

## SDS SHEET

Rev 12-13-17

### Indium Phosphide Zinc Sulfide Nanocrystals in Toluene

#### 1. PRODUCT IDENTIFICATION

**Chemical Name:** Indium Phosphide Zinc Sulfide Nanocrystals in Toluene

**Supplier:** NNCrystal US Corporation 534 W Research Center Blvd., Ste 254 Fayetteville, AR 72701

**Product Line:** INP

**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

Skin irritation (Category 2), H315

Carcinogenicity (Category 1B), H350

Reproductive toxicity (Category 2), H361

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

Specific target organ toxicity - repeated exposure (Category 1), H372

Aspiration hazard (Category 1), H304

Acute aquatic toxicity (Category 2), H401

Chronic aquatic toxicity (Category 3), H412

##### GHS Label Elements:



**Signal Word:** Danger

##### Hazardous Statements

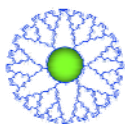
H225	Highly flammable liquid and vapor.
H304	May be fatal if swallowed and enters airways.
H315	Causes skin irritation.
H336	May cause drowsiness or dizziness.
H350	May cause cancer.
H361	Suspected of damaging fertility or the unborn child.
H372	Causes damage to organs through prolonged or repeated exposure.

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H373 May cause damage to organs through prolonged or repeated exposure.  
H401 Toxic to aquatic life.

## 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/ vapors/ 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 + P310 IF SWALLOWED: Immediately call a POISON CENTER or doctor/ physician.  
P303 + P361 + P353 IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower.  
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.  
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.  
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

**Chemical Name:** Indium Phosphide Zinc Sulfide Nanocrystals

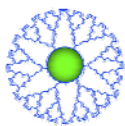
**Chemical Formula:** INP/ZnS

<u>Substance Name</u>	<u>CAS #</u>
InP	22398-80-7
ZnS	1314-98-3
Toluene	108-88-3
Oleylamine	112-90-3

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## 4. FIRST AID MEASURES

### Eye:

1. Flush immediately with warm water for at least 20 minutes.
2. Ensure complete irrigation of the eye by keeping eyelids apart and away from eye and moving the eyelids by occasionally lifting the upper and lower lids.
3. If pain persists or recurs seek medical attention.
4. Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

### Skin:

1. Removing contaminated clothing, shoes and leathery wearings.
2. Washing affected area thoroughly with soap and water for at least 20 minutes.
3. Call a physician if irritation develops or persists.

### Ingestion:

1. If spontaneous vomiting appears imminent or occurs, hold patient's head down, lower than their hips to help avoid possible aspiration of vomits.
2. If victim is conscious and alert, give 2-4 cupfuls of milk/water to dilute the substance in the stomach.
3. Never give anything by mouth to an unconscious person.
4. Don't induce vomiting unless directed to by a medical person.
5. If vomiting occurs, lean patient forward or place on left side (head-down position, if possible, prior to initiating first aid procedures.
6. Seek medical attention.

### Inhalation

1. Remove from further exposure and flush thoroughly with air.
2. Lay patient down. Keep warm and rested.
3. Prosthesis such as false teeth, which may block airway, should be removed, where possible, prior to initiating first aid procedures.
4. If respiratory irritation seek immediate medical assistance and call a physician.

## 5. FIRE FIGHTING MEASURES

**Suitable extinguishing agents:** Foam, CO<sub>2</sub>, dry chemical

### Special Hazards:

1. Liquid and vapor are highly flammable.
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.

## 6. ACCIDENTAL RELEASE MEASURES

**Person-related safety precautions:** Wear protective equipment. Keep unprotected persons away. Ensure adequate ventilation

**Measures for environmental protection:** Do not allow material to be released to the environment without proper governmental permits.

### Measures for cleaning/collecting:

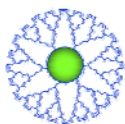
1. Remove all ignition sources
2. Clean up all spills immediately
3. Avoid breathing vapors and contact with skin and eyes

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4. Control personal contact by using protective equipment
5. Contain and absorb small quantities with vermiculite or other absorbent material
6. Wipe up
7. Collect residues in a flammable waste container

## 7. HANDLING AND STORAGE

### Precautions for safe handling:

1. Keep container tightly sealed. Store in refrigerator (2-8°C) under dark conditions.
2. Wash thoroughly after handling
3. Use only in well ventilated area
4. Ground and bond containers when transferring
5. Use spark free tools and explosion proof equipment

### 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

## 8. EXPOSURE CONTROLS AND PERSONAL PROTECTION

### Exposure Limits Indium Phosphide:

TWA: 0.100000 mg/m<sup>3</sup>

### Exposure for Toluene solvent

OSHA – Final PELs: 200ppm TWA

OSHA Ceiling: 300ppm

ACGIH: 50ppm, skin-potential for cutaneous absorption

NIOSH: 100ppm TWA; 375 mg/m<sup>3</sup> 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 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:** Clear/Yellow – Brown

**Odor:** Odor dependent upon solvent used. Crystalline powder is odorless

**Melting point/Melting range:** ~1070 to bulk melting point of InP crystals. The solvent is liquid and melting point depends on the chemical composition of the solvent.

**Boiling point/Boiling range:** Determined by solvent used

**Sublimation temperature / start:** Not determined

**Flash point:** Dependent upon solvent used

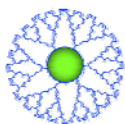
**Ignition temperature:** Dependent upon solvent used

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**Decomposition temperature:** Not determined

**Danger of explosion:** Dependent upon solvent used. Crystalline powder does not present an explosion hazard.

**Explosion limits:** Currently unknown for nanocrystals

**Vapor pressure:** Dependent upon solvent used

**Density:** 4.79 g/cm<sup>3</sup> (crystal at 20 °C) for the nanocrystal powder if isolated

**Solubility in / Miscibility with Polar Solvents:** Soluble when hydrophilic ligands are present

**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

**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

**Hazardous decomposition products:** Carbon monoxide, carbon dioxide, hydrocarbons

**Thermal decomposition / conditions to be avoided:** Not determined, but temperature increases will affect the solvent used.

**Be aware of the necessary warnings for the specific solvent used.**

## 11. TOXICOLOGICAL INFORMATION

**Skin:** Irritant to skin and mucous membranes.

**Eye:** Irritating effect.

**Sensitization:** No sensitizing effects known.

**Subacute to chronic toxicity:** Inorganic phosphorus compounds may cause irritation and hemorrhages in the stomach as well as liver and kidney damage. Bone structure may be attacked, especially the jaw and teeth.

Exposure to indium compounds may cause pain in the joints and bones, tooth decay, nervous and gastrointestinal disorders, heart pain and general debility. Experiments with animals also indicate that indium may cause reduced food and water consumption with weight loss, pulmonary edema, pneumonia, blood, liver and kidney damage, leg paralysis and damage to the brain, heart, adrenals, and spleen. If phosphine is generated, central nervous system, cardiac and respiratory injury may occur.

**Reproductive toxicity:** Damage to fetus possible Suspected human reproductive toxicant. Reproductive toxicity - Rat - Inhalation Paternal Effects: Spermatogenesis (including genetic material, sperm morphology, motility, and count). Experiments have shown reproductive toxicity effects in male and female laboratory animals.

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

### Carcinogenicity

**IARC:** 2A - Group 2A: Probably carcinogenic to humans (indium phosphide)

**IARC:** 3 - Group 3: Not classifiable as to its carcinogenicity to humans (Toluene)

**NTP:** No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

**OSHA:** No component of this product present at levels greater than or equal to 0.1% is identified as a known or potential carcinogen by OSHA.

**Additional toxicological information:** To the best of our knowledge the acute and chronic toxicity of this substance is not fully known.

## 12. ECOLOGICAL INFORMATION

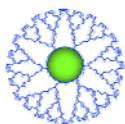
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## 13. DISPOSAL CONSIDERATIONS

Consult local or national regulations for proper disposal.

## 14. TRANSPORT INFORMATION (Solvent Specific) – When dissolved in toluene

### 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

The following components are subject to reporting levels established by SARA Title III, Section 313:

Toluene	CAS-No. 108-88-3	Revision Date 2007-07-01
Zinc sulfide	CAS-No. 1314-98-3	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

Toluene	CAS-No. 108-88-3	Revision Date 2007-07-01
Zinc sulfide	CAS-No. 1314-98-3	Revision Date 2007-07-01

### New Jersey Right to Know Components

Toluene	CAS-No. 108-88-3	Revision Date 2007-07-01
Indium phosphide	CAS-No. 22398-80-7	Revision Date 2009-07-17
Zinc sulfide	CAS-No. 1314-98-3	Revision Date 2007-07-01

### California Prop. 65 Components

WARNING! This product contains a chemical known to the State of California to cause cancer.

Indium phosphide	CAS-No. 22398-80-7	Revision Date 2007-09-28	WARNING: This
Toluene	CAS-No. 108-88-3	Revision Date 2009-02-16.	

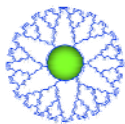
**WARNING:** This product contains a chemical known to the State of California to cause birth defects or other reproductive harm:

Toluene	CAS-No. 108-88-3	Revision Date 2009-02-16.
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## OTHER INFORMATION

### HMIS Rating

Health hazard: 2

Chronic Health Hazard: \*

Flammability: 3

Physical Hazard: 0

### NFPA Rating

Health hazard: 2

Fire Hazard: 3

Reactivity Hazard: 0