NANOMATERIALS & NANOFABRICATION LABORATORIES

MSDS SHEET

InP/ZnS Nanocrystals in a Solvent

1. PRODUCT IDENTIFICATION
CAS No.: 22398-80-7 (InP), 1314-98-3 (ZnS)
Inorganic Unit (InP): 145.794
Chemical Name: Indium Phosphide/Zinc Sulfide Core/Shell Nanocrystals
Chemical Formula: InP/ZnS
Chemical Family: III-V Compounds
Typical Solvents (CAS No): Toluene (108-88-3), Hexanes (110-54-3), Chloroform (67-66-3), Dichloromethane (75-09-2)

2. COMPOSITION/INFORMATION ON INGREDIENT (EACH VIAL)

Substance Name	CAS #	Percentage of Whole (by weight)
InP	22398-80-7	1.5%
ZnS	1314-98-3	1.5%
Toluene	108-88-3	97%
Oleylamine	124-30-1	< 0.01%

3. HAZARDS IDENTIFICATION
Irritating to eyes and respiratory system.

4. FIRST AID MEASURES
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: Seek immediate medical advice.

5. FIRE FIGHTING MEASURES
Suitable extinguishing agents: CO_2, sand, extinguishing powder. Do not use water. For solvent, use fire fighting measures that suit the necessary solvent type.
Resulting gases in case of fire: Phosphorus oxides, Hydrogen phosphide (Phosphine)
Protective equipment: Wear self-contained respirator. Wear fully protective impervious suit.

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 12. Ensure adequate ventilation.

7. HANDLING AND STORAGE
Information for safe handling: Keep container tightly sealed. Store in cool, dry, and dark place in tightly closed containers. 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.
Requirements to be met by storerooms and receptacles: No special requirements.
Information about storage in one common storage facility: Store away from oxidizing agents. Do not store together with acids.
Further information about storage conditions: Keep container tightly sealed. Store in cool, dry, and dark conditions in well sealed containers.

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
Eye protection: Safety glasses, Tightly sealed goggles, Full face protection
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
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^3 (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 should not be higher than 50°C to maintain their optical properties.
Materials to be avoided: Acids, Bases, Oxidizing agents, and Ligands to the nanocrystals should be used with caution.
Dangerous reactions: No dangerous reactions known
Dangerous products of decomposition: Phosphorus oxides (e.g. P_2O_5), Hydrogen phosphide (Phosphine)

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

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*

(InP/ZnS is not a hazardous material for transportation)
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
Hazard symbols: Xi Irritant
Risk phrases: 36/37 Irritating to eyes and respiratory system.
Safety phrases: 26 In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
National regulations: All components of this product are listed in the U.S. Environmental Protection Agency Toxic Substances Control Act Chemical Substance Inventory.
Information about limitation of use: For use only by technically qualified individuals.