

**MATERION****1. Chemical and company identification**

Name of chemical (Product name)	Ge-As-Se-Si 17-24-55-4 at% (16-24-58-2 wt%)	
Company name	Materion Advanced Chemicals Inc.	
Address	407 N 13th Street 1316 W. St. Paul Avenue Milwaukee, WI 53233 United States	
Division	Milwaukee	
Contact person	Noreen Atkinson	
Telephone	414.212.0257	
e-mail address	advancedmaterials@materion.com	
Emergency telephone number	Chemtrec	800.424.9300
Materion Code	2JW	
Reference number	2JW	

2. Hazards identification**GHS classification**

Physical hazards	The product is not classified according to GHS.	
Health hazards	Serious eye damage/eye irritation	Category 2
	Carcinogenicity	Category 1A
	Reproductive toxicity	Category 2
	Specific target organ toxicity, single exposure	Category 1 (blood system, cardiovascular system, central nervous system, circulatory system, digestive system, digestive tract, kidney, liver, nervous system, respiratory system, skin)
	Specific target organ toxicity, repeated exposure	Category 1 (blood system, circulatory system, digestive system, kidney, liver, nervous system, respiratory system, skin)
Environmental hazards	Hazardous to the aquatic environment, acute hazard	Category 3
	Hazardous to the aquatic environment, long-term hazard	Category 4

GHS label elements**Symbols****Signal words**

Danger

Hazard statement

Causes serious eye irritation. May cause cancer. Suspected of damaging fertility or the unborn child. Causes damage to organs (blood system, cardiovascular system, central nervous system, circulatory system, digestive system, digestive tract, kidney, liver, nervous system, respiratory system, skin). Causes damage to organs (blood system, circulatory system, digestive system, kidney, liver, nervous system, respiratory system, skin) through prolonged or repeated exposure. Toxic to aquatic life. May cause long lasting harmful effects to aquatic life.

Precautionary statement**Prevention**

Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Do not breathe dust/fume/gas/mist/vapors/spray. Wash thoroughly after handling. Do not eat, drink or smoke when using this product. Avoid release to the environment. Wear protective gloves/protective clothing/eye protection/face protection.

Response	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. IF exposed or concerned: Call a POISON CENTER/doctor. If eye irritation persists: Get medical advice/attention.
Storage	Store locked up.
Disposal	Dispose of contents/container in accordance with local/regional/national/international regulations.
Other hazards which do not result in classification	None known.
Supplemental information	16% of the mixture consists of component(s) of unknown acute oral toxicity. 100% of the mixture consists of component(s) of unknown acute dermal toxicity. 76% of the mixture consists of component(s) of unknown acute hazards to the aquatic environment. 18% of the mixture consists of component(s) of unknown long-term hazards to the aquatic environment. For further information, please contact the Product Stewardship Department at +1.800.862.4118.

Main symptoms and emergency overview

Main symptoms	Narcosis. Headache. Behavioral changes. Decrease in motor functions. Severe eye irritation. Symptoms may include stinging, tearing, redness, swelling, and blurred vision. Skin irritation. Rash. Defatting of the skin. Edema. Jaundice. Prolonged exposure may cause chronic effects.
Emergency overview	Causes damage to organs. May cause cancer. Causes serious eye irritation. Possible reproductive hazard. Prolonged exposure may cause chronic effects. Dangerous for the environment if discharged into watercourses. The material as sold in solid form is generally not considered hazardous. However, if the process involves grinding, melting, cutting or any other process that causes a release of dust or fumes, hazardous levels of airborne particulate could be generated.

3. Composition/information on ingredients

Substance or mixture	Mixture	Gazette notification		
Components	CAS Number	ENCS no.	ISHL no.	Concentration (%)
Selenium	7782-49-2			58
Arsenic	7440-38-2			24
Germanium	7440-56-4			≤ 16
Silicon	7440-21-3			≤ 2

Chemical formula Se (7782-49-2), As (7440-38-2), Ge (7440-56-4), Si (7440-21-3)

4. First aid measures

If inhaled	Move to fresh air. Call a physician if symptoms develop or persist.
If on skin	Wash off with soap and water. Get medical attention if irritation develops and persists.
If in eyes	Immediately flush eyes with plenty of water for at least 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical advice/attention.
If swallowed	Rinse mouth. Get medical attention if symptoms occur.
Most important symptoms/effects, acute and delayed	Narcosis. Headache. Behavioral changes. Decrease in motor functions. Severe eye irritation. Symptoms may include stinging, tearing, redness, swelling, and blurred vision. Skin irritation. Rash. Defatting of the skin. Edema. Jaundice. Prolonged exposure may cause chronic effects.
Protection of first-aid responders	IF exposed or concerned: Get medical advice/attention. If you feel unwell, seek medical advice (show the label where possible). Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves. Show this safety data sheet to the doctor in attendance.
Notes to physician	Provide general supportive measures and treat symptomatically. Keep victim under observation. Symptoms may be delayed.

5. Fire-fighting measures

Extinguishing media	Foam. Powder. Dry sand. Carbon dioxide (CO ₂).
Extinguishing media to avoid	Do not use water jet as an extinguisher, as this will spread the fire.
Specific hazards	During fire, gases hazardous to health may be formed.
Special fire fighting procedures	Move containers from fire area if you can do so without risk.
Protection of fire-fighters	Self-contained breathing apparatus and full protective clothing must be worn in case of fire.

General fire hazards No unusual fire or explosion hazards noted.

Specific methods Use standard firefighting procedures and consider the hazards of other involved materials.

6. Accidental release measures

Personal precautions, protective equipment and emergency measures Keep unnecessary personnel away. Keep people away from and upwind of spill/leak. Wear appropriate protective equipment and clothing during clean-up. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. Ensure adequate ventilation. Local authorities should be advised if significant spillages cannot be contained.

Environmental precautions Avoid release to the environment. Inform appropriate managerial or supervisory personnel of all environmental releases. Prevent further leakage or spillage if safe to do so. Avoid discharge into drains, water courses or onto the ground.

Methods or materials for containment and cleaning up Prevent entry into waterways, sewer, basements or confined areas.

Large Spills: Stop the flow of material, if this is without risk. Dike the spilled material, where this is possible. Absorb in vermiculite, dry sand or earth and place into containers. Following product recovery, flush area with water.

Small Spills: Wipe up with absorbent material (e.g. cloth, fleece). Clean surface thoroughly to remove residual contamination.

Never return spills to original containers for re-use. Put material in suitable, covered, labeled containers.

7. Handling and storage

Handling

Technical measures (e.g. Local and general ventilation) Provide adequate ventilation.

Safe handling advice Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Avoid contact with eyes. Avoid prolonged exposure. When using, do not eat, drink or smoke. Pregnant or breastfeeding women must not handle this product. Should be handled in closed systems, if possible. Wash hands thoroughly after handling. Avoid release to the environment. Observe good industrial hygiene practices.

Contact avoidance measures Strong oxidizing agents. Acids. Fluorine. Chlorine.

Hygiene measures Observe any medical surveillance requirements. Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking.

Storage

Safe storage conditions Store locked up. Keep container tightly closed.

Safe packaging materials Store in original tightly closed container.

8. Exposure controls/personal protection

Occupational exposure limits

Japan. OELs - ISHL. (Workplace Environment Assessment Standards)

Components	Type	Value
Arsenic (CAS 7440-38-2)	TLV	0.003 mg/m3

Japan. OELs - JSOH (Japan Society of Occupational Health: Recommendation of Occupational Exposure Limits)

Components	Type	Value
Selenium (CAS 7782-49-2)	TWA	0.1 mg/m3

US. ACGIH Threshold Limit Values

Components	Type	Value
Arsenic (CAS 7440-38-2)	TWA	0.01 mg/m3
Selenium (CAS 7782-49-2)	TWA	0.2 mg/m3

Biological limit values

ACGIH Biological Exposure Indices

Components	Value	Determinant	Specimen	Sampling Time
Arsenic (CAS 7440-38-2)	35 µg/l	Inorganic arsenic, plus methylated metabolites, as As	Urine	*

* - For sampling details, please see the source document.

Engineering measures

Good general ventilation (typically 10 air changes per hour) should be used. Ventilation rates should be matched to conditions. If applicable, use process enclosures, local exhaust ventilation, or other engineering controls to maintain airborne levels below recommended exposure limits. If exposure limits have not been established, maintain airborne levels to an acceptable level. Provide eyewash station.

Personal protective equipment

Respiratory protection	Wear positive pressure self-contained breathing apparatus (SCBA).
Hand protection	Wear appropriate chemical resistant gloves.
Eye protection	Wear safety glasses with side shields (or goggles).
Skin and body protection	Wear suitable protective clothing. Use of an impervious apron is recommended.

9. Physical and chemical properties

Appearance

Physical state	Solid.
Form	Solid.
Color	Not available.

Odor Not available.

pH Not available.

Melting point/Freezing point 356 °F (180 °C) estimated

Boiling point, initial boiling point, and boiling range 1265 °F (685 °C) estimated

Flash point Not available.

Combustion characteristics (solid, gas) Not available.

Upper/lower flammability or explosive limits

Flammability limit - lower (%) Not available.

Flammability limit - upper (%) Not available.

Explosive limit - lower (%) Not available.

Explosive limit - upper (%) Not available.

Vapor pressure 3647.69 hPa estimated

Vapor density Not available.

Specific gravity 4.89 estimated

Solubility(ies)

Solubility (water) Not available.

Partition coefficient (n-octanol/water) Not available.

Auto-ignition temperature Not available.

Decomposition temperature Not available.

Viscosity (Coefficient of viscosity) Not available.

Other information

Density 4.89 g/cm3 estimated

Explosive properties Not explosive.
Oxidizing properties Not oxidizing.

10. Stability and reactivity

Reactivity The product is stable and non-reactive under normal conditions of use, storage and transport.
Chemical stability Material is stable under normal conditions.
Possibility of hazardous reactions No dangerous reaction known under conditions of normal use.
Conditions to avoid Contact with incompatible materials.
Incompatible materials Acids. Strong oxidizing agents. Fluorine. Chlorine.
Hazardous decomposition products No hazardous decomposition products are known.

11. Toxicological information

Acute toxicity Not known.
Skin corrosion/irritation Prolonged skin contact may cause temporary irritation.
Serious eye damage/eye irritation Causes serious eye irritation.
Respiratory or skin sensitization
Respiratory sensitization Not a respiratory sensitizer.
Skin sensitization This product is not expected to cause skin sensitization.
Germ cell mutagenicity No data available to indicate product or any components present at greater than 0.1% are mutagenic or genotoxic.
Carcinogenicity May cause cancer.
ACGIH Carcinogens
 Arsenic (CAS 7440-38-2) A1 Confirmed human carcinogen.
IARC Monographs. Overall Evaluation of Carcinogenicity
 Arsenic (CAS 7440-38-2) 1 Carcinogenic to humans.
 Selenium (CAS 7782-49-2) 3 Not classifiable as to carcinogenicity to humans.
Japan Society for Occupational Health: Carcinogen
 Arsenic (CAS 7440-38-2) 1 Carcinogenic to humans.
NTP Report on Carcinogens
 Arsenic (CAS 7440-38-2) Known To Be Human Carcinogen.
Reproductive toxicity Suspected of damaging fertility or the unborn child.
Specific target organ toxicity - single exposure Causes damage to organs (blood system, cardiovascular system, central nervous system, circulatory system, digestive system, digestive tract, kidney, liver, nervous system, respiratory system, skin).
Specific target organ toxicity - repeated exposure Causes damage to organs (blood system, circulatory system, digestive system, kidney, liver, nervous system, respiratory system, skin) through prolonged or repeated exposure.
Aspiration hazard Not an aspiration hazard.

12. Ecological information

Ecotoxicological data

Product	Species		Test Results
Ge-As-Se-Si 17-24-55-4 at% (16-24-58-2 wt%)			
Aquatic			
Fish	LC50	Fish	41.25 mg/l, 96 hours estimated
Components	Species		Test Results
Arsenic (CAS 7440-38-2)			
Aquatic			
Fish	LC50	Fathead minnow (Pimephales promelas)	9.9 mg/l, 96 hours

Ecotoxicity Toxic to aquatic life. May cause long lasting harmful effects to aquatic life.

Persistence and degradability

Bioaccumulation	No data available.
Mobility in soil	No data available for this product.
Hazardous to the ozone layer	No data available.
Other hazardous effects	No other adverse environmental effects (e.g. ozone depletion, photochemical ozone creation potential, endocrine disruption, global warming potential) are expected from this component.

13. Disposal considerations

Dispose in accordance with all applicable regulations.

Residual waste	Dispose of in accordance with local regulations. Empty containers or liners may retain some product residues. This material and its container must be disposed of in a safe manner (see: Disposal instructions).
Contaminated packaging	Since emptied containers may retain product residue, follow label warnings even after container is emptied. Empty containers should be taken to an approved waste handling site for recycling or disposal.
Local disposal regulations	Contract with a disposal operator licensed by the Law on Disposal and Cleaning. Do not allow this material to drain into sewers/water supplies. Do not contaminate ponds, waterways or ditches with chemical or used container. Dispose of contents/container in accordance with local/regional/national/international regulations. When your own wastewater treatment plant is not available, collect entire waste and then charge to a licensed industrial waste management professional with manifests for industrial waste.

14. Transport information

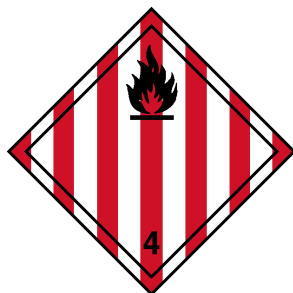
IATA

UN number	3178
UN proper shipping name	Flammable solid, inorganic, n.o.s. (Silicon)
Transport hazard class(es)	
Class	4.1
Subsidiary risk	-
Packing group	III
Environmental hazards	Yes
ERG Code	3L
Special precautions for user	Not available.
Other information	
Passenger and cargo aircraft	Allowed with restrictions.
Cargo aircraft only	Allowed with restrictions.

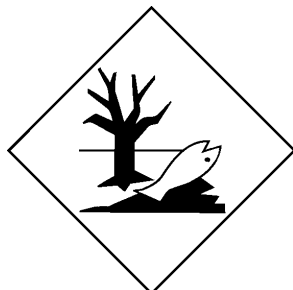
IMDG

UN number	3178
UN proper shipping name	FLAMMABLE SOLID, INORGANIC, N.O.S. (Silicon), MARINE POLLUTANT
Transport hazard class(es)	
Class	4.1
Subsidiary risk	-
Packing group	III
Environmental hazards	
Marine pollutant	Yes
EmS	F-A, S-G
Special precautions for user	Not available.
Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code	Not applicable.
General information	IMDG Regulated Marine Pollutant.

IATA; IMDG



Marine pollutant



National regulations Follow regulation in section 15 for domestic transportation.
Emergency Response Guide Number 133

15. Regulatory information

Industrial Safety and Health Act

Specified substances regulation

Class 2 designated chemical substances

ARSENIC AND ITS COMPOUNDS (EXCLUDING ARSINE, GALLIUM ARSENIDE)

Notifiable substances

ARSENIC AND ARSENIC COMPOUNDS
SELENIUM AND SELENIUM COMPOUNDS

Table 9 Ordinance No. 458 0 - 24 %

Table 9 Ordinance No. 333 0 - 58 %

Labeling substances

ARSENIC AND ARSENIC COMPOUNDS
SELENIUM AND SELENIUM COMPOUNDS

0 - 24 %

0 - 58 %

Poisonous and Deleterious Substances Control Act

Specified poisonous substances

Not regulated.

Poisonous substances

ARSENIC
SELENIUM COMPOUNDS AND PREPARATIONS CONTAINING THEM, EXCEPT SELENIOUS ACID, SODIUM SELENITE AND SODIUM SELENATE

Deleterious substances

Not regulated.

Act on the Evaluation of Chemical Substances and Regulation of Their Manufacture, etc.

Class I specified chemical substances

Not regulated.

Class II specified chemical substances

Not regulated.

Monitoring chemical substances

Not regulated.

Priority Assessment Chemical Substances (PACs)

Not regulated.

Reporting Exempted Substances

Not regulated.

Law concerning Pollutant Release and Transfer Register

Specified class 1 substances (substance name, ordinance number and content)

ARSENIC AND ITS INORGANIC COMPOUNDS Ordinance No. 332 24 % (Arsenic)

Class 1 substances (substance name, ordinance number and content)

SELENIUM AND ITS COMPOUNDS Ordinance No. 242 58 % (Selenium)

Class 2 substances (substance name, ordinance number and content)

Not regulated.

Ship Safety Law, Dangerous Goods Marine Transport and Storage Rule Flammable solid materials

Air Law, Enforcement Rule Flammable solid materials

Explosives Control Act

Not regulated.

Soil Pollution Control Law

Cutoff for 2nd elution standard

ARSENIC	Class 2	0.3 MG/L
ARSENIC & ITS COMPOUNDS	Class 2	0.3 MG/L Total As
SELENIUM	Class 2	0.3 MG/L
SELENIUM & ITS COMPOUNDS	Class 2	0.3 MG/L Total Se

Cutoff for ground water standard

ARSENIC	Class 2	0.01 MG/L
ARSENIC & ITS COMPOUNDS	Class 2	0.01 MG/L Total As
SELENIUM	Class 2	0.01 MG/L
SELENIUM & ITS COMPOUNDS	Class 2	0.01 MG/L Total Se

Cutoff for soil content standard

ARSENIC	Class 2	150 MG/KG
ARSENIC & ITS COMPOUNDS	Class 2	150 MG/KG Total As
SELENIUM	Class 2	150 MG/KG
SELENIUM & ITS COMPOUNDS	Class 2	150 MG/KG Total Se

Cutoff for soil elution standard

ARSENIC	Class 2	0.01 MG/L
ARSENIC & ITS COMPOUNDS	Class 2	0.01 MG/L Total As
SELENIUM	Class 2	0.01 MG/L
SELENIUM & ITS COMPOUNDS	Class 2	0.01 MG/L Total Se

Waste Management and Public Cleansing Act

DUST CONTAINING ARSENIC AND ITS COMPOUNDS

DUST CONTAINING SELENIUM AND ITS COMPOUNDS

SLUDGE, SPENT ACID, AND WASTE ALKALI CONTAINING ARSENIC AND ITS COMPOUNDS

SLUDGE, SPENT ACID, AND WASTE ALKALI CONTAINING SELENIUM AND ITS COMPOUNDS

Water Pollution Control Act

ARSENIC AND ITS COMPOUNDS (TOTAL AS)

SELENIUM AND ITS COMPOUNDS (TOTAL SE)

Sewage Act

ARSENIC AND ITS COMPOUNDS (AS AS) 0.1 MG/L

SELENIUM AND ITS COMPOUNDS (AS SE) 0.1 MG/L

16. Other information

Bibliography

ACGIH Documentation of the Threshold Limit Values and Biological Exposure Indices
HSDB® - Hazardous Substances Data Bank
IARC Monographs. Overall Evaluation of Carcinogenicity
National Toxicology Program (NTP) Report on Carcinogens
Japan Society for Occupational Health, Recommendation of Occupational Exposure Limits
Japan Chemical Industry Association (JCIA) GHS Guideline, June 2012
JIS Z 7252:2014 Classification of chemicals based on "Globally Harmonized System of Classification and Labelling of Chemicals (GHS)"
JIS Z 7253:2012 Hazard communication of chemicals based on GHS - Labelling and Safety Data Sheet (SDS)

Materion Advanced Chemicals Inc. cannot anticipate all conditions under which this information and its product, or the products of other manufacturers in combination with its product, may be used. It is the user's responsibility to ensure safe conditions for handling, storage and disposal of the product, and to assume liability for loss, injury, damage or expense due to improper use.

This document has been prepared using data from sources considered to be technically reliable and the information is believed to be correct. Materion makes no warranties, expressed or implied, as to the accuracy of the information contained herein. Materion cannot anticipate all conditions under which this information and its products may be used and the actual conditions of use are beyond its control. The user is responsible to evaluate all available information when using this product for any particular use and to comply with all Federal, State, Provincial and Local laws, statutes and regulations.

Revision information

Product and Company Identification: Product and Company Identification
Composition / Information on Ingredients: Ingredients