

SDS SHEET

Rev 12-13-17

Mn:ZnSe Nanocrystals in Toluene (620nm)

1. PRODUCT IDENTIFICATION

Chemical Name: Zinc/Manganese Selenide in Toluene (Doped Nanocrystals/D-dots)

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

Product Line: DD

Phone: 479.95.0662

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 3), H301

Skin irritation (Category 2), H315

Acute toxicity, Inhalation (Category 3), H331

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 1), H400

Acute aquatic toxicity (Category 2), H401

Chronic aquatic toxicity (Category 1), H410

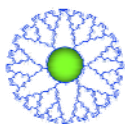
GHS Label Elements:



Signal Word: Danger

Hazardous Statements

H225 Highly flammable liquid and vapor.
H301 + H331 Toxic if swallowed or if inhaled



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H304	May be fatal if swallowed and enters airways.
H315	Causes skin irritation. H336 May cause drowsiness or dizziness.
H373	May cause damage to organs through prolonged or repeated exposure.
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.

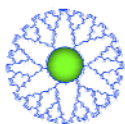
Precautionary Statements

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 + P330	IF SWALLOWED: Immediately call a POISON CENTER or doctor/ physician. Rinse mouth.
P303 + P361 + P353	IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower.
P303 + P361 + P353	IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower.
P304 + P340 + P311	IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. Call a POISON CENTER or doctor/ physician.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.
P314	Get medical advice/ attention if you feel unwell.
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.

3. COMPOSITION/INFORMATION ON INGREDIENT (EACH VIAL)

Chemical Name: Zinc/Manganese Selenide (Doped Nanocrystals/D-dots)

Chemical Formula: Mn/ZnSe



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Mixture Composition:

<u>Substance Name</u>	<u>CAS #</u>
ZnSe	1315-09-9
MnSe	1313-22-0
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

Most important symptoms/effects, acute and delayed

Headache, fatigue, drowsiness, insomnia, anorexia and pain in limbs, nervousness, impairment of memory

5. FIRE FIGHTING MEASURES

Suitable extinguishing agents: Foam, CO₂, dry chemical, water fog

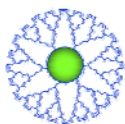
Special Hazards:

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.

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4. Heating may cause expansion and or decomposition leading to violent rupture of containers.
5. On combustion may emit toxic fumes of carbon monoxide.

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 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.

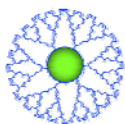
Breathing equipment: Use suitable respirator when high concentrations are present.

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

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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 when dilute, Yellowish Clear when concentrated, White/Yellow in powder form.

Odor: aromatic petroleum odor. Crystalline powder is odorless

Melting point/Melting range: ~1100°C to bulk melting point of Mn:ZnSe crystals. Toluene: -95°C

Boiling point/Boiling range: Determined by solvent used; Toluene 110.6°C

Sublimation temperature / start: Not determined

Flash point: 4.4°C

Ignition temperature: 480°C

Decomposition temperature: Not determined

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

Vapor pressure: 22mmHg@20°C/68F

Density: 5.42 g/cm³ (crystal at 20 °C) for the nanocrystal powder if isolated. Toluene 0.86

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.

Dangerous reactions: No dangerous reactions known for nanocrystals but look up specifics for the solvent

11. TOXICOLOGICAL INFORMATION

(For Mn:ZnSe)

Acute Toxicity: Selenium may cause amyotrophic lateral sclerosis, bronchial irritation, gastrointestinal distress, vasopharyngeal irritation, garlic odor on breath and sweat, metallic taste, pallor, irritability, excessive fatigue, loss of fingernails and hair, pulmonary edema, anemia and weight loss.

Zinc and Manganese fumes may cause metal fume fever. Effects include dry throat, metallic taste, chest pain, dyspnea, rales and dry cough. Several hours later, chills many occur with lassitude, malaise, fatigue, headache, back pain, muscle cramps, blurred vision, nausea, fever, perspiration, vomiting and leukocytosis.

Skin: Irritant to skin and mucous membranes.

Eye: Irritating effect.

Sensitization: No sensitizing effects known.

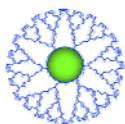
Additional toxicological information: To the best of our knowledge the acute and chronic toxicity of this substance is not fully known. No classification data on carcinogenic properties of this material is available from the EPA, IARC, NTP, OSHA, or ACGIH.

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

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(For Toluene)

Toxicity

LD50: <870mg/kg (rat, oral)

LC50: 6000ppm/6h (rat, inhalation)

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:

Ecotoxicity

LC50 (96 hr.) fish: 7.3-22.8mg/L

EC50 (48 hr.) water flea: --

Bioccentration factor (BCF): 1.67-380

Very toxic for fish.

General notes: Also poisonous for fish and plankton in water bodies. Do not allow material to be released into the environment without proper governmental permits. Very toxic for aquatic organisms.

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

Canadian Transportation of Dangerous Goods: UN1294, Class 3

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

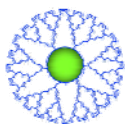
Air Transport IATA/ICAO: UN1294, Class or Division 3, Pack group II

Exceptions: 49 CFR 173.4

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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
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Massachusetts Right to Know Components

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

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

Toluene CAS-No.	CAS NO. 108-88-3	Revision Date 2007-07-01
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California Prop. 65 Components

Toluene	CAS-No. 108-88-3	Revision Date 2007-07-01
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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
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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