SDS SHEET

Rev 12-13-17

Cadmium Sulfide Nanocrystals in Toluene

1. PRODUCT IDENTIFICATION

Chemical Name: Cadmium Sulfide Nanocrystals
Supplier: NNCrystal US Corporation 534 W Research Center Blvd., Ste 254 Fayetteville, AR 72701
Product Line: CS
Phone: 479.595.0662
Recommended Use: Research and development use only

2. HAZARDS IDENTIFICATION

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

Acute toxicity, Oral (Category 4), H302
Flammable liquids (Category 2), H225
Skin irritation (Category 2), H315
Eye irritation (Category 2A), H319
Acute toxicity, Inhalation (Category 4), H332
Carcinogenicity (Category 1A), 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 2), H373
Aspiration hazard (Category 1), H304
Acute aquatic toxicity (Category 2), H401
Chronic aquatic toxicity (Category 2), H411

GHS Label Elements:

Signal Word: Danger

Hazardous Statements

H225	Highly flammable liquid and vapor.
H302 + H332	Harmful if swallowed or if inhaled.
H304	May be fatal if swallowed and enters airways.
H315	Causes skin irritation.

H318	Causes serious eye damage.
H350	May cause cancer.
H361	Suspected of damaging fertility or the unborn child.
H373	May cause damage to organs (Gastro-intestinal system, Liver, Immune) through prolonged or repeated exposure.
H373	May cause damage to organs (Kidney, Bone) through prolonged or repeated exposure if swallowed.
H410	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/ 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.
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: Cadmium Sulfide Nanocrystals
Chemical Formula: CdS
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

Substance Name	CAS #
CdS	1306-23-6
Toluene	108-88-3
Oleic Acid	112-80-1

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, CO2, dry chemical, water fog
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.
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 (2-8ºC) 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 (2-8ºC) under dark conditions.
2. Do not store with acids or oxidizers.

8. EXPOSURE CONTROLS AND PERSONAL PROTECTION

Exposure Limits Cadmium Sulfide:
TWA: 0.01 (ppm) Consult local authorities for acceptable exposure limits.

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: Clear – Yellow
Odor: Odor dependent upon solvent used. Crystalline powder is odorless
Melting point/Melting range: ~400°C to bulk melting point of CdS crystals. The solvent is liquid and melting point depends on the chemical composition of the solvent.
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: 4.8 g/cm3 (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 tetraoxide; 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.
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)

WARNING: Many of the toxic effects of CdSe nanocrystals are still being researched and are currently unknown at this point. Use at own risk.

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: 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

ID Number: UN2570
Hazard class: 6
Packing Group: III
Labeling Requirements: Poison
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:

Cadmium sulfide	CAS-No.1306-23-6	Revision Date 1993-04-24
Toluene	CAS-No. 108-88-3	Revision Date 2007-07-01

Massachusetts Right to Know Components

Cadmium sulfide	CAS-No.1306-23-6	Revision Date1993-04-24
Toluene	CAS-No. 108-88-3	Revision Date 2007-07-01

Pennsylvania Right to Know Components

Cadmium sulfide	CAS-No.1306-23-6	Revision Date1993-04-24
Toluene	CAS-No. 108-88-3	Revision Date 2007-07-01

New Jersey Right to Know Components

Cadmium sulfide	CAS-No.1306-23-6	Revision Date 1993-04-24
Toluene	CAS-No. 108-88-3	Revision Date 2007-07-01

California Prop. 65 Components

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

Cadmium sulfide	CAS-No.1306-23-6	Revision Date1987-10-01
Toluene	CAS-No. 108-88-3	Revision Date 2007-07-01

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

Cadmium Sulfide	CAS-No.1306-23-6	Revision Date 1987-10-01
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