MATERIAL SAFETY DATA SHEET

I PRODUCT IDENTIFICATION

Trade Name: Bismuth Telluride
Synonyms: Bismuth telluride, bismuth tritelluride, natural tetradymite, bismuth sesquitelluride

Formula: Bi_2Te_3
CAS #: 1304-82-1
Molecular Weight: 800.76

II HAZARDOUS INGREDIENTS

Hazardous Components:	**OSHA/PEL**:	**ACGIH/TLV**:	**Other Limits**:
Bismuth Telluride	15 mg/m^3	10 mg/m^3	5 mg/m^3-resp
Percent: 100	**Sec.302**: No	**Sec.304**: No	**Sec.313**: No

III PHYSICAL DATA

Boiling Point (^oC): N/A
Melting Point: 573 °C
Appearance and Odor: Grey powder and pieces, no odor

Solubility in H_2O: Decomposes
Vapor Pressure: N/A
Specific Gravity: 7.7 gm/cc @ 20 °C

IV FIRE AND EXPLOSION HAZARDS DATA

Flash Point (method): Not Available Method: Non-flammable

Special Fire Fighting Procedures: Wear a self-contained breathing apparatus and full protective clothing to prevent contact with skin and eyes. Fumes from fire are hazardous. Isolate runoff to prevent environmental pollution.

Extinguishing Media: Suitable for surrounding fire.

Unusual Fire and Explosion Hazards: When heated to decomposition, bismuth telluride may emit toxic fumes of tellurium. May react with water to evolve toxic gases. Moderate fire hazard by spontaneous chemical reaction with powerful oxidizing agents. Slight explosion hazard with moisture.

V HEALTH HAZARD INFORMATION

Routes of Entry: Inhalation, Skin, Eyes, Ingestion

Health Hazards (Acute and Chronic):

To the best of our knowledge the chemical, physical and toxicological properties of bismuth telluride have not been thoroughly investigated and recorded. Bismuth compounds and its salts can cause kidney damage. Although the degree of such damage is usually mild. Large doses can be fatal. Serious and sometimes fatal poisoning may occur from the injection of large doses into closed cavities and from extensive application to burns. It is stated that the administration of Bi should be stopped when gingivitis appears, for otherwise serious ulcerative stomatitis is likely to result. Other toxic results may develop, such as feeling of bodily discomfort, presence of albumin or other protein substance in the urine, diarrhea, skin reaction and sometimes serious exodermatitis (Sax, Dangerous Properties of Industrial Materials, eighth ed).

Elemental tellurium has relatively low toxicity. It is converted in the body to dimethyl telluride which imparts a garlic-like odor to the breath and sweat. Heavy exposures may, in addition, result in headache, drowsiness, metallic taste, loss of appetite, nausea, tremors, convulsions, and respiratory arrest (Sax, Dangerous Properties of Industrial Materials, eighth ed).

Inhalation: Acute: may cause irritation to the respiratory system, a dry mouth, metallic taste, gingivitis, garlic odor to breath, sweat and urine.
Chronic: May cause anorexia, nausea, depression, somnolence and affect the function of the liver and kidneys.

Ingestion: Acute: May cause a dry mouth, suppression of sweat, malaise, albuminuria, diarrhea, skin reactions, stomatitis, diarrhea, headache, fever, rheumatic pain, black line on gums, garlic odor to breath and urine.
Chronic: May cause anorexia, anemia, black line on gums, ulcerative stomatitis, nausea, depression and somnolence. May affect the function of the liver and kidneys.

Skin: **Acute**: May cause irritation and itching.
Chronic: May cause dermatitis.

Eyes: **Acute**: May cause irritation.
Chronic: No chronic health effects recorded.

Target Organs: May affect the skin, liver, kidneys and central nervous system.
Carcinogenicity: NTP: No, IARC: No, OSHA Regulated: No

Signs and Symptoms of Exposure:

Inhalation: May cause a red, dry throat, coughing, metallic taste, dry mouth, garlic-like odor to breath, sweat and urine, loss of appetite, sleepiness and nausea.
Ingestion: May cause a dry mouth, diarrhea, bodily discomfort, albumin or other protein substances in the urine, skin disorders, garlic-like odor to breath and urine, loss of appetite, sleepiness and nausea.
Skin: May cause redness, inflammation and itching.
Eye: May cause redness, itching, burning and watering.

Medical Conditions Generally Aggravated by Exposure: Pre-existing skin and respiratory disorders.

EMERGENCY AND FIRST AID PROCEDURES:

INGESTION: Give 1-2 glasses of milk or water and induce vomiting, seek medical attention immediately. Never induce vomiting or give anything by mouth to an unconscious person.
INHALATION: Remove victim to fresh air, keep warm and quiet, give oxygen if breathing is difficult and seek medical attention.
SKIN: Remove contaminated clothing, brush material off skin, wash affected area with mild soap and water for 15 minutes, seek medical attention if symptoms persist.
EYES: Flush eyes with lukewarm water, lifting upper and lower eyelids, for at least 15 minutes. Seek medical attention if symptoms persist.

VI REACTIVITY DATA

Stability: Stable
Incompatibility: Strong acids, moisture, water and oxidizing agents.

Hazardous Decomposition Products: Fumes of tellurium.
Hazardous Polymerization: Will not occur.

VII SPILL OR LEAK PROCEDURES

Steps to Be Taken in Case Material Is Released or Spilled: Wear appropriate respiratory and protective equipment specified in Section VIII - Special Protection Information. Isolate spill area and provide ventilation. Vacuum up spill using a high efficiency particulate absolute (HEPA) air filter and place in a closed container for proper disposal. Take care not to raise dust.

Waste Disposal Method: Dispose in accordance with local, state and federal regulations.
Hazard Label Information: Store in a cool, dry area, Wash thoroughly after handling. Store in tightly sealed container.
Precautions to be Taken in Handling and Storing: Bismuth telluride may react with water. Handle and store in a controlled environment and inert gas such as argon.

VIII SPECIAL PROTECTION INFORMATION

Respiratory Protection (Specify Type): Wear a NIOSH-approved dust, mist, vapor cartridge respirator.

Ventilation: **Local Exhaust**: To maintain conc. at or below PEL, TLV.
Special: Handle in a controlled environment.

Mechanical (General): Not recommended
Other: Handle in an inert gas such as argon.

Protective Gloves: Neoprene

Eye Protection: Safety Glasses

Other Protective Equipment: Wear protective clothing to prevent contamination. Implement engineering and work practice controls to reduce and maintain concentration of exposure at low levels. Use good housekeeping and sanitation practices. Do not use tobacco or food in work area. Wash thoroughly before eating and smoking. do not blow dust off clothing or skin with compressed air.

IX SPECIAL PRECAUTIONS

Some of the chemicals listed herein are research or experimental substances which may be toxic, as defined by various governmental regulations. In accordance with Environmental Protection Agency regulation and the Toxic Substances Control Act (TSCA), these materials should only be handled by, or under the direct supervision of, a "technically qualified individual", as defined in 40 CFR 710.2(aa).

The above information is accurate to the best of our knowledge. However, since, data, safety standards, and government regulation are subject to change, and the conditions of handling and use or misuse are beyond our control, ESPI makes no warranty, neither expressed nor implied, with respect to the completeness or continuing accuracy of the information contained herein, and disclaims all liability for reliance thereon. Users should satisfy themselves that they have all current data relevant to their particular use.

Prepared by: S. Dierks
Dated: March 1994