

This Material Safety Data Sheet complies with Controlled Products Regulations (SOR/88-66) and with ANSI Z400.1-2004

SECTION 1. PRODUCT AND COMPANY IDENTIFICATION

| | |
|---|--|
| Product name | Cadmium zinc telluride |
| Chemical formula | CdZnTe |
| CAS # (Chemical Abstracts Service) | 1306-25-8 (Cadmium telluride) 1315-11-3 (Zinc telluride) |
| EC # (European Chemical Substance) | 215-149-9 (Cadmium telluride) 215-260-2 (Zinc telluride) |
| Use of the substance | Electronic and semiconductor industry |
| Supplier/manufacturer | 5N Plus Inc. 4405 Garand Street St-Laurent, Quebec Canada H4R 2B4 |
| Contact information | Maxime Cossette, EH&S Coordinator |
| Telephone number (business hours) | (514) 856-0644 ext. 2395 |
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| Telephone number (emergency) | CANUTEC: 613-996-6666 (call collect) |
| Data sheet author | Maxime Cossette – 5N Plus Inc. |

SECTION 2. HAZARDS IDENTIFICATION

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|---|---|
| Physical state | Solid (ingots, pieces) |
| Colour | Black |
| Risk status | This product is classified as toxic by the WHMIS |
| Emergency overview | Toxic by ingestion and inhalation, may cause cancer |
| Routes of entry | Inhalation, ingestion |
| Potential acute health effects | |
| Eyes | No effects reported |
| Skin | No effects reported |
| Inhalation | Cadmium and its compounds: Deep inhalation of the fumes or dust of cadmium and its compounds may cause symptoms such as coughing, dyspnea and tightening of the chest resembling those caused by metal fume fever, but which in the worst, can progress into pneumonia, pulmonary edema and death as a result of respiratory arrest. Acute exposure can result in residual emphysema or in fibrosis. Tellurium and its compounds: May cause irritation of the respiratory system & lead to bronchitis & pneumonia. |
| Ingestion | Cadmium and its compounds: May cause abdominal pain, diarrhea, headache, nausea and vomiting. Tellurium and its compounds: Abdominal pain, constipation, vomiting, garlic odor. |
| Potential chronic health effects | Cadmium and its compounds: Carcinogenic effects are suspected. <i>NOTE: At this time there are a limited number of cadmium telluride toxicological studies so we refer to the health effects reported for cadmium. However the CdTe is an insoluble compound in water which it can give a less toxic character than cadmium and soluble cadmium compounds.</i> Tellurium and its compounds: Odor of garlic on the breath, in the urine and in the sweat. Published studies report no serious symptoms or death following exposure to tellurium and its compounds. |

For toxicological information, see Section 11

SECTION 3. COMPOSITION OF/INFORMATION REGARDING CONSTITUENTS

| Name | Symbol | CAS # | EC # | Percentage (%) |
|-------------------|--------|-----------|-----------|----------------|
| Cadmium telluride | CdTe | 1306-25-8 | 215-149-9 | 80-97% |
| Zinc telluride | ZnTe | 1315-11-3 | 215-260-2 | 3-20% |

SECTION 4. FIRST AID

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|------------------------------------|---|
| Eye contact | Check for and remove any contact lenses. In the event of contact with eyes, rinse immediately with plenty of water. Get medical attention. |
| Skin contact | In case of contact, immediately flush skin with plenty of water. Remove and wash any contaminated clothing. Dust may provoke skin irritation. |
| Inhalation | If inhaled, remove to fresh air. Get immediate medical attention. |
| Ingestion | Rare in industry. Ingestion may cause irritation of the nose and throat. If the person is unconscious, do not give anything to drink or induce vomiting. Get immediate medical attention. |
| Note to attending physician | There is no specific antidote. Please contact poison centre. |

SECTION 5. FIREFIGHTING MEASURES

Flammability of the product This mixture is not flammable
Products of combustion Metallic oxides
Extinguishing media
Suitable Use an extinguishing agent suitable for the surrounding fire.
Not suitable None-know
Special exposure hazards Toxic metal oxides can form in the event of fire.
Special protective equipment for firefighters Firefighters should wear self-contained breathing apparatus (SCBA).

SECTION 6. ACCIDENTAL RELEASE MEASURES

Personal precautions Safety goggles, impervious gloves and boots. Wear at least a NIOSH-approved P100 particulate filter respirator if the airborne concentrations are above the permissible exposure limit. If the airborne concentrations are unknown, wear approved self-contained breathing apparatus.
Environmental precautions Contain spilled material, and prevent runoff and contact with soil, waterways, drains or sewers.
Clean-up methods Vacuum the spilled material with an appropriate HEPA Vacuum and place in an appropriate container for disposal in a safe place.

SECTION 7. HANDLING AND STORAGE

Handling Never breathe or ingest dust. Wear suitable respiratory equipment in case of insufficient ventilation. In the event of accidental ingestion or inhalation, contact medical services immediately and forward them the material safety data sheet. Avoid skin and eye contact.
Storage Keep in a tightly sealed container in a cool, well-ventilated area, away from acids.

SECTION 8. EXPOSURE CONTROL/PERSONAL PROTECTION

Occupational exposure limits

| Product name | QUEBEC (CA) TWAEV (mg/m ³) | ACGIH (U.S.A.) TLV-TWA (mg/m ³) | OSHA (U.S.A.) PEL-TWA (mg/m ³) |
|-------------------|---|--|---|
| Cadmium telluride | 0.025 (as Cd) | 0.01 (inhalable fraction as Cd) 0.002 (respirable fraction as Cd) | 0.005 (as Cd) |
| Zinc telluride | 0.1 (as Te) | 0.1 (as Te) | 0.1 (as Te) |

Technical measures Use only in well ventilated areas. If handling generates dust, fumes, gases, vapor or mist, use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits.
Eyes Safety goggles
Skin Use of a Lab coat is recommended.
Respiratory If there is a risk of exceeding exposure limits, use at least a type P100 particulate filter respirator.
Hands Natural rubber (latex).

Personal safety equipment pictograms



Personal protection in case of a large spill Safety glasses, impervious gloves and boots. Full protective gear and NIOSH-approved self-contained breathing apparatus are recommended.
Hygiene measures Wash hands, forearms and face thoroughly after handling this product and before eating, smoking or using the lavatory. Do not take your work clothes home.

HMIS personal protection equipment code B

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Physical state Solid (ingots, pieces)
Colour Black
Molecular weight Between 230.6 and 238.6 g/mol depending on concentration
Molecular formula CdZnTe
Melting point Between 1100 and 1150°C depending on concentration
Specific gravity Not-available
Vapour density Not-available
Solubility This mixture is insoluble in water

SECTION 10. STABILITY AND REACTIVITY

| | |
|--|-------------------------|
| Stability and reactivity | This mixture is stable |
| Incompatibility with various substances | Incompatible with acids |
| Hazardous polymerization | Will not occur |
| Conditions of reactivity | Not-available |

SECTION 11. TOXICOLOGICAL INFORMATION

Toxicological data

| Product/ingredient name | Test | Result | Route | Species |
|-------------------------|------|-------------|-----------------|---------|
| Cadmium telluride | LD50 | 2820mg/kg | Intraperitoneal | Rat |
| Cadmium telluride | LD50 | 2100 mg/kg | Intraperitoneal | Mouse |
| Tellurium ¹ | LD50 | >5000 mg/kg | Oral | Rat |
| Tellurium ¹ | Ld50 | >5000 mg/kg | Oral | Mouse |

¹ No toxicological data has been published for zinc telluride (ZnTe); therefore we refer to tellurium toxicological data.

Acute effects

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|-------------------|--|
| Eyes | No effects reported |
| Skin | No effects reported |
| Inhalation | Cadmium and its compounds: Deep inhalation of the fumes or dust of cadmium and its compounds may cause symptoms such as coughing, dyspnea and tightening of the chest resembling those caused by metal fume fever, but which in the worst, can progress into pneumonia, pulmonary edema and death as a result of respiratory arrest. Acute exposure can result in residual emphysema or in fibrosis. Tellurium and its compounds: Somnolence, dry mouth, metallic taste, headache, garlic odor, nausea. |
| Ingestion | Cadmium and its compounds: Ingestion of cadmium and its compounds may cause abdominal pain, diarrhea, headache, nausea and vomiting. Tellurium and its compounds: Drowsiness, dry mouth, metal taste, headache, nausea, garlic odor. |

Potential chronic health effects

| | |
|-----------------------------|--|
| Carcinogenic effects | Cadmium and its compounds: Carcinogenic effects are suspected |
| Mutagenic effects | Not-classified |
| Teratogenic effects | Not-classified |

SECTION 12. ECOLOGICAL INFORMATION

Ecotoxicity data

| Product/ingredient name | Species | Period | Result |
|-------------------------|---------|-------------------|--------|
| Cadmium telluride | | No data available | |
| Zinc telluride | | No data available | |

| | |
|--|---|
| Environmental precautions | This product is toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment (classification applicable for cadmium and its compounds). |
| Breakdown products | The breakdown products may includes zinc oxides, tellurium and cadmium oxides. |
| Toxicity of biodegradation products | Cadmium oxides are toxic for the environment. |

SECTION 13. DISPOSAL CONSIDERATIONS

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|-----------------------|---|
| Waste disposal | The generation of waste should be avoided or minimized wherever possible. Contain spilled material, and prevent runoff and contact with soil, waterways, drains or sewers. Disposal of this product, solutions and any by-products should comply at all times with the requirements of environmental protection and waste disposal legislation and any regional and local authority requirements. |
|-----------------------|---|

SECTION 14. TRANSPORTATION INFORMATION

| Regulatory information | Proper shipping name | Class | UN number | PG | Label |
|---------------------------|----------------------|----------------|----------------|----------------|----------------|
| UN/IMDG/IATA Class | Not classified | Not classified | Not classified | Not classified | Not classified |
| DOT classification | Not classified | Not classified | Not classified | Not classified | Not classified |
| TDG classification | Not classified | Not classified | Not classified | Not classified | Not classified |

SECTION 15. REGULATORY INFORMATION

CANADA

| | |
|-------------------------------------|---|
| WHMIS | D2A (Very toxic material causing other toxic effects) |
| Domestic substances list | Cadmium telluride appears on the Canadian Domestic Substances List. |
| Non-domestic substances list | Zinc telluride is specified on the Non-domestic Substances List. |

United States

HCS Classification

Cadmium and its compounds : Toxic, carcinogenic
Tellurium and its compounds : Toxic

EU Regulation

Indications of danger



Harmful



Hazardous to the environment

Risk phrases

R20/21/22 Harmful by inhalation, in contact with skin and if swallowed.
R51/53 Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
S2 Keep out of the reach of children.
S60 This material and its container must be disposed of as hazardous waste.
S61 Avoid release to the environment. Refer to special instructions/safety data sheets.

Safety phrases

SECTION 16. OTHER INFORMATION

Information to appear on label

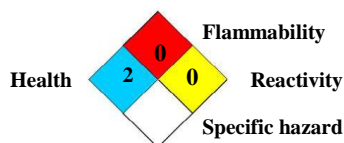
HMIS (United States)

| | |
|---------------------|---|
| Health | 3 |
| Fire hazard | 0 |
| Physical hazard | 0 |
| Personal protection | B |

HAZARD RATINGS

4- Extreme
3- Serious
2- Moderate
1- Slight
0-Minimal

NFPA (United States)



References

1. CSST – *Service du répertoire toxicologique du Québec*
2. FactSage 5.4 (Thermodynamic database)
3. NIOSH Pocket Guide to Chemical Hazards – Ed. of August 2006
4. CANUTEC'S ERGO 2004, Version 1.0 (Transport Canada)
5. Controlled Products Regulations (SOR/88-66)
6. Règlement sur la santé et la sécurité du travail (Quebec)
7. OSHA Hazard Communication Standard (29 CFR 1910.1200)
8. NIOSH RTECS® databases (Registry of Toxic Effects of Chemical Substances)
9. European Inventory of Existing Commercial chemical Substances (EINECS) – European Chemical Bureau
10. European Chemical Bureau's databases

Glossary

LD50: Indicates the dose that is lethal to 50% of an exposed group.
LC50: Indicates the concentration of the chemical that is lethal to 50% of the exposed animals.
TWAEV: Time-weighted average exposure value
TLV-TWA: Threshold Limit Value/Time Weighted Average
PEL-TWA: Permissible Exposure Limit/Time Weighted Average

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