the plating surface area.
   (a) Ensure that the power supply is set and ready but disconnected from the sample now.
   (b) Measure the surface area of the sample and validate that current supplied to the sample is nominal to $10 - 20A/ft^2$ or $0.01 - 0.02A/cm^2$. For the current design this corresponds to nominal values of (0.02A, 0.1V)
   (c) Power should be connected as NEGATIVE terminal to sample and POSITVE terminal to indium anode
   (d) Electroplating time is a function of the current density and expected final thickness of the deposited indium.
10. Rinse the sample with DI water, place into HCl solution for the activation time (5min), rinse again with DI water, and place into the sulfamic acid solution for cleansing (3min).

(a) The sample should be attached to the custom holder

(b) The HCl solution is required for cleaning and acid-activation (see the guide to indium plating).

(c) The sulfamic acid ensures the pH of the base metallization surface remains acidic and no reformation of oxide occurs.

11. Place the sample into the plating bath at the appropriate distance and turn on the power supply for the target plating time.

(a) See the Indium electroplating guide for more information on how this affects the grain size.

7. Waste Disposal

- DO NOT dispose of any chemicals from this experiment in the drain
- Always use appropriate waste bottles for any chemicals including DI water. Each bottle MUST be labeled with UWaterloo Waste Labels. When bottles are 80% full, they must be disposed of at UW Chemical Waste. For additional waste new bottles must be used
- Partially filled waste bottles will be placed in the acids cabinet and must be labeled with the waste materials that it contains.

8. Storage of the Indium Sulfamate Plating Kit

- SDSs of indium sulfamate bath and sulfamic acid are attached at the end of this document
- Store indium sulfamate bath and acids in correctly labelled HDPE bottles after use and stored in the Acids cabinet (cool, dry, well-ventilated)
- All bottles should be correctly labelled with containing chemicals, and your name should be on them

9. Storage of the Equipment

- Ensure all equipment (beakers, pipette, funnel, stir-bar) is rinsed 2-3 times and labeled according to the materials it was used with. Avoid using other chemicals with the labeled equipment to prevent contamination
- Cover the indium anode, the beakers, and the funnel with aluminum foil
- Replace all equipment into the storage box labeled from whence it came

10. Emergency Procedures

10.1. Chemical Exposure

If the indium sulfamate solution ends up in your eyes, rinse continuously with water for 15 minutes.

Chemical	Location	Procedure
Indium Sulfamate	Skin	Wash with plenty of soap and water; see safety shower located on opposite wall to fume hood
Indium Sulfamate	Swallowed	Rinse mouth thoroughly, sip water, seek medical attention if needed
Indium Sulfamate	Eyes	Rinse eyes with water for 15 minutes; see eyewash station located on the opposite wall to the fume hood
Indium Sulfamate	Inhaled	If breathing difficult, remove self to fresh air and rest comfortably
Sulfamic Acid	Skin	Wash with plenty of water; see safety shower located on opposite wall to fume hood
Sulfamic Acid	Eyes	Wash with plenty of water; see safety shower located on opposite wall to fume hood
Hydrochloric Acid	Skin	Wash with plenty of water; see safety shower located on opposite wall to fume hood
Hydrochloric Acid	Swallowed	Rinse mouth thoroughly, sip water, seek medical attention if needed
Hydrochloric Acid	Eyes	Rinse eyes with water for 15 minutes; see eyewash station located on the opposite wall to the fume hood
Hydrochloric Acid	Inhaled	If breathing difficult, remove self to fresh air and rest comfortably

10.2. Chemical Spill

For any of indium sulfamate bath, sulfamic acid, and hydrochloric acid.

1. Ensure other people in the immediate vicinity are aware of the chemical spill.
2. Use the spill kit located above the Acids Cabinet to absorb the spilt materials
3. Gather spill kit materials into secure and ventilated area.
4. Call Environmental Safety Facility at Ext. 35755 for disposal instructions.

11. References

Indium Electroplating SOP by Kunal Chandan (Last updated: 2022/09/20)

Indium Electroplating SOP by Belle Shin (Last updated: 2022/01/03)

Indium Electroplating SOP by Pranav Gavirneni (Last updated: 2021/03/16)

A Guide to Indium Plating Surface Preparation https://www.indium.com/technical-documents/application-notes/download/29/ (Retrieved: 2022/09/14)

12. Sulfamic Acid SDS

In appendix.

13. Indium Electroplating Bath SDS

In appendix.

14. Appendix

SAFETY DATA SHEET

Version 6.8
Revision Date 18.03.2023
Print Date 19.03.2023

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1 Product identifiers

Product name : Sulfuric acid

Product Number : 339741
Brand : Aldrich
Index-No. : 016-020-00-8
CAS-No. : 7664-93-9

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses : Laboratory chemicals, Synthesis of substances

1.3 Details of the supplier of the safety data sheet

Company : SIGMA-ALDRICH CANADA LTD.
2149 WINSTON PARK DRIVE
OAKVILLE ON L6H 6J8
CANADA

Telephone : +1 905 829-9500
Fax : +1 905 829-9292

1.4 Emergency telephone

Emergency Phone # : 800-424-9300 CHEMTREC (USA)
+1-703-527-3887 CHEMTREC (International)
24 Hours/day; 7 Days/week

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

GHS Classification in accordance with Hazardous Products Regulations (HPR) (SOR/2015-17)

Corrosive to Metals (Category 1), H290
Skin corrosion (Category 1A), H314
Serious eye damage (Category 1), H318

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram

Signal Word Danger

Hazard statement(s)

H290	May be corrosive to metals.
H314	Causes severe skin burns and eye damage.

Precautionary statement(s)

P234	Keep only in original packaging.
P264	Wash skin thoroughly after handling.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P301 + P330 + P331	IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.
P303 + P361 + P353	IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water.
P304 + P340 + P310	IF INHALED: Remove person to fresh air and keep comfortable for breathing. Immediately call a POISON CENTER/ doctor.
P305 + P351 + P338 + P310	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER/ doctor.
P363	Wash contaminated clothing before reuse.
P390	Absorb spillage to prevent material damage.
P405	Store locked up.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS

- none

SECTION 3: Composition/information on ingredients

3.1 Substances

Formula	:	H_2O_4S
Molecular weight	:	98.08 g/mol
CAS-No.	:	7664-93-9
EC-No.	:	231-639-5
Index-No.	:	016-020-00-8

Component	Classification	Concentration *
sulphuric acid		
	Met. Corr. 1; Skin Corr. 1A; Eye Dam. 1; H290, H314, H318 Concentration limits: >= 0.3 %: Met. Corr. 1, H290; >= 15 %: Skin Corr. 1A, H314; 5 - < 15 %: Skin Irrit. 2, H315; 5 - < 15 %: Eye Irrit. 2, H319;	<= 100 %
* Weight %		

For the full text of the H-Statements mentioned in this Section, see Section 16.

SECTION 4: First aid measures

4.1 Description of first-aid measures

General advice
First aiders need to protect themselves. Show this material safety data sheet to the doctor in attendance.

If inhaled
After inhalation: fresh air. Call in physician.

In case of skin contact
In case of skin contact: Take off immediately all contaminated clothing. Rinse skin with water/ shower. Call a physician immediately.

In case of eye contact
After eye contact: rinse out with plenty of water. Immediately call in ophthalmologist. Remove contact lenses.

If swallowed
After swallowing: make victim drink water (two glasses at most), avoid vomiting (risk of perforation). Call a physician immediately. Do not attempt to neutralise.

4.2 Most important symptoms and effects, both acute and delayed
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed
No data available

SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media
Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.

Unsuitable extinguishing media
For this substance/mixture no limitations of extinguishing agents are given.

5.2 Special hazards arising from the substance or mixture
Sulfur oxides
Not combustible.
Ambient fire may liberate hazardous vapours.

5.3 Advice for firefighters
Stay in danger area only with self-contained breathing apparatus. Prevent skin contact by keeping a safe distance or by wearing suitable protective clothing.

5.4 Further information
Suppress (knock down) gases/vapors/mists with a water spray jet. Prevent fire extinguishing water from contaminating surface water or the ground water system.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

Advice for non-emergency personnel: Do not breathe vapors, aerosols. Avoid substance contact. Ensure adequate ventilation. Evacuate the danger area, observe emergency procedures, consult an expert.
For personal protection see section 8.

6.2 Environmental precautions

Do not let product enter drains.

6.3 Methods and materials for containment and cleaning up

Cover drains. Collect, bind, and pump off spills. Observe possible material restrictions (see sections 7 and 10). Take up with liquid-absorbent and neutralising material (e.g. Chemizorb® H^+, Merck Art. No. 101595). Dispose of properly. Clean up affected area.

6.4 Reference to other sections

For disposal see section 13.

SECTION 7: Handling and storage

7.1 Precautions for safe handling

For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Storage conditions
No metal containers.
Tightly closed.

Storage class
Storage class (TRGS 510): 8B: Non-combustible, corrosive hazardous materials

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

SECTION 8: Exposure controls/personal protection

8.1 Control parameters

Ingredients with workplace control parameters

Components	CAS-No.	Value	Control parameters	Basis
sulphuric acid	7664-93-9	TWA	0.2 mg/m3	Canada. British Columbia OEL
Remarks	ACGIH 'A2' applies to those substances that are considered suspected human carcinogens. IARC '1' applies to substances categorized as carcinogenic to humans, and used when there is sufficient evidence of carcinogenicity in humans.			
		TWAEV	0.2 mg/m3	Canada. Ontario OELs
		STEV	3 mg/m3	Canada. Ontario OELs

		STEL	3 mg/m3	Canada. Alberta, Occupational Health and Safety Code (table 2: OEL)
		TWA	1 mg/m3	Canada. Alberta, Occupational Health and Safety Code (table 2: OEL)
		TWA	1 mg/m3	Québec. Regulation respecting occupational health and safety, Schedule 1, Part 1: Permissible exposure values for airborne contaminants
		STEL	3 mg/m3	Québec. Regulation respecting occupational health and safety, Schedule 1, Part 1: Permissible exposure values for airborne contaminants
		TWA	0.2 mg/m3	USA. ACGIH Threshold Limit Values (TLV)

8.2 Exposure controls

Appropriate engineering controls
Change contaminated clothing and immerse in water. Preventive skin protection Wash hands and face after working with substance.

Personal protective equipment

Eye/face protection
Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU). Tightly fitting safety goggles

Skin protection
This recommendation applies only to the product stated in the safety data sheet, supplied by us and for the designated use. When dissolving in or mixing with other substances and under conditions deviating from those stated in EN374 please contact the supplier of CE-approved gloves (e.g. KCL GmbH, D-36124 Eichenzell, Internet: www.kcl.de).
Full contact
Material: Viton®
Minimum layer thickness: 0.7 mm
Break through time: 480 min
Material tested:Vitoject® (KCL 890 / Aldrich Z677698, Size M)

This recommendation applies only to the product stated in the safety data sheet, supplied by us and for the designated use. When dissolving in or mixing with other substances and under conditions deviating from those stated in EN374 please contact the supplier of CE-approved gloves (e.g. KCL GmbH, D-36124 Eichenzell, Internet: www.kcl.de).
Splash contact
Material: butyl-rubber
Minimum layer thickness: 0.7 mm
Break through time: 120 min
Material tested:Butoject® (KCL 898)

Body Protection
Acid-resistant protective clothing

Respiratory protection
required when vapours/aerosols are generated. Our recommendations on filtering respiratory protection are based on the following standards: DIN EN 143, DIN 14387 and other accompanying standards relating to the used respiratory protection system.

Control of environmental exposure
Do not let product enter drains.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: clear, liquid Color: colorless
b)	Odor	odorless
c)	Odor Threshold	Not applicable
d)	pH	1.2 at 5 g/l
e)	Melting point/freezing point	Melting point: 10.31 °C (50.56 °F)
f)	Initial boiling point and boiling range	290 °C 554 °F - lit.
g)	Flash point	()No data available
h)	Evaporation rate	No data available
i)	Flammability (solid, gas)	No data available
j)	Upper/lower flammability or explosive limits	No data available
k)	Vapor pressure	1.33 hPa at 145.8 °C (294.4 °F)
l)	Vapor density	3.39 - (Air = 1.0)
m)	Density	1.84 g/cm3 at 25 °C (77 °F) - lit.
	Relative density	No data available
n)	Water solubility	soluble
o)	Partition coefficient: n-octanol/water	Not applicable for inorganic substances
p)	Autoignition temperature	No data available
q)	Decomposition temperature	No data available
r)	Viscosity	No data available
s)	Explosive properties	No data available
t)	Oxidizing properties	none

9.2 Other safety information

Surface tension	55.1 mN/m at 20 °C (68 °F)
Relative vapor density	3.39 - (Air = 1.0)

SECTION 10: Stability and reactivity

10.1 Reactivity

No data available

10.2 Chemical stability

The product is chemically stable under standard ambient conditions (room temperature) .

10.3 Possibility of hazardous reactions

A risk of explosion and/or of toxic gas formation exists with the following substances:
Water
Alkali metals
alkali compounds
Ammonia
Aldehydes
acetonitrile
Alkaline earth metals
alkalines
Acids
alkaline earth compounds
Metals
metal alloys
Oxides of phosphorus
phosphorus
hydrides
halogen-halogen compounds
oxyhalogenic compounds
permanganates
nitrates
carbides
combustible substances
organic solvent
acetylidene
Nitriles
organic nitro compounds
anilines
Peroxides
picrates
nitrides
lithium silicide
iron(III) compounds
bromates
chlorates
Amines
perchlorates
hydrogen peroxide

10.4 Conditions to avoid
no information available

10.5 Incompatible materials
animal/vegetable tissuesContact with metals liberates hydrogen gas.

10.6 Hazardous decomposition products
In the event of fire: see section 5

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity
LD50 Oral - Rat - male and female - 2,140 mg/kg
Remarks: (ECHA)
Inhalation: Corrosive to respiratory system.
Dermal: No data available

Skin corrosion/irritation
Skin - Rabbit
Result: Extremely corrosive and destructive to tissue.
Remarks: (IUCLID)

Serious eye damage/eye irritation
Remarks: Causes serious eye damage.

Respiratory or skin sensitization
No data available

Germ cell mutagenicity
Test Type: Ames test
Test system: Salmonella typhimurium
Result: negative
Remarks: (HSDB)

Carcinogenicity
No data available

Reproductive toxicity
No data available

Specific target organ toxicity - single exposure
No data available

Specific target organ toxicity - repeated exposure
No data available

Aspiration hazard
No data available

11.2 Additional Information

RTECS: WS5600000
Material is extremely destructive to tissue of the mucous membranes and upper respiratory tract, eyes, and skin., spasm, inflammation and edema of the larynx, spasm, inflammation and edema of the bronchi, pneumonitis, pulmonary edema, burning sensation, Cough, wheezing, laryngitis, Shortness of breath, Headache, Nausea, Vomiting, Pulmonary edema. Effects may be delayed.

To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

After inhalation of aerosols: damage to the affected mucous membranes. After skin contact: severe burns with formation of scabs. After eye contact: burns, corneal lesions. After swallowing: severe pain (risk of perforation!), nausea, vomiting and diarrhoea. After a latency period of several weeks possibly pyloric stenosis.

Other dangerous properties can not be excluded.

Handle in accordance with good industrial hygiene and safety practice.

Stomach - Irregularities - Based on Human Evidence

SECTION 12: Ecological information

12.1 Toxicity

Toxicity to daphnia and other aquatic invertebrates	static test EC50 - Daphnia magna (Water flea) - > 100 mg/l - 48 h (OECD Test Guideline 202)
Toxicity to algae	static test ErC50 - Desmodesmus subspicatus (green algae) - > 100 mg/l - 72 h (OECD Test Guideline 201)

12.2 Persistence and degradability

The methods for determining the biological degradability are not applicable to inorganic substances.

12.3 Bioaccumulative potential

No data available

12.4 Mobility in soil

No data available

12.5 Results of PBT and vPvB assessment

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Endocrine disrupting properties

No data available

12.7 Other adverse effects

Biological effects:
Harmful effect due to pH shift.
Caustic even in diluted form.
Does not cause biological oxygen deficit.
Endangers drinking-water supplies if allowed to enter soil and/or waters in large quantities.
Neutralisation possible in waste water treatment plants.
Discharge into the environment must be avoided.

SECTION 13: Disposal considerations

13.1 Waste treatment methods

Product
Waste material must be disposed of in accordance with the national and local regulations. Leave chemicals in original containers. No mixing with other waste. Handle uncleaned containers like the product itself. See www.retrologistik.com for processes regarding the return of chemicals and containers, or contact us there if you have further questions.

SECTION 14: Transport information

TDG
UN number: 1830 Class: 8 Packing group: II
Proper shipping name: SULPHURIC ACID
Labels: 8
ERG Code: 137
Marine pollutant: no

IMDG
UN number: 1830 Class: 8 Packing group: II EMS-No: F-A, S-B
Proper shipping name: SULPHURIC ACID

IATA
UN number: 1830 Class: 8 Packing group: II
Proper shipping name: Sulphuric acid

SECTION 15: Regulatory information

This product has been classified in accordance with the hazard criteria of the Hazardous Products Regulations (HPR) and the SDS contains all the information required by the HPR.

SECTION 16: Other information

Further information
The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

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SAFETY DATA SHEET

1. PRODUCT AND COMPANY IDENTIFICATION

Product Identifier: INDIUM SULFAMATE PLATING BATH

SDS Number: SDS-IB002 **Revised Date:** 11 NOVEMBER 2021
Version 1.1

Product Use: INDUSTRIAL USE – Indium Plating bath solution. Use includes surface preparations, decorative finishing on metals and plastics, sealing applications, use in aircraft bearings and electrical interconnections in microelectronic devices.

MANUFACTURER:

In America:
The Indium Corporation of America®
34 Robinson Rd., Clinton, NY 13323
Information: (315) 853-4900
mkinne@indium.com

In Europe:
The Indium Corporation of America® (European Operations)
7 Newmarket Ct
Kingston, Milton Keynes, UK, MK 10 OAG
Information: +44 [0] 1908 580400

In Asia:
Indium Corporation of America
Asia-Pacific Operations-Singapore
29 Kian Teck Avenue
Singapore 628908
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In India:
Indium Solder Private Limited
Shed A, NP-7 Guidny Industrial Estate,
Ekkaduthangal, Chennai, Tamil Nadu, India 600032
Tel: +91-044-46877888

EMERGENCY PHONE:
CHEMTREC 24 hrs.
USA: 1 (800) 424-9300
Outside USA: +1 (703) 527-3887
China: Emergency 86+ 4001-204937

In China:
Indium Corporation (Suzhou), Co., Ltd.
No. 428 Xinglong Street
Suzhou Industrial Park
Suchun Industrial Square
Unit No. 14-C
Jiangsu Province, China 215126
Information: (86) 512-6283-4900

http://www.indium.com

2. HAZARDS IDENTIFICATION

PRIMARY ROUTES OF ENTRY:				CARCINOGEN LISTED IN:			
✳Eye	✳Inhalation	✳Skin	✳Ingestion	NTP	IARC	OSHA	✳Not Listed

GHS:

Classification
Eye irritation (Category 2A)
Skin irritation (Category 2)
Specific target organ toxicity, repeated exposure (Category 1)

Signal Word: Danger

Hazard statement(s)

H315	Causes skin irritation
H319	Causes serious eye irritation
H372	Causes damage to organs through prolonged or repeated exposure

Precautionary statement(s)

P233	Keep container tightly closed
P261	Avoid breathing dust/fume/gas/mist/vapors/spray
P270	Do not eat, drink or smoke when using this product
P273	Avoid release to the environment
P280	Wear protective gloves/protective clothing/eye protection/face protection
P362+P364	Take off contaminated clothing and wash before reuse
P301+P312	IF SWALLOWED: Call a POISON CENTER/doctor if you feel unwell
P302+P352	IF ON SKIN: Wash with plenty of soap and water
P304+P341	IF INHALED: If breathing is difficult, remove victim to fresh air and keep at rest in a position comfortable for breathing
P305+P351+P338	IF IN EYES: Rinse continuously with water for several minutes. Remove contact lenses if present and easy to do - continue rinsing.

POTENTIAL HEALTH EFFECTS:

Eye Contact: May cause severe irritation and possible burns.

Ingestion: May cause burning and irritation or damage of mouth, stomach and other internal organs.

Inhalation: Possible damage to nasal and respiratory passages and mucous membranes.

Skin Contact: May cause skin irritation.

Chronic: Signs and symptoms of exposure are difficulty breathing, watery eyes, red irritating skin, abdominal pain and discomfort. Kidney and liver damage from injecting indium compounds has been reported based on limited animal testing but no systematic effects from human exposure has been reported.

WARNING: This product can expose you to chemicals including [trace amounts of lead] which is known to the State of California to cause cancer, and birth defects or other reproductive harm. For more information go to www.P65Warnings.ca.gov

Note: The Indium Corporation does not recommend, manufacture, market or endorse any of its products for human consumption.

3. COMPOSITION / INFORMATION ON INGREDIENTS

Components	% wt/v	CAS Registry #/EINECS	PEL mg/m³	TLV-TWA mg/m³	TLV-STEL mg/m³
INDIUM SULFAMATE		66027-93-8/266-072-2	N.E.	N.E.	N.E.
SULFAMIC ACID	2-4	5329-14-6/226-218-8	N.E.	N.E.	N.E.
INDIUM (30-60 grams/liter of solution)		7440-74-6/231-180-0			
		(US)	0.1	0.1	-
		(EU)	-	0.1	0.3
		(Canada)	-	0.1	0.3
		(Singapore)	0.1	-	-
		(Mexico)	0.1	-	0.3
		(China)	0.1	-	0.3
WATER		7732-18-5	N.E.	N.E.	N.E.

N.E. = Not established

4. FIRST AID MEASURES

Eye Contact: Hold eyelids apart and flush eyes with plenty of tepid water for at least 15 minutes. Seek medical attention if irritation persists.

Ingestion: If patient is conscious, ONLY induce vomiting as directed by trained personnel. NEVER give anything by mouth to an unconscious person. Seek medical attention immediately.

Inhalation: Remove to fresh air. If not breathing, give artificial respiration or oxygen by trained personnel. Seek immediate medical attention.

Skin Contact: Remove contaminated clothing. Wash affected area with soap and water. Wash clothing before reuse. If irritation persists, obtain medical attention.

5. FIRE FIGHTING MEASURES

Flash Point: Not established. **Method:** Not established.

Auto-ignition Temperature: Not established.

Flammable Limits: Limits not established. Not flammable. Will not burn.

Extinguishing Media: Use extinguishers appropriate for the surrounding fire conditions.

Special Fire Fighting Procedures: Firefighters must wear NIOSH approved self-contained breathing apparatus and full protective clothing.

6. ACCIDENTAL RELEASE MEASURES

Spill or Leak Procedures: Isolate spill and clean up with absorbent or neutralize. Place material in proper waste container. An approved air purifying respirator with acid gas/particulate cartridge and other personal protective equipment such as gloves is recommended. Dispose of in accordance with Federal, State and Local regulations. In Europe dispose of following the Special Waste Regulations. Indium may have reclaim value.

7. HANDLING AND STORAGE

Handling: Keep containers tightly closed when not in use. Use care to avoid spills. Wear appropriate personal protective equipment. Use good work practices when handling corrosive material. Always thoroughly wash your hands after handling this product. DO NOT touch or rub eyes until hands are washed.

Storage Precautions: Store product in tightly capped original containers in a cool, well ventilated and dry area.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Engineering Controls: Exhaust ventilation is recommended to control any air contaminants.

Personal protection:

Eyes: Wear chemical safety glasses/goggles. The addition of a face shield may be necessary during some work practices.

Respirator: A NIOSH approved air-purifying respirator with an acid gas/particulate filter is recommended under certain circumstances where airborne concentrations are expected to be elevated.

Skin: Compatible chemical resistant gloves. Rubber or vinyl gloves are recommended.

Other: Lab coat, apron, eyewash fountain in work area. Avoid the use of contact lenses in high fume/splash areas.

Work/Hygienic: Maintain good housekeeping. Clean up spills immediately. Good personal hygiene is essential. Avoid eating, smoking or drinking in the work area. Wash hands thoroughly with soap and water immediately upon leaving the work area.

Refer to Indium Corporation of America's Application Notes: ***Proper Surface Preparation for Indium Plating.***

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance:	Clear (new) or amber liquid	**Boiling Point:**	Not established
Odor:	Odorless	**Melting Point:**	Not applicable
Specific Gravity:	$H_2O = 1$	**pH:**	2 (Corrosive)
Vapor Pressure:	Not applicable.	**Solubility in Water:**	Soluble
Vapor Density:	Not applicable		

Note: When using product the pH is adjusted as needed. Review the Product Data Sheet for proper use of the plating bath solution. Preferred pH is 1.5-2. Addition of a 10% solution of sulfamic acid dissolved in distilled or deionized water is used to adjust the pH.

10. STABILITY AND REACTIVITY

General: Stable.

Conditions to Avoid: May give off toxic fumes and possible oxides of constituents when exposed to

Unusually high temperatures. Not established.

Incompatible Materials: Avoid contact with bases and oxidizers.

Hazardous Decomposition / Combustion: Toxic fumes may form at elevated temperatures.

Hazardous Polymerization: Will not occur.

11. TOXICOLOGICAL INFORMATION

Carcinogenicity:
National Toxicology Program (NTP): No
Occupational Safety & Health Administration (OSHA): No
U.N. International Agency for Research on Cancer (IARC): No

LD50: Not established. **LC50:** Not established.

Mixture not tested

Indium: LD50 oral >2000 mg/kg bw (rat)
Specific target organ toxicity- repeated exposure (Category 1).

Consult ECHA- EU REACH: Indium
DNEL inhalation-6.3 ug/m3 repeated dose toxicity. Short term-no hazard identified
DNEL dermal-0.12 mg/kg bw/day. Short term-no hazard identified
DNEL- (Derived No Effect Level)
NIOSH RTECS Number: NL1050000

12. ECOLOGICAL INFORMATION

Contains a substance that is harmful to aquatic organisms, and may cause long term adverse effects in the aquatic environment.

Mixture not tested

Indium is not chronically toxic to organisms.

13. DISPOSAL CONSIDERATION

Waste Disposal Method: Scrap indium metal may have some value. Contact a commercial indium reclaimer for recycling. Otherwise, dispose of in accordance with all Federal, State and Local environmental regulations. In Europe follow the Special Waste Regulations. Refer to Indium Corporation application bulletins regarding reclamation and disposal of indium sulfamate plating bath solution. http://www.indium.com see under Technical Documents.

14. TRANSPORT INFORMATION

Transport in accordance with applicable international regulations and requirements.

Shipping Name: UN 3264,Corrosive Liquid, Acidic, Inorganic, N.O.S., 8, PGIII (sulfamic acid, indium sulfamate mixture)

North America Emergency Guidebook – Guide 154

Marine pollutant: No

15. REGULATORY INFORMATION

The information in this Safety Data Sheet meets the requirements of the United States Occupational Safety and Health Act and regulations promulgated hereunder (29 CFR 1910.1200 ET. SEQ.).


WARNING: This product can expose you to chemicals including [trace amounts of lead] which is known to the State of California to cause cancer, and birth defects or other reproductive harm. For more information go to www.P65Warnings.ca.gov

SARA 313 listing - 40 CFR 372.65: None

All ingredients are listed on the EPA TSCA Inventory.

Ozone depleting substances- Not applicable

Persistent Organic Pollutants- Not applicable

International:

This product has been classified in accordance with the guidelines set by the Dept. of Industrial Health of the Republic of Singapore.

This product has been classified in accordance with the Mexican regulations NOM-018-STPS-2015 and NOM-010-STPS-2014.

This product has been classified in accordance with: Malaysian – OCCUPATIONAL SAFETY AND HEALTH (CLASSIFICATION, LABELING AND SAFETY DATA SHEET OF HAZARDOUS CHEMICALS) REGULATION OCTOBER 2013 – (CLASS).

Regulatory Information China:

GB/T 16483-2008, GB/T 17519-2013, Safety Data Sheets for Chemical Products

GB 30000.2-29-2013, Rules for classification and labeling of chemicals (GHS)

Decree No. 591: Regulations on the Control Over Safety of Hazardous Chemicals.
This product has been classified using the Chinese Occupational Exposure Limit of Hazardous Agents in the Workplace, GBZ2-2007.

16. OTHER INFORMATION

HMIS Hazard Rating:	**Health:**	2
	Fire:	0
	Physical Hazards:	0
Revised Date:	11 NOVEMBER 2021	
Prepared by:	Marny Kinne, Indium Corporation of America	
Approved by:	Marny Kinne, Indium Corporation of America	

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