

SDS SHEET

Copper Indium Sulfide / Zinc Sulfide Nanocrystals in Toluene

1. PRODUCT IDENTIFICATION

Chemical Name: Copper Indium Sulfide / Zinc Sulfide Nanocrystals

Supplier: NNCrystal US Corporation 534 W Research Center Blvd., Ste 260 Fayetteville, AR 72701

Product Line: CIS

Phone: 479.595.0662

Recommended Use: Research and development use only

2. HAZARDS IDENTIFICATION

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)

Flammable liquids (Category 2), H225

Acute toxicity, Oral (Category 4), H302

Aspiration hazard (Category 1), H304

Acute toxicity, Dermal (Category 4), H312

Skin corrosion (Category 1B), H314

Skin irritation (Category 2), H315

Eye irritation (Category 2A), H319

Acute toxicity, Inhalation (Category 4), H332

Specific target organ toxicity - single exposure (Category 3), Respiratory system, H335

Specific target organ toxicity - single exposure (Category 3), Central nervous system, H336

Reproductive toxicity (Category 2), H361

Specific target organ toxicity - repeated exposure (Category 2), Central nervous system H373

Short-term (acute) aquatic hazard (Category 1), H400

Acute aquatic toxicity (Category 2), H401

Long-term (chronic) aquatic hazard (Category 1), H410

Chronic aquatic toxicity (Category 3), H412

GHS Label Elements:



Signal Word: Warning

Hazardous Statements

H225

Highly flammable liquid and vapor.

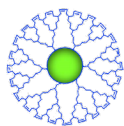
H302 + H312 + H332

Harmful if swallowed, in contact with skin or if inhaled.

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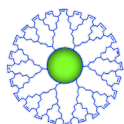
H304	May be fatal if swallowed and enters airways.
H314	Causes severe skin burns and eye damage
H315	Causes skin irritation.
H319	Causes serious eye irritation.
H335	May cause respiratory irritation.
H336	May cause drowsiness or dizziness.
H361	Suspected of damaging fertility or the unborn child.
H373	May cause damage to organs through prolonged or repeated exposure.
H401	Toxic to aquatic life
H410	Very toxic to aquatic life with long lasting effects
H412	Very toxic to aquatic life with long lasting effects.

Precautionary Statements

P201	Obtain special instructions before use.
P202	Do not handle until all safety precautions have been read and understood.
P210	Keep away from heat/sparks/open flames/hot surfaces. No smoking.
P233	Keep container tightly closed.
P240	Ground/bond container and receiving equipment.
P241	Use explosion-proof electrical/ ventilating/ lighting/ equipment.
P242	Use only non-sparking tools.
P243	Take precautionary measures against static discharge.
P260	Do not breathe dust/ fume/ gas/ mist/ vapor/ spray.
P264	Wash skin thoroughly after handling.
P270	Do not eat, drink or smoke when using this product.
P271	Use only outdoors or in a well-ventilated area.
P273	Avoid release to the environment.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P301 + P312 + P330	IF SWALLOWED: Call a POISON CENTER/ doctor if you feel unwell. Rinse mouth.
P303 + P361 + P353	IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower. Call a POISON CENTER/ doctor if you feel unwell.
P304 + P340 + P312	IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER or doctor/ physician if you feel unwell.
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.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.
P331	Do NOT induce vomiting.
P332 + P313	If skin irritation occurs: Get medical advice/ attention.
P362	Take off contaminated clothing and wash before reuse.
P370 + P378	In case of fire: Use dry sand, dry chemical or alcohol-resistant foam to extinguish.
P391	Collect spillage.
P403 + P233	Store in a well-ventilated place. Keep container tightly closed.
P403 + P235	Store in a well-ventilated place. Keep cool.
P405	Store locked up.
P501	Dispose of contents/ container to an approved waste disposal plant.

Hazards not otherwise classified (HNOC) or not covered by GHS --none

3. COMPOSITION/INFORMATION ON INGREDIENT (EACH VIAL)



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Chemical Name: Copper Indium sulfide/Zinc sulfide Quantum Dots

Chemical Formula: CuInS₂/ZnS

Typical Solvents (CAS No): Toluene (108-88-3)

<u>Substance Name</u>	<u>CAS #</u>
CuS	19138-68-2
In ₂ S ₃	12030-24-9
ZnS	1314-98-3
Oleylamine	112-90-3
Oleic Acid	112-80-1
Toluene	108-88-3

4. FIRST AID MEASURES

Eye:

1. Flush immediately with warm water for at least 20 minutes.
2. Call in ophthalmologist.
4. Remove of contact lenses.

Skin:

1. Removing contaminated clothing.
2. Rinse skin with water/shower.
3. Call a physician.

Ingestion:

1. After swallowing: caution if victim vomits. Risk of aspiration! Keep airways free. Pulmonary failure possible after aspiration of vomit.
2. Call a physician immediately
3. Never give anything by mouth to an unconscious person.
4. Don't induce vomiting unless directed to by a medical person.

Inhalation

1. Move to fresh air.
2. Seek immediate medical assistance and call a physician.

5. FIRE FIGHTING MEASURES

Suitable extinguishing media: Foam, Carbon Dioxide (CO₂), dry powder

Unsuitable extinguishing media: No limitations are given

Special Hazards:

1. Carbon oxides
2. Combustible.
3. Pay attention to flashback.
4. Vapors are heavier than air and may spread along floors.
5. Development of hazardous combustion gases or vapors possible in the event of fire.
6. Forms explosive mixtures with air at ambient temperatures.

Protective equipment: Wear self-contained respirator in danger area. Prevent skin contact by keeping a safe distance or by wearing suitable protective clothing

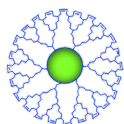
Special Hazards:

1. Liquid and vapor are highly flammable

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2. Severe fire hazard when exposed to heat, flame and/or oxidizers
3. Vapor may travel a considerable distance to source of ignition
4. Heating may cause expansion and or decomposition leading to violent rupture of containers

Protective equipment: Wear self-contained respirator if necessary. Wear protective gloves.

Further information: Remove container from danger zone and cool with water. Prevent fire extinguishing water from contaminating surface water or the ground water system.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures:

Advice for non-emergency personnel:

1. Do not breathe vapors, aerosols.
2. Avoid substance contact.
3. Ensure adequate ventilation.
4. Keep away from heat and sources of ignition.
5. Evacuate the danger area, observe emergency procedures, consult an expert.
6. For personal protection see section 8.

Environmental precautions: Do not let product enter drains. Risk of explosion.

Methods and materials for containment and cleaning up

1. Cover drains.
2. Collect, bind, and pump off spills.
3. Observe possible material restrictions (see sections 7 and 10).
4. Take up carefully with liquid-absorbent material (e.g. Chemisorb®).
5. Dispose of properly.
6. Clean up affected area.

7. HANDLING AND STORAGE

Precautions for safe handling:

1. Keep container tightly sealed. Store in refrigerator (2-8°C) under dark conditions.
2. Wear protective skin protection
3. Wash hands and face thoroughly after handling.
4. Work under hood.
5. Keep away from open flames, hot surfaces and sources of ignition.
6. Take precautionary measures against static discharge.
7. Use spark free tools and explosion proof equipment.
8. Do not inhale substance/mixture.
9. Avoid generation of vapors/aerosols.

Conditions for safe storage, including any incompatibilities

1. Keep container tightly sealed. Store in refrigerator (2-8°C) under dark conditions.
2. Do not store with acids or oxidizers.
3. Keep away from heat and sources of ignition
4. Handle and store under inert gas.

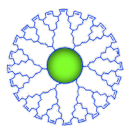
Storage Class (TRGS 510): 3 Flammable liquids

8. EXPOSURE CONTROLS AND PERSONAL PROTECTION

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Exposure Limits Indium Sulfide Component:

Indium (III) sulfide 12030-24-9

TWA 0.100000 mg/m³ USA. ACGIH Threshold Limit Values (TLV)

Exposure for Toluene solvent

OSHA – Final PELs: 200ppm TWA

OSHA Ceiling: 300ppm

ACGIH: 50ppm, skin-potential for cutaneous absorption

NIOSH: 100ppm TWA; 375 mg/m³ TWA; 550ppm IDLH

Additional information about design of technical systems: Properly operating chemical fume hood designed for hazardous chemicals and having an average face velocity of at least 100 feet per minute.

General protective and hygienic measures: The usual precautionary measures for handling chemicals should be followed. Keep away from foodstuffs, beverages, and feed. Remove all soiled and contaminated clothing immediately. Wash hands before breaks and at the end of work. Avoid contact with the eyes and skin.

Breathing equipment: Use a suitable respirator when high concentrations are present.

Protection of hands: Impervious gloves – check gloves using UV light after use to determine level of contamination.

Eye protection: Safety glasses

Body protection: Protective work clothing.

9. PHYSICAL AND CHEMICAL PROPERTIES

Form: Liquid form - Crystalline powder, dissolved in a solvent

Color: Green to dark red

Odor: benzene-like

Melting point/Melting range: -93 °C (-135 °F)

Boiling point/Boiling range: 110 - 111 °C 230 - 232 °F

Flash point: 4.4 °C (39.9 °F) - closed cup

Autoignition temperature: 535.0 °C (995.0 °F)

Decomposition temperature: Not determined

Explosion limits: Upper explosion limit: 7.1 %(V); Lower explosion limit: 1.2 %(V)

Vapor pressure: 30.88 hPa at 21.1 °C (70.0 °F)

Density: 0.865 g/mL at 25 °C (77 °F)

Solubility in / Miscibility with Polar Solvents: 0.58 g/l at 25 °C (77 °F) - partly soluble

Solubility in / Miscibility with Non-Polar Solvents: Soluble when hydrophobic ligands are present.

10. STABILITY AND REACTIVITY

Reactivity: Vapor is explosive when exposed to heat or flame, vapors may form explosive mixture when mixed with air.

Stability: Stable at room temperature in closed containers under normal storage and handling conditions

Incompatible materials: Heat, flame, strong oxidizers, nitric and sulfuric acids, chlorine, nitrogen tetroxide; will attack some forms of plastics, rubber, and coatings

fuming sulfuric acid, Nitric acid, silver, perchlorates, nitrogen dioxide, nonmetallic halides, acetic acid, halogen-halogen compounds, uranium hexafluoride, organic nitro compounds,

Violent reactions possible with: Strong acids, Strong oxidizing agents, sulfur with heat.

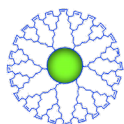
Hazardous decomposition products: In event of fire, see section 5.

Thermal decomposition / conditions to be avoided: warming

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11. TOXICOLOGICAL INFORMATION

Acute toxicity

LD50 Oral - Rat - male - 5,580 mg/kg
(Tested according to Directive 92/69/EEC.)
LC50 Inhalation - Rat - male and female - 4 h - 25.7 mg/l - vapor
(OECD Test Guideline 403)
LD50 Dermal - Rabbit - > 5,000 mg/kg
Remarks: (ECHA)
No data available

Skin corrosion/irritation

Skin - Rabbit
Result: irritating - 4 h
Remarks: (ECHA)

Serious eye damage/eye irritation

Eyes - Rabbit
Result: slight irritation
(OECD Test Guideline 405)

Respiratory or skin sensitization

Maximization Test - Guinea pig
Result: negative
(Regulation (EC) No. 440/2008, Annex, B.6)

Germ cell mutagenicity

Test Type: In vitro mammalian cell gene mutation test
Test system: Mouse lymphoma test
Metabolic activation: with and without metabolic activation
Method: OECD Test Guideline 476
Result: negative
Test Type: Ames test
Test system: S. typhimurium
Metabolic activation: with and without metabolic activation
Method: Mutagenicity (Salmonella typhimurium - reverse mutation assay)
Result: negative
Test Type: Chromosome aberration test
Species: Rat
Cell type: Bone marrow
Application Route: i.p.
Result: negative
Remarks: (ECHA)
Carcinogenicity: No data available

Target Organs: Lungs, Liver, Kidneys, central nervous system. May cause drowsiness or dizziness.

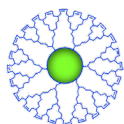
EPA-B1: Probable human carcinogen, limited evidence of carcinogenicity from epidemiologic studies.

IARC-1: Carcinogenic to humans: sufficient evidence of carcinogenicity.

NTP-2: Reasonably anticipated to be a carcinogen: limited evidence from studies in humans or sufficient evidence from studies in experimental animals. Carcinogen as defined by OSHA.

ACGIH A2: Suspected human carcinogen: Agent is carcinogenic in experimental animals at dose levels, by route(s) of administration, at site(s), of histologic type(s), or by mechanism(s) considered relevant to worker exposure. Available epidemiologic studies are conflicting or insufficient to confirm an increased risk of cancer in exposed humans.

Reproductive toxicity: Damage to fetus possible suspected human reproductive toxicant. Reproductive toxicity - Rat – Inhalation Paternal Effects: Spermatogenesis (including genetic material, sperm morphology, motility, and



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count). Experiments have shown reproductive toxicity effects in male and female laboratory animals. Suspected of damaging the unborn child.

Developmental Toxicity: Rat - Oral Effects on Embryo or Fetus: Fetotoxicity (except death, e.g., stunted fetus)

Additional Information

RTECS: Not available

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

12. ECOLOGICAL INFORMATION

Do not allow material to be released to the environment without proper governmental permits.

13. DISPOSAL CONSIDERATIONS

Consult local or national regulations for proper disposal.

14. TRANSPORT INFORMATION

U.S. DOT 49 CFR 172.101

ID Number: UN1294

Hazard class: 3

Packing Group: II

Labeling Requirements: Flammable Liquid

Canadian Transportation of Dangerous Goods: UN1294, Class 3

Land Transport ADR/RID: UN1294, Class 3, Class Code F1, Pack group II

Air Transport IATA/ICAO: UN1294, Class or Division 3, Pack group II

Exceptions: 49 CFR 173.4

15. REGULATIONS

SARA 302 Components

No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components

Toluene	CAS-No. 108-88-3	Revision Date 2007-07-01
Zinc Sulfide	CAS-No. 1314-98-3	Revision Date 2007-01-07
Indium (III) sulfide red	CAS -No. 12030-24-9	Revision Date 2007-07-01

Massachusetts Right to Know Components

Toluene	CAS-No. 108-88-3	Revision Date 2007-07-01
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Pennsylvania Right to Know Components

Indium (III) sulfide red	CAS -No. 12030-24-9	Revision Date 2007-07-01
Toluene	CAS-No. 108-88-3	Revision Date 2007-07-01
Zinc Sulfide	CAS-No. 1314-98-3	Revision Date 2007-01-07

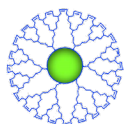
New Jersey Right to Know Components

Indium (III) sulfide red	CAS -No. 12030-24-9	Revision Date 2007-07-01
Toluene	CAS-No. 108-88-3	Revision Date 2007-07-01
Zinc Sulfide	CAS-No. 1314-98-3	Revision Date 2007-01-07

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California Prop. 65 Components

WARNING: This product contains a chemical known to the State of California to cause birth defects or other reproductive harm

Toluene

CAS-No. 108-88-3

Revision Date 2009-02-16

16. OTHER INFORMATION

The above information is believed to be correct and shall be used only as a guide.

The information in this document is based on our current knowledge and applicable to the product regarding appropriate safety precautions. It does not represent any guarantee of the properties of the product. NNCrystal US Corporation shall not be held liable for any damage resulting from handling or contact with the above product.

Revision Date: 12-19-2022

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