Lead Sulfide Nanoparticles in Toluene

1. PRODUCT IDENTIFICATION

Chemical Name: Lead Sulfide Nanoparticles in Toluene
Supplier: NNCrystal US Corporation 534 W Research Center Blvd., Ste 254 Fayetteville, AR 72701
Product Line: PBS
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
- Skin irritation(Category 2), H315
- Acute toxicity, Inhalation(Category 4), H332
- Specific target organ toxicity -single exposure(Category 3), Central nervous system, H336
- Reproductive toxicity(Category 1A), H360
- Reproductive toxicity(Category 2), H361
- Specific target organ toxicity -repeated exposure(Category 2), H373
- Acute aquatic toxicity(Category 1), H400
- Acute aquatic toxicity(Category 2), H401
- Chronic aquatic toxicity(Category 1), H410

GHS Label Elements:

- Signal Word: Danger

Precautionary statement(s)

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/ vapours/ 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.
P304 + P340 + P312 IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER/doctor if you feel unwell.
P308 + P313 IF exposed or concerned: Get medical advice/ attention.
P311 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)

Chemical Name: Lead(II) Sulfide
Chemical Formula: PbS
Typical Solvents (CAS No): Toluene (108-88-3), Hexanes (110-54-3), Chloroform (67-66-3), Dichloromethane (75-09-2), Methanol (67-56-1), Water

<table>
<thead>
<tr>
<th>Substance Name</th>
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<tbody>
<tr>
<td>Lead sulfide</td>
<td>1314-87-0</td>
</tr>
<tr>
<td>Oleic Acid</td>
<td>112-80-1</td>
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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: Use water spray, alcohol - resistant foam, dry chemical or carbon dioxide.

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.
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 Cadmium Sulfide:
TWA:

Exposure for Toluene solvent

OSHA – Final PELs: 200ppm TWA
OSHA Ceiling: 300ppm
ACGIH: 50ppm, skin-potential for cutaneous absorption
NIOSH: 100ppm TWA; 375 mg/m03 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: Black
Odor: Odor dependent upon solvent used. Crystalline powder is odorless
Melting point/Melting range: ~114 degrees C to bulk melting point of PbS crystals.
Boiling point/Boiling range: Determined by solvent used
Flash point: Dependent upon solvent used
Ignition temperature: Dependent upon solvent used
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: 7.5 g/cm³ (crystal at 15 degrees C) for the isolated nanocrystal powder
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: Strong Oxidizers
Hazardous decomposition products: Carbon
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

Lead Sulfide:

This product is or contains a component that has been reported to be possibly carcinogenic based on its IARC, ACGIH, NTP, or EPA classification.

IARC: 2A - Group 2A: Probably carcinogenic to humans (Lead sulfide)
2A - Group 2A: Probably carcinogenic to humans (Lead sulfide)
NTP: Reasonably anticipated to be a human carcinogen
The reference note has been added by TD based on the background information of the NTP. (Lead sulfide)
OSHA: OSHA specifically regulated carcinogen (Lead sulfide)

Reproductive toxicity: Possible risk of congenital malformation in the fetus. Known human reproductive toxicant
Specific target organ toxicity -single exposure: No data available
Specific target organ toxicity - repeated exposure: May cause damage to organs through prolonged or repeated exposure.

Additional Information
RTECS : OG4550000
Lead salts have been reported to cross the placenta and to induce embryo- and feto-mortality. They also have teratogenic effect in some animal species. No teratogenic effects have been reported with exposure to organometallic lead compounds. Adverse effects of lead on human reproduction, embryonic and fetal development, and postnatal (e.g., mental) development have been reported. Excessive exposure can affect blood, nervous, and digestive systems. The synthesis of hemoglobin is inhibited and results in anemia. If left untreated, neuromuscular dysfunction, possible paralysis, and encephalopathy can result. Additional symptoms of overexposure include: joint and muscle pain, weakness of the extensor muscles (frequently the hand and wrist), headache, dizziness, abdominal pain, diarrhea, constipation, nausea, vomiting, blue line on the gums, insomnia, and metallic taste. High body levels produce increased cerebrospinal pressure, brain damage, and stupor leading to coma and often death.

Toluene:
Skin: Irritant to skin and mucous membranes.
Eye: Irritating effect.
Sensitization: No sensitizing effects known.
Additional toxicological information: Danger through skin absorption.
To the best of our knowledge the acute and chronic toxicity of this substance is not fully known.
Target Organs: Lungs, Liver, Kidneys
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 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)

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 (Solvent Specific) – When dissolved in toluene

U.S. DOT 49 CFR 172.101

ID Number: 3077
Hazard class: 9
Packing Group: III

ID Number: 1294
Hazard class: 3
Packing Group:

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:

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Massachusetts Right to Know Components

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

Lead sulfide  
CAS-No. 1314-87-0  
Revision Date 1993-04-24

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

Lead sulfide  
CAS-No. 1314-87-0  
Revision Date 1993-04-24

California Prop. 65 Components
WARNING: This product contains a chemical known to the State of California to cause cancer.
Toluene  
CAS-No. 108-88-3  
Revision Date 2007-07-01

Lead sulfide  
CAS-No. 1314-87-0  
Revision Date 1993-04-24

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 2007-07-01

16. 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