

LTS RESEARCH LABORATORIES, INC.
MATERIAL SAFETY DATA SHEET
BISMUTH TELLURIDE SELENIDE

GENERAL

MANUFACTURER/SUPPLIER: LTS RESEARCH LABORATORIES, INC.

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DATE MSDS PREPARED: 02/03/05
DATE MSDS REVISED: 10/6/2010

1. PRODUCT IDENTIFICATION

PRODUCT NAME: BISMUTH TELLURIDE-SELENIDE
FORMULA: $\text{Bi}_2\text{Te}_2\text{Se}_3$
CAS #: 1304-82-1/12068-69-8

2. PHYSICAL AND CHEMICAL CHARACTERISTICS

BOILING POINT 760 mm Hg: N/A
MELTING POINT: N/A
SPECIFIC GRAVITY: N/A
VAPOR PRESSURE: N/A
% VOLATILES: N/A
SOLUBILITY IN H_2O : INSOLUBLE
APPEARANCE AND ODOR: GREY BLACK TARGET, ODORLESS

3. HAZARD IDENTIFICATION

HAZARDOUS DESCRIPTION: Xi IRRITANT
T TOXIC
N DANGEROUS FOR THE ENVIRONMENT
R 23/25 TOXIC BY INHALATION AND IF SWALLOWED.
R 33 DANGER OF CUMULATIVE EFFECTS.
R 36/37/38 IRRITATING TO EYES, RESPIRATORY SYSTEM AND SKIN.

HAZARDOUS COMPONENTS %
BISMUTH TELLURIDE 0-100%
OSHA/PEL: N/E
ACGIH/TLV N/E
SEC.302 NO
SEC.304 NO
SEC.313 NO

HMIS RATINGS:
HEALTH: 2
FLAMMABILITY: 0
REACTIVITY: 1
PROTECTIVE EQUIP: H: GLASSES, GLOVES, CLOTHING, AND DUST RESPIRATOR

4. FIRE FIGHTING MEASURES

FLASH POINT: N/A
AUTOIGNITION TEMPERATURE: N/A
FLAMMABLE LIMITS:
UPPER: N/A
LOWER: N/A

FLAMMABILITY:	NON-FLAMMABLE
EXTINGUISHING MEDIA:	USE ANY MEANS SUITABLE FOR EXTINGUISHING SURROUNDING FIRE
SPECIAL FIRE FIGHTING PROCEDURES:	FIREFIGHTERS MUST WEAR FULL FACE, 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.
UNUSUAL FIRE AND EXPLOSION HAZARDS:	IN CASE OF FIRE, HYDROGEN SELENIDE AND TOXIC METAL OXIDE FUME CAN BE RELEASED.

5. HEALTH HAZARD INFORMATION

EFFECTS OF EXPOSURE:	BISMUTH AND ITS SALTS CAN CAUSE KIDNEY DAMAGE, ALTHOUGH THE DEGREE OF SUCH DAMAGE IS USUALLY MILD. LARGE DOSES CAN BE FATAL. INDUSTRIALLY IT IS CONSIDERED ONE OF THE LESS TOXIC OF THE HEAVY METALS. 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 BISMUTH SHOULD BE STOPPED WHEN GINGIVITIS APPEARS, FOR OTHERWISE SERIOUS ULCERATION STOMATITIS IS LIKELY TO RESULT. OTHER TOXIC RESULTS MAY DEVELOP, SUCH AS A VAGUE FEELING OF BODILY DISCOMFORT, PRESENCE OF ALBUMIN OR OTHER PROTEIN SUBSTANCE IN THE URINE, DIARRHEA, SKIN REACTIONS AND SOMETIMES SERIOUS EXODERMATITIS. SELENIUM MAY CAUSE AMYOTROPHIC LATERAL SCLEROSIS, BRONCHIAL IRRITATION, GASTROINTESTINAL DISTRESS, VASOPHARYNGEAL IRRITATION, GARLIC ODOR ON BREATH AND SWEAT, METALLIC TASTE, PALLOW, IRRITABILITY, EXCESSIVE FATIGUE, LOSS OF FINGERNAILS AND HAIR, PULMONARY EDEMA, ANEMIA AND WEIGHT LOSS.
ACUTE EFFECTS: INGESTION:	LOW TOXICITY. BISMUTH SALTS ARE POORLY ABSORBED. SHOULD ABSORPTION OCCUR, SYMPTOMS MAY INCLUDE LOSS OF APPETITE, HEADACHE, SKIN RASHES, KIDNEY DAMAGE, AND RARELY MILD JAUNDICE.
SKIN:	MAY CAUSE IRRITATION
EYE:	MAY CAUSE IRRITATION
INHALATION: KIDNEYS:	MAY AFFECT THE FUNCTION OF THE LIVER AND THE
CHRONIC EXPOSURE:	TELLURIUM IS CONVERTED IN THE BODY TO DIMETHYL TELLURIDE WHICH IMPARTS A GARLIC LIKE ODOR TO THE BREATH AND SWEAT. HEAVY EXPOSURE MAY RESULT IN HEADACHE, DROWSINESS, METALLIC TASTE, AND LOSS OF APPETITE, HEADACHE, SKIN RASH, KIDNEY DAMAGE AND JAUNDICE.
MEDICAL CONDITIONS GENERALLY AGGRAVATED BY EXPOSURE:	NONE RECORDED
ROUTES OF EXPOSURE:	INHALATION, SKIN, AND INGESTION
CARCINOGENICITY:	
NTP:	NO
IARC:	NO
OSHA:	NO

6. STABILITY

STABILITY:	STABLE.
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CONDITION TO AVOID:	NONE
INCOMPATIBILITY (MATERIAL TO AVOID):	OXDIZING AGENTS, ACIDS, WATER/MOISTURE
HAZARDOUS REACTIONS:	REACTS WITH OXIDIZING AGENTS.
HAZARDOUS DECOMPOSITION:	METAL OXIDE FUME, HYDROGEN SELENIDE

7. EMERGENCY AND FIRST AID PROCEDURES:

INHALATION:	REMOVE TO FRESH AIR. IF BREATHING IS DIFFICULT GIVE OXYGEN. SEEK MEDICAL ATTENTION
INGESTION:	IF CONSCIOUS, ADMINISTER 1-2 GLASSES OF MILK OR WATER AND INDUCE VOMITING. SEEK MEDICAL ATTENTION.
SKIN:	BRUSH MATERIAL OFF SKIN AND WASH AREA WITH SOAP AND WATER. SEEK MEDICAL ATTENTION IF SYMPTOMS PERSIST.
EYE:	FLUSH EYES WITH LUKEWARM WATER FOR AT LEAST 15 MINUTE. SEEK MEDICAL ATTENTION IF SYMPTOMS PERSIST.

8. HANDLING AND STORAGE

HANDLING AND STORAGE	STORE IN TIGHTLY CLOSED CONTAINERS IN A COOL, DRY PLACE. WASH HANDS AND FACE THOROUGHLY AFTER HANDLING AND BEFORE MEALS.
OTHER PRECAUTIONS:	AVOID CONTACT TO SKIN AND EYES. AVOID CONTACT WITH HEAT, SPARKS AND FLAME. AVOID INGESTION AND INHALATION.

9. SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED:	WEAR APPROPRIATE RESPIRATORY AND PROTECTIVE EQUIPMENT SPECIFIED BELOW. ISOLATE SPILL AND PROVIDE ADEQUATE 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
RESPIRATORY PROTECTION SPECIFY TYPE): RESPIRATOR.	NIOSH APPROVED DUST-FUME-MIST CARTRIDGE
VENTILATION:	USE LOCAL EXHAUST TO MAINTAIN CONCENTRATION AT LOW EXPOSURE LEVELS. GENERAL EXHAUST IS RECOMMENDED.
PROTECTIVE GLOVES:	RUBBER GLOVES
EYE PROTECTION:	SAFETY GLASSES
OTHER PROTECTIVE EQUIPMENT:	PROTECTIVE GEAR SUITABLE TO PREVENT CONTAMINATION.
WASTE DISPOSAL METHOD:	IN ACCORDANCE WITH LOCAL, STATE AND FEDERAL REGULATIONS.

10. TOXICITY DATA

METALLIC BISMUTH IS RELATIVELY NON-TOXIC	
IRRITANTION:	SKIN, MUCUS MEMBRANE EYES.
SENSITIZATION:	NONE
ORAL RAT LD50:	5g/Kg
ORAL MOUSE:	10gm/kg

SUBACUTE TO CHRONIC TOXICITY: BISMUTH AND BISMUTH COMPOUNDS ARE OFTEN POORLY ABSORBED. SHOULD ABSORPTION OCCUR, HOWEVER, EXPOSURE MAY CAUSE LOSS OF APPETITE, HEADACHE, SKIN RASH, EXODERMATITIS, KIDNEY INJURY AND JAUNDICE. REPEATED OR PROLONGED EXPOSURE MAY CAUSE A BISMUTH LINE OR BLACK SPOTS ON THE GUMS, FOUL BREATH AND SALIVATION.

CARCINOGENICITY:

ACGIH:	NO
IARC:	NO
NIOSH:	NO
NTP:	NO
OSHA:	NO

11. TRANSPORTATION DATA

BISMUTH SELENIDE

UN NUMBER:	UN3077
HAZARD CLASS:	9
ADR//RID CLASS:	9
IMDG CLASS:	9
AIR TRAN. ICAO/IATA CLASS:	9
MARITIME TRAN. IMDG CLASS:	9
PROPER SHIPPING NAME:	ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (Bismuth (III) selenide)

BISMUTH TELLURIDE

UN NUMBER:	UN3284
HAZARD CLASS:	6.1
ADR//RID CLASS:	6.1
IMDG CLASS:	6.1
AIR TRAN. ICAO/IATA CLASS:	6.1
MARITIME TRAN. IMDG CLASS:	6.1
PROPER SHIPPING NAME:	TELLURIUM COMPOUND, N.O.S. (Bismuth (III) telluride)

12. REGULATIONS

PRODUCT RELATED HAZARD INFORMATION:

HAZARD SYMBOLS:

XI IRRITANT RISK PHRASES: R 23/25 TOXIC BY INHALATION AND IF SWALLOWED.

R 33 DANGER OF CUMULATIVE EFFECTS.
R 36/37/38 IRRITATING TO EYES, RESPIRATORY SYSTEM AND SKIN.

SAFETY PHRASES:

26 IN CASE OF CONTACT WITH EYES, RINSE IMMEDIATELY WITH PLENTY OF WATER AND SEEK MEDICAL ADVICE.
37 WEAR SUITABLE GLOVES.

NATIONAL REGULATIONS:

ALL COMPONENTS OF THIS PRODUCT ARE LISTED IN THE U.S. ENVIRONMENTAL PROTECTION AGENCY TOXIC SUBSTANCES CONTROL ACT CHEMICAL SUBSTANCE

INVENTOR INFORMATION ABOUT

LIMITATION OF USE:

FOR USE ONLY BY TECHNICALLY QUALIFIED INDIVIDUALS.

13. OTHER INFORMATION

THIS SAFETY DATA SHEET SHOULD BE USED IN CONJUNCTION WITH TECHNICAL SHEETS. IT DOES NOT REPLACE THEM. THE INFORMATION GIVEN IS BASED ON OUR KNOWLEDGE OF THIS

PRODUCT, AT THE TIME OF PUBLICATION. IT IS GIVEN IN GOOD FAITH. THE ATTENTION OF THE USER IS DRAWN TO THE POSSIBLE RISKS INCURRED BY USING THE PRODUCT FOR ANY OTHER PURPOSE OTHER THAN THAT FOR WHICH IT WAS INTENDED. THIS DOES NOT IN ANY WAY EXCUSE THE USER FROM KNOWING AND APPLYING ALL THE REGULATIONS GOVERNING HIS ACTIVITY. IT IS THE SOLE RESPONSIBILITY OF THE USER TO TAKE ALL PRECAUTIONS REQUIRED IN HANDLING THE PRODUCT. THE AIM OF THE MANDATORY REGULATIONS MENTIONED IS TO HELP THE USER TO FULFILL HIS OBLIGATIONS REGARDING THE USE OF HAZARDOUS PRODUCTS.