

# NANOMATERIALS & NANOFABRICATION LABORATORIES

## MSDS SHEET

---

### Cu:ZnSe Nanocrystals in Hexanes

#### 1. PRODUCT IDENTIFICATION

**CAS No.:** 1315-09-9 (ZnSe), 7440-50-8 (Cu)

**Inorganic Unit (ZnSe):** 144.369 g/mol (ZnSe)

**Chemical Name:** Copper doped Zinc Selenide (Doped Nanocrystals/D-dots)

**Chemical Formula:** Cu/ZnSe

**Chemical Family:** II-VI Compounds, Doped Semiconductor Compounds

**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

#### 2. COMPOSITION/INFORMATION ON INGREDIENT (EACH VIAL)

<u>Substance Name</u>	<u>CAS #</u>	<u>Percentage of Whole (by weight)</u>
ZnSe	1315-09-9	3.0%
Cu	7440-50-8	0.5%
Hexanes	110-54-3	90%
Oleic Acid	112-80-1	1.5%
TOP	4731-53-7	5.0%

#### 3. HAZARDS IDENTIFICATION

Irritating to eyes, respiratory system, and skin.

**HMIS ratings (scale 0-4)** (Nanocrystals only, does not include solvent)

Health = 2

Flammability = 1

Reactivity = 1

#### 4. FIRST AID MEASURES

**General Information:** Immediately remove clothing contaminated by the product. Remove any breathing apparatus only after contaminated clothing has been completely removed. In case of irregular breathing or respiratory arrest provide artificial respiration.

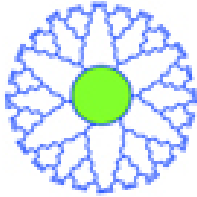
**Inhalation :** Supply fresh air. If required, provide artificial respiration. Keep patient warm. Seek immediate medical advice.

**Skin contact:** Immediately wash with water and soap and rinse thoroughly. Seek immediate medical advice.

**Eye contact :** Rinse opened eye for several minutes under running water. Then consult a doctor.

**Ingestion:** Do not induce vomiting; immediately call for medical help. Seek immediate medical advice

#### 5. FIRE FIGHTING MEASURES



# NANOMATERIALS & NANOFABRICATION LABORATORIES

## MSDS SHEET

---

**Suitable extinguishing agents:** Product is not flammable but the solvent is. Use fire fighting measures that suit the necessary solvent type.

**Special Hazards:** In case of fire, possible toxic metal fumes may be emitted.

**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:** Dispose contaminated material as waste according to item 13. Ensure adequate ventilation.

### 7. HANDLING AND STORAGE

**Information for safe handling:** Keep container tightly sealed. Store at room temperature or in refrigerator (4-10°C) under dark conditions within a tightly sealed container. Ensure good ventilation at the workplace. Store dissolved in solvent to prevent the formation of dust.

**Information about protection against explosions and fires:** Know the requirements of the necessary solvent. Product itself is not flammable

**Requirements to be met by storerooms and receptacles:** No special requirements.

**Information about storage in one common storage facility:** Do not store together with acids.

**Further information about storage conditions:** Keep container tightly sealed. Store at room temperature or in refrigerator (4-10°C) under dark conditions within a tightly sealed container. Ensure good ventilation at the workplace. Store dissolved in solvent to prevent the formation of dust.

### 8. EXPOSURE CONTROLS AND PERSONAL PROTECTION

**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.

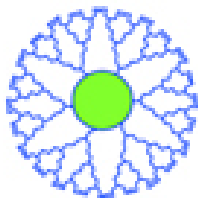
**Breathing equipment:** Use suitable respirator when high concentrations are present.

**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:



# NANOMATERIALS & NANOFABRICATION LABORATORIES

## MSDS SHEET

---

**Form:** Liquid form. Crystalline powder, dissolved in a solvent  
**Color:** Clear when dilute, Yellowish Clear when concentrated, White/Yellow in powder form.  
**Odor:** Odor dependent upon solvent used. Crystalline powder is odorless  
**Melting point/Melting range:** ~1100°C to bulk melting point of Cu:ZnSe crystals. The solvent is liquid and 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  
**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:** 5.42 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

**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.  
**Materials to be avoided:** Acids, Bases, Oxidants, Reductants, and Ligands to the nanocrystals should be used with caution.  
**Dangerous reactions:** No dangerous reactions known for nanocrystals but look up specifics for the solvent

### 11. TOXICOLOGICAL INFORMATION (For Cu:ZnSe Only)

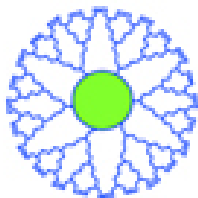
**Acute Toxicity:** Selenium may cause amyotrophic lateral sclerosis, bronchial irritation, gastrointestinal distress, vasopharyngeal irritation, garlic odor on breath and sweat, metallic taste, pallor, irritability, excessive fatigue, loss of fingernails and hair, pulmonary edema, anemia and weight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



# NANOMATERIALS & NANOFABRICATION LABORATORIES

## MSDS SHEET

---

**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 Cu:ZnSe nanocrystals are still being researched and are currently unknown at this point. Use at own risk.

### 12. ECOLOGICAL INFORMATION:

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 (Solvent Specific)-*When dissolved in Hexanes* (Cu:ZnSe is not a hazardous material for transportation)

**U.S. DOT 49 CFR 172.101**

**ID Number:** UN1208

**Hazard class:** 3

**Packing Group:** II

**Labeling Requirements:** Flammable Liquid (Unnecessary when Water is the solvent)

**Canadian Transportation of Dangerous Goods:** UN1208, Class 3

**Land Transport ADR/RID:** UN1208, Class 3, Class Code F1, Pack group II

**Air Transport IATA/ICAO:** UN1208, Class or Division 3, Pack group II

**Exceptions:** 49 CFR 173.4

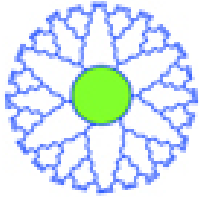
### 15. REGULATIONS

**Hazard symbols:** T Toxic N Dangerous for the environment

**Risk phrases:** (23/25) Toxic by inhalation and if swallowed. (33) Danger of cumulative effects. (50/53) Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

**Safety phrases:** (20/21) When using do not eat, drink, or smoke. (28) After contact with skin, wash immediately with plenty of soap and water. (45) In case of accident or if you feel unwell, seek medical advice immediately. (60) This material and its container must be disposed of as hazardous waste. (61) Avoid release into the environment. Refer to special instructions/safety data sheets.

**National regulations:** All components of this product are listed in the U.S. Environmental Protection Agency Toxic Substances Control Act Chemical Substance Inventory.



# NANOMATERIALS & NANOFABRICATION LABORATORIES

## MSDS SHEET

---

**Information about limitation of use:** For use only by technically qualified individuals. This product contains zinc and selenium and is subject to the reporting requirements of section 313 of the Emergency Planning and Community Right to Know Act of 1986 and 40CFR372.