SAFETY DATA SHEET

This safety data sheet was created pursuant to the requirements of:
US OSHA Hazard Communication Standard (29 CFR 1910.1200)

Revision date 07/03/2024 **Revision Number** 5

1. Identification

Product identifier

Product Name Germanium Antimony Tellurium (pieces) - Ge2Sb2Te5

Other means of identification

Safety data sheet number 06074

Synonyms None

Recommended use of the chemical and restrictions on use

Recommended use Physical vapor deposition of thin films

Restrictions on use This product is designed for use by technically competent persons.
Any use of this product, other than for its stated use, should not be attempted without expert review.

Details of the supplier of the safety data sheet

Supplier Address
Kurt J Lesker Company

Manufacturer Address
Kurt J Lesker Company
1925 Route 51
Jefferson Hills, PA 15025
+1 412-387-9200

Kurt J Lesker Company LTD
United Kingdom
Austin House
Sidney Little Road
Churchfields Industrial Estate
St Leonards on Sea, East Sussex, TN38 9PU, United Kingdom
Customer Service: +44 (0) 1424 458100

E-mail msds@lesker.com

Emergency telephone number

Emergency Telephone North America [USA, Canada, Mexico]: 1-866-519-4752
Mainland China: (+86) 4001 2001 74
Europe: { int'l call prefix} -1-760-476-3961
Asia Pacific: { int'l call prefix} -1-760-476-3960
Middle East & Africa: { int'l call prefix} -1-760-476-3959
South Korea: +080-880-0455
Philippines: (+63) 2 83953471

2. Hazard(s) identification

Classification

Acute toxicity - Inhalation (Gases)	Not applicable
Acute toxicity - Inhalation (Dusts/Mists)	Category 4
Carcinogenicity	Category 2
Reproductive toxicity	Category 1B
Effects on or via lactation	Yes
Specific target organ toxicity (repeated exposure)	Category 2

Hazards not otherwise classified (HNOC)
Not applicable

Label elements



Danger

Hazard statements
Harmful if inhaled.
Suspected of causing cancer.
May damage fertility or the unborn child.
May cause harm to breast-fed children.
May cause damage to organs through prolonged or repeated exposure.

Precautionary Statements - Prevention
Obtain special instructions before use.
Do not handle until all safety precautions have been read and understood.
Wear protective gloves/clothing and eye/face protection.
Avoid contact during pregnancy and while nursing.
Wash face, hands and any exposed skin thoroughly after handling.
Do not eat, drink or smoke when using this product.
Use only outdoors or in a well-ventilated area.
Do not breathe dust/fume/gas/mist/vapors/spray.

Precautionary Statements - Response
IF exposed or concerned: Get medical advice/attention.
IF INHALED: Remove person to fresh air and keep comfortable for breathing.

Precautionary Statements - Storage
Store locked up.

Precautionary Statements - Disposal
Dispose of contents/container to an approved waste disposal plant.

Unknown acute toxicity
14 % of the mixture consists of ingredient(s) of unknown acute inhalation toxicity (dust/mist).

Other information
May be harmful if inhaled.

3. Composition/information on ingredients

Substance

Not applicable.

Mixture

Formula Ge2Sb2Te5

Chemical name	CAS No.	Weight-%	Trade secret
Tellurium (pieces)	13494-80-9	50-70	*
Antimony (pieces)	7440-36-0	22-25	*
Germanium (powder and pieces)	7440-56-4	10-20	*

*The exact percentage (concentration) of composition has been withheld as a trade secret.

4. First-aid measures

Description of first aid measures

General advice IF exposed or concerned: Get medical advice/attention. Show this safety data sheet to the doctor in attendance.

Inhalation If breathing has stopped, give artificial respiration. Get medical attention immediately. Remove to fresh air. If symptoms persist, call a physician.

Eye contact Rinse thoroughly with plenty of water for at least 15 minutes, lifting lower and upper eyelids. Consult a physician.

Skin contact Wash skin with soap and water.

Ingestion Do NOT induce vomiting. Rinse mouth. Never give anything by mouth to an unconscious person. Get medical attention.

Self-protection of the first aider Ensure that medical personnel are aware of the material(s) involved, take precautions to protect themselves and prevent spread of contamination. Avoid breathing dust/fume/gas/mist/vapors/spray. Use personal protective equipment as required. See section 8 for more information.

Most important symptoms and effects, both acute and delayed

Symptoms Coughing and/ or wheezing. Difficulty in breathing.

Effects of Exposure May cause adverse reproductive effects - such as birth defect, miscarriages, or infertility. May cause damage to organs through prolonged or repeated exposure.

Indication of any immediate medical attention and special treatment needed

Note to physicians Treat symptomatically.

5. Fire-fighting measures

Suitable Extinguishing Media Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.

Large Fire CAUTION: Use of water spray when fighting fire may be inefficient.

Unsuitable extinguishing media Do not scatter spilled material with high pressure water streams.

Specific hazards arising from the No information available.

chemical

Explosion data

Sensitivity to mechanical impact None.

Sensitivity to static discharge None.

Special protective equipment and precautions for fire-fighters Firefighters should wear self-contained breathing apparatus and full firefighting turnout gear. Use personal protection equipment.

6. Accidental release measures

Personal precautions, protective equipment and emergency procedures

Personal precautions Ensure adequate ventilation. Avoid generation of dust. Do not breathe dust. Use personal protective equipment as required.

Other information Refer to protective measures listed in Sections 7 and 8.

Methods and material for containment and cleaning up

Methods for containment Prevent further leakage or spillage if safe to do so.

Methods for cleaning up Pick up and transfer to properly labeled containers.

Prevention of secondary hazards Clean contaminated objects and areas thoroughly observing environmental regulations.

7. Handling and storage

Precautions for safe handling

Advice on safe handling Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin, eyes or clothing. Do not eat, drink or smoke when using this product. Remove contaminated clothing and shoes. Avoid breathing dust/fume/gas/mist/vapors/spray. Avoid generation of dust. Ensure adequate ventilation.

Conditions for safe storage, including any incompatibilities

Storage Conditions Store locked up. Keep containers tightly closed in a dry, cool and well-ventilated place. Keep out of the reach of children.

8. Exposure controls/personal protection

Control parameters

Exposure Limits

Chemical name	ACGIH TLV	OSHA PEL	NIOSH
Tellurium (pieces) 13494-80-9	TWA: 0.1 mg/m³	TWA: 0.1 mg/m³ (vacated) TWA: 0.1 mg/m³	IDLH: 25 mg/m³ TWA: 0.1 mg/m³
Antimony (pieces) 7440-36-0	TWA: 0.5 mg/m³	TWA: 0.5 mg/m³ (vacated) TWA: 0.5 mg/m³	IDLH: 50 mg/m³ TWA: 0.5 mg/m³

Appropriate engineering controls

Engineering controls
Showers
Eyewash stations
Ventilation systems.

Individual protection measures, such as personal protective equipment

Eye/face protection
Appropriate eye/face protection should be selected and used according to the chemical nature, hazards and use of this product and safety requirements of the local jurisdiction.

Hand protection
Wear suitable gloves.

Skin and body protection
Wear suitable protective clothing.

Respiratory protection
Appropriate respiratory protection should be selected and used according to the chemical nature, hazards and use of this product and safety requirements of the local jurisdiction. If exposure limits are exceeded or irritation is experienced, ventilation and evacuation may be required.

General hygiene considerations
Do not eat, drink or smoke when using this product. Wash hands before breaks and immediately after handling the product. Avoid breathing dust/fume/gas/mist/vapors/spray.

9. Physical and chemical properties

Information on basic physical and chemical properties

Physical state	Solid
Appearance	solid
Color	Various colours
Odor	No characteristic odour
Odor threshold	No information available

Property	**Values**	**Remarks • Method**
pH	No data available	
pH (as aqueous solution)		
Melting point / freezing point	600 °C / 1112.0 °F	600°C/1112°F
Initial boiling point and boiling range	No data available	
Flash point	No data available	
Evaporation rate	No data available	
Flammability	No data available	
Flammability Limit in Air		
Upper flammability or explosive limits	No data available	
Lower flammability or explosive limits	No data available	
Vapor pressure	No data available	
Relative vapor density	No data available	
Relative density	~ 6.35	
Water solubility	Insoluble in water	
Solubility(ies)	No data available	
Partition coefficient	No data available	
Autoignition temperature	No data available	
Decomposition temperature		
Kinematic viscosity	No data available	
Dynamic viscosity	No data available	

Other information

Explosive properties	No information available
Oxidizing properties	No information available
Softening point	No information available

Molecular weight	1026.8
VOC content	No information available
Liquid Density	No information available
Bulk density	No information available

10. Stability and reactivity

Reactivity No information available.

Chemical stability Stable under normal conditions.

Possibility of hazardous reactions None under normal processing.

Conditions to avoid Excessive heat.

Incompatible materials None known based on information supplied.

Hazardous decomposition products None under normal use conditions. Thermal decomposition can lead to release of irritating and toxic gases and vapors. antimony trioxide. Tellurium and its compounds.

11. Toxicological information

Information on likely routes of exposure

Product Information

Inhalation Specific test data for the substance or mixture is not available. Harmful by inhalation. (based on components). May be harmful if inhaled.

Eye contact Specific test data for the substance or mixture is not available.

Skin contact Specific test data for the substance or mixture is not available.

Ingestion Specific test data for the substance or mixture is not available. Toxic if swallowed. (based on components).

Symptoms related to the physical, chemical and toxicological characteristics

Symptoms Coughing and/ or wheezing.

Acute toxicity Harmful by inhalation.

Numerical measures of toxicity

The following values are calculated based on chapter 3.1 of the GHS document

ATEmix (oral)	25,083.30 mg/kg
ATEmix (dermal)	99,999.00 mg/kg
ATEmix (inhalation-vapor)	39.40 mg/l
ATEmix (inhalation-dust/mist)	1.50 mg/l

Unknown acute toxicity

14 % of the mixture consists of ingredient(s) of unknown acute inhalation toxicity (dust/mist)

Component Information

Chemical name	Oral LD50	Dermal LD50	Inhalation LC50
Tellurium (pieces) 13494-80-9	> 5000 mg/kg (Rat)	-	> 2.42 mg/L (Rat) 4 h
Antimony (pieces) 7440-36-0	= 7 g/kg (Rat)	-	-

Germanium (powder and pieces) 7440-56-4	-	-	> 5340 mg/m³ (Rat) 4 h

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Skin corrosion/irritation No information available.

Serious eye damage/eye irritation No information available.

Respiratory or skin sensitization No information available.

Germ cell mutagenicity No information available.

Carcinogenicity Contains a known or suspected carcinogen. Classification based on data available for ingredients. Suspected of causing cancer.

Reproductive toxicity Classification based on data available for ingredients. May damage fertility or the unborn child. May cause harm to breast-fed children.

STOT - single exposure No information available.

STOT - repeated exposure May cause damage to organs through prolonged or repeated exposure.

Target organ effects Respiratory system, Eyes, Skin, Central nervous system, Blood, Central Vascular System (CVS).

Aspiration hazard No information available.

Other adverse effects No information available.

Interactive effects No information available.

12. Ecological information

Ecotoxicity The environmental impact of this product has not been fully investigated.

Persistence and degradability No information available.

Bioaccumulation There is no data for this product.

Other adverse effects No information available.

13. Disposal considerations

Disposal methods

Waste from residues/unused products Dispose of in accordance with local regulations. Dispose of waste in accordance with environmental legislation.

Contaminated packaging Do not reuse empty containers.

California Hazardous Waste Status This product contains one or more substances that are listed with the State of California as a hazardous waste.

14. Transport information

DOT Not regulated

TDG

MEX

15. Regulatory information

International Inventories

TSCA Contact supplier for inventory compliance status.

Chemical name	CAS No.	Inventory Listing Status	Commercial Activity Designation
Tellurium (pieces)	13494-80-9	Present	Active
Antimony (pieces)	7440-36-0	Present	Active
Germanium (powder and pieces)	7440-56-4	Present	Active

DSL/NDSL Contact supplier for inventory compliance status.
EINECS/ELINCS Contact supplier for inventory compliance status.
ENCS Contact supplier for inventory compliance status.
IECSC Contact supplier for inventory compliance status.
KECL Contact supplier for inventory compliance status.
PICCS Contact supplier for inventory compliance status.
AIIC Contact supplier for inventory compliance status.
NZIoC Contact supplier for inventory compliance status.

Legend:
TSCA - United States Toxic Substances Control Act Section 8(b) Inventory
DSL/NDSL - Canadian Domestic Substances List/Non-Domestic Substances List
EINECS/ELINCS - European Inventory of Existing Chemical Substances/European List of Notified Chemical Substances
ENCS - Japan Existing and New Chemical Substances
IECSC - China Inventory of Existing Chemical Substances
KECL - Korean Existing and Evaluated Chemical Substances
PICCS - Philippines Inventory of Chemicals and Chemical Substances
AIIC - Australian Inventory of Industrial Chemicals
NZIoC - New Zealand Inventory of Chemicals

US Federal Regulations

SARA 313
Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA). This product contains a chemical or chemicals which are subject to the reporting requirements of the Act and Title 40 of the Code of Federal Regulations, Part 372.

Chemical name	SARA 313 - Threshold Values %
Antimony (pieces) - 7440-36-0	1.0

SARA 311/312 Hazard Categories
Should this product meet EPCRA 311/312 Tier reporting criteria at 40 CFR 370, refer to Section 2 of this SDS for appropriate classifications.

CWA (Clean Water Act)
This product contains the following substances which are regulated pollutants pursuant to the Clean Water Act (40 CFR 122.21 and 40 CFR 122.42).

Chemical name	CWA - Reportable Quantities	CWA - Toxic Pollutants	CWA - Priority Pollutants	CWA - Hazardous Substances
Antimony (pieces) 7440-36-0	-	X	X	-

CERCLA
This material, as supplied, contains one or more substances regulated as a hazardous substance under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302).

Chemical name	Hazardous Substances RQs	Extremely Hazardous Substances RQs	Reportable Quantity (RQ)
Antimony (pieces) 7440-36-0	5000 lb	-	RQ 5000 lb final RQ RQ 2270 kg final RQ

US State Regulations

California Proposition 65
This product does not contain any Proposition 65 chemicals.

U.S. State Right-to-Know Regulations

Chemical name	New Jersey	Massachusetts	Pennsylvania
Tellurium (pieces) 13494-80-9	X	X	X
Antimony (pieces) 7440-36-0	X	X	X

U.S. EPA Label Information

EPA Pesticide Registration Number Not applicable

16. Other information

NFPA **Health hazards** 3 **Flammability** 0 **Instability** 0 **Special hazards** -
HMIS **Health hazards** 3 * **Flammability** 0 **Physical hazards** 0 **Personal protection** X
Chronic Hazard Star Legend ** = Chronic Health Hazard*

Key or legend to abbreviations and acronyms used in the safety data sheet

Legend Section 8: Exposure controls/personal protection

TWA	TWA (time-weighted average)	STEL	STEL (Short Term Exposure Limit)
Ceiling	Maximum limit value	Sk*	Skin designation

Key literature references and sources for data used to compile the SDS
Agency for Toxic Substances and Disease Registry (ATSDR)
U.S. Environmental Protection Agency ChemView Database
European Food Safety Authority (EFSA)
EPA (Environmental Protection Agency)
Acute Exposure Guideline Level(s) (AEGL(s))
U.S. Environmental Protection Agency Federal Insecticide, Fungicide, and Rodenticide Act
U.S. Environmental Protection Agency High Production Volume Chemicals
Food Research Journal
Hazardous Substance Database
International Uniform Chemical Information Database (IUCLID)
National Institute of Technology and Evaluation (NITE)
Australia National Industrial Chemicals Notification and Assessment Scheme (NICNAS)
NIOSH (National Institute for Occupational Safety and Health)
National Library of Medicine's ChemID Plus (NLM CIP)
National Library of Medicine’s PubMed database (NLM PUBMED)
National Toxicology Program (NTP)
New Zealand's Chemical Classification and Information Database (CCID)
Organization for Economic Co-operation and Development Environment, Health, and Safety Publications
Organization for Economic Co-operation and Development High Production Volume Chemicals Program
Organization for Economic Co-operation and Development Screening Information Data Set
World Health Organization

Revision date 07/03/2024
Revision Note No information available.
Disclaimer
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End of Safety Data Sheet