



SAFETY DATA SHEET

MATERION

1. Identification

Product identifier Cu-In-Ga-Se powder

Other means of identification None.

Manufacturer/Importer/Supplier/Distributor information

Manufacturer

Company name Materion Advanced Chemicals Inc.

Address 407 N 13th Street
1316 W. St. Paul Avenue
Milwaukee, WI 53233
United States

Telephone 414.212.0257

E-mail advancedmaterials@materion.com

Contact person Laura Hamilton

Emergency phone number Chemtrec 800.424.9300

2. Hazard(s) identification

Physical hazards Not classified.

Health hazards

Acute toxicity, oral	Category 3
Acute toxicity, inhalation	Category 3
Skin corrosion/irritation	Category 1
Serious eye damage/eye irritation	Category 1
Specific target organ toxicity, repeated exposure	Category 2

Environmental hazards

Hazardous to the aquatic environment, acute hazard	Category 1
Hazardous to the aquatic environment, long-term hazard	Category 1

OSHA defined hazards Not classified.

Label elements



Signal word Danger

Hazard statement Toxic if swallowed or if inhaled. Causes skin irritation. Causes serious eye damage. May cause respiratory irritation. Suspected of damaging fertility or the unborn child. Causes damage to organs (). Causes damage to organs (respiratory system) through prolonged or repeated exposure. Very toxic to aquatic life. Very toxic to aquatic life with long lasting effects. 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. Wear eye/face protection. Avoid breathing dust/fume. Wash thoroughly after handling. Do not eat, drink or smoke when using this product. Use only outdoors or in a well-ventilated area. Avoid release to the environment. Wear protective gloves. Use personal protective equipment as required.

Response	If on skin: Wash with plenty of water. If inhaled: Remove person to fresh air and keep comfortable for breathing. If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER or doctor/physician. Specific treatment (see this label). Rinse mouth. If skin irritation occurs: Get medical advice/attention. Take off contaminated clothing and wash before reuse. Collect spillage.
Storage	Store in a well-ventilated place. Keep container tightly closed. Store locked up.
Disposal	Dispose of contents/container in accordance with local/regional/national/international regulations.
Hazard(s) not otherwise classified (HNOC)	The Safety Information Sheet Chemicals of hazardous chemical can be obtained through phone, email or on the company website.
Supplemental information	62.3% of the mixture consists of component(s) of unknown acute oral toxicity. 69.4% of the mixture consists of component(s) of unknown acute hazards to the aquatic environment. 69.4% of the mixture consists of component(s) of unknown long-term hazards to the aquatic environment. % of the mixture consists of component(s) of unknown long-term hazards to the aquatic environment.

3. Composition/information on ingredients

Mixtures

Chemical name	Common name and synonyms	CAS number	%
Selenium		7782-49-2	12 - 57
Indium		7440-74-6	7 - 30
Gallium		7440-55-3	4 - 24

CLP: Regulation No. 1272/2008.

DSD: Directive 67/548/EEC.

M: M-factor

vPvB: very persistent and very bioaccumulative substance.

PBT: persistent, bioaccumulative and toxic substance.

#: This substance has been assigned Community workplace exposure limit(s).

Composition comments The full text for all R- and H-phrases is displayed in section 16.

4. First-aid measures

Inhalation

Remove victim to fresh air and keep at rest in a position comfortable for breathing. Oxygen or artificial respiration if needed. Do not use mouth-to-mouth method if victim inhaled the substance. Induce artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device. Call a physician or poison control center immediately.

Skin contact

Before washing use a dry brush to remove dust from skin. Remove contaminated clothing. Remove and isolate contaminated clothing and shoes. Immediately flush skin with plenty of water. Wash off with soap and plenty of water. Call a physician or poison control center immediately. For minor skin contact, avoid spreading material on unaffected skin. Wash clothing separately before reuse.

Eye contact

Immediately flush eyes with plenty of water for at least 15 minutes. Rinse cautiously with water for several minutes. Flush eyes with water as a precaution. If a contact lens is present, DO NOT delay irrigation or attempt to remove the lens. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical attention immediately. Call a physician or poison control center immediately.

Ingestion

IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician. If swallowed, seek medical advice immediately and show this container or label. Call a physician or poison control center immediately. Rinse mouth. Rinse mouth thoroughly. Never give anything by mouth to a victim who is unconscious or is having convulsions. Do not induce vomiting without advice from poison control center. If vomiting occurs, keep head low so that stomach content doesn't get into the lungs. Do not use mouth-to-mouth method if victim ingested the substance. Induce artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device. If ingestion of a large amount does occur, call a poison control center immediately.

Most important symptoms/effects, acute and delayed	Irritation of eyes and mucous membranes. May cause temporary blindness and severe eye damage. Symptoms may include stinging, tearing, redness, swelling, and blurred vision. Discomfort in the chest. Shortness of breath. Narcosis. Decrease in motor functions. Behavioral changes. Coughing. Liver enlargement. Jaundice. Prolonged exposure may cause chronic effects.
Indication of immediate medical attention and special treatment needed	Provide general supportive measures and treat symptomatically. Treat symptomatically. In case of shortness of breath, give oxygen. Keep victim warm. Keep victim under observation. Symptoms may be delayed.
General information	Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves. Immediate medical attention is required. In the case of accident or if you feel unwell, seek medical advice immediately (show the label where possible). IF exposed or concerned: Get medical advice/attention. If you feel unwell, seek medical advice (show the label where possible). Show this safety data sheet to the doctor in attendance. In case of shortness of breath, give oxygen. Keep victim warm. Keep victim under observation. Wash contaminated clothing before reuse.

5. Fire-fighting measures

Suitable extinguishing media	Powder. Foam. Dry sand. Carbon dioxide (CO ₂).
Unsuitable extinguishing media	Water. Do not use water jet as an extinguisher, as this will spread the fire.
Specific hazards arising from the chemical	Not applicable.
Special protective equipment and precautions for firefighters	Wear suitable protective equipment.
Fire fighting equipment/instructions	Water runoff can cause environmental damage.
General fire hazards	No unusual fire or explosion hazards noted.

6. Accidental release measures

Personal precautions, protective equipment and emergency procedures	Local authorities should be advised if significant spillages cannot be contained. Immediately evacuate personnel to safe areas. Keep people away from and upwind of spill/leak. Keep out of low areas. Wear appropriate personal protective equipment. Fully encapsulating, vapor protective clothing should be worn for spills and leaks with no fire. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. Ventilate closed spaces before entering them.
Methods and materials for containment and cleaning up	This material is classified as a water pollutant under the Clean Water Act and should be prevented from contaminating soil or from entering sewage and drainage systems which lead to waterways. Stop the flow of material, if this is without risk. Collect spillage. Prevent entry into waterways, sewer, basements or confined areas.
Environmental precautions	Avoid release to the environment. Refer to special instructions/safety data sheets. Contact local authorities in case of spillage to drain/aquatic environment. Prevent further leakage or spillage if safe to do so. Do not contaminate water. Avoid discharge into drains, water courses or onto the ground.

7. Handling and storage

Precautions for safe handling	Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Minimize dust generation and accumulation. Do not breathe dust. Do not get this material in contact with eyes. Do not get this material in contact with skin. Do not taste or swallow. Avoid contact during pregnancy/while nursing. Avoid prolonged exposure. Do not get this material on clothing. Use only outdoors or in a well-ventilated area. Wear personal protective equipment. When using, do not eat, drink or smoke. Wash thoroughly after handling. Handle and open container with care. Use appropriate container to avoid environmental contamination. Avoid release to the environment. Do not empty into drains.
Conditions for safe storage, including any incompatibilities	CAUTION Keep locked up. Store locked up. Store in a closed container away from incompatible materials. Use appropriate container to avoid environmental contamination. Store in a cool, dry place out of direct sunlight. Store in a well-ventilated place. Keep away from food, drink and animal feedingstuffs. Keep out of the reach of children.

8. Exposure controls/personal protection

Occupational exposure limits

US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000)

Components	Type	Value
Selenium (CAS 7782-49-2)	PEL	0.2 mg/m3

US. ACGIH Threshold Limit Values

Components	Type	Value
Indium (CAS 7440-74-6)	TWA	0.1 mg/m3
Selenium (CAS 7782-49-2)	TWA	0.2 mg/m3

US. NIOSH: Pocket Guide to Chemical Hazards

Components	Type	Value
Indium (CAS 7440-74-6)	TWA	0.1 mg/m3
Selenium (CAS 7782-49-2)	TWA	0.2 mg/m3

US. California Code of Regulations, Title 8, Section 5155. Airborne Contaminants

Components	Type	Value
Indium (CAS 7440-74-6)	PEL	0.1 mg/m3
Selenium (CAS 7782-49-2)	PEL	0.2 mg/m3

Biological limit values No biological exposure limits noted for the ingredient(s).

Appropriate engineering controls Ensure adequate ventilation, especially in confined areas. Provide eyewash station.

Individual protection measures, such as personal protective equipment

Eye/face protection Do not get in eyes. Chemical goggles are recommended. Face-shield. Provide an emergency eye wash fountain and quick drench shower in the immediate work area. Eye wash fountain is recommended.

Skin protection

Hand protection Wear protective gloves. Not normally needed.

Other Do not get this material in contact with skin. Do not get this material on clothing. Use chemical splash goggles and face shield (ANSI Z87.1 or approved equivalent). Chemical resistant gloves. Wear chemical protective equipment that is specifically recommended by the manufacturer. It may provide little or no thermal protection. Structural firefighters protective clothing provides limited protection in fire situations ONLY; it is not effective in spill situations.

Respiratory protection Do not breathe dust/fume/gas/mist/vapors/spray. Wear positive pressure self-contained breathing apparatus (SCBA).

Thermal hazards Not available.

General hygiene considerations When using, do not eat, drink or smoke. Do not get in eyes. Do not get this material in contact with skin. Do not get this material on clothing. Wash hands before breaks and immediately after handling the product.

9. Physical and chemical properties

Appearance

Physical state Solid.

Form Solid.

Color Not available.

Odor Not available.

Odor threshold Not available.

pH Not available.

Melting point/freezing point 85.6 °F (29.78 °C) estimated

Initial boiling point and boiling range 1265 °F (685 °C) estimated

Flash point	Not available.
Evaporation rate	Not available.
Flammability (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	0.0005 hPa estimated
Vapor density	Not available.
Relative density	Not available.
Solubility(ies)	
Solubility (water)	Not available.
Partition coefficient (n-octanol/water)	Not available.
Auto-ignition temperature	Not available.
Decomposition temperature	Not available.
Viscosity	Not available.
Other information	
Density	6.63 g/cm3 estimated
Specific gravity	6.63 estimated

10. Stability and reactivity

Reactivity	Not available.
Chemical stability	Material is stable under normal conditions.
Possibility of hazardous reactions	No dangerous reaction known under conditions of normal use. Hazardous polymerization does not occur.
Conditions to avoid	None under normal conditions.
Incompatible materials	Strong oxidizing agents. Acids.
Hazardous decomposition products	Irritating and/or toxic fumes and gases may be emitted upon the product's decomposition.

11. Toxicological information

Information on likely routes of exposure

Inhalation	Toxic by inhalation.
Skin contact	Causes skin irritation. Frequent or prolonged contact may defat and dry the skin, leading to discomfort and dermatitis.
Eye contact	Causes serious eye damage.
Ingestion	Toxic if swallowed.

Symptoms related to the physical, chemical and toxicological characteristics Permanent eye damage including blindness could result. Discomfort in the chest. Shortness of breath. Narcosis. Coughing. Liver enlargement. Jaundice. Behavioral changes. Decrease in motor functions. Irritant effects.

Information on toxicological effects

Acute toxicity	Toxic by inhalation. Toxic if swallowed. Causes burns. May cause respiratory irritation.
Skin corrosion/irritation	Hazardous by OSHA criteria. Causes skin irritation.
Serious eye damage/eye irritation	Causes serious eye damage.

Respiratory or skin sensitization	
Respiratory sensitization	Due to lack of data the classification is not possible.
Skin sensitization	Frequent or prolonged contact may defat and dry the skin, leading to discomfort and dermatitis. Due to lack of data the classification is not possible.
Germ cell mutagenicity	Due to lack of data the classification is not possible.
Carcinogenicity	This product is not considered to be a carcinogen by IARC, ACGIH, NTP, or OSHA.
IARC Monographs. Overall Evaluation of Carcinogenicity	
Selenium (CAS 7782-49-2)	3 Not classifiable as to carcinogenicity to humans.
OSHA Specifically Regulated Substances (29 CFR 1910.1001-1052)	
Not regulated.	
US. National Toxicology Program (NTP) Report on Carcinogens	
Not listed.	
Reproductive toxicity	Suspected of damaging fertility or the unborn child.
Specific target organ toxicity - single exposure	Respiratory tract irritation. Causes damage to organs ().
Specific target organ toxicity - repeated exposure	Causes damage to organs () through prolonged or repeated exposure. May cause damage to organs through prolonged or repeated exposure.
Aspiration hazard	Due to lack of data the classification is not possible.
Chronic effects	Hazardous by OSHA criteria. Prolonged inhalation may be harmful. Repeated absorption may cause disorder of central nervous system, liver, kidneys and blood. Prolonged exposure may cause chronic effects. Causes damage to organs through prolonged or repeated exposure. May cause damage to organs through prolonged or repeated exposure.
Further information	Symptoms may be delayed.

12. Ecological information

Ecotoxicity Very toxic to aquatic life with long lasting effects. Accumulation in aquatic organisms is expected.

Product	Species		Test Results
Cu-In-Ga-Se powder			
Aquatic			
Crustacea	EC50	Daphnia	0.5227 mg/l, 48 hours estimated
Fish	LC50	Fish	8.259 mg/l, 96 hours estimated

* Estimates for product may be based on additional component data not shown.

Persistence and degradability	No data is available on the degradability of this product.
Bioaccumulative potential	Not available.
Mobility in soil	Not available.
Other adverse effects	Not available.

13. Disposal considerations

Disposal instructions	Contract with a disposal operator licensed by the Law on Disposal and Cleaning. This material and its container must be disposed of as hazardous waste. Incinerate the material under controlled conditions in an approved incinerator. Must be incinerated in a suitable incineration plant holding a permit delivered by the competent authorities. Do not discharge into drains, water courses or onto the ground. Do not allow this material to drain into sewers/water supplies. Do not contaminate ponds, waterways or ditches with chemical or used container. After recovery of solvent dispose of residue as hazardous waste. Dispose of contents/container in accordance with local/regional/national/international regulations. Dispose of contents/container (in accordance with related regulations). Collect entire waste and then charge to a licensed industrial waste management professional with manifests for industrial waste.
Hazardous waste code	D002: Waste Corrosive material [pH <=2 or >=12.5, or corrosive to steel] D010: Waste Selenium

Waste from residues / unused products

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). Avoid discharge into water courses or onto the ground. Not applicable.

Contaminated packaging

Empty containers should be taken to an approved waste handling site for recycling or disposal. Since emptied containers may retain product residue, follow label warnings even after container is emptied.

14. Transport information

DOT

UN number	UN3288
UN proper shipping name	Toxic solid, inorganic, n.o.s. (Selenium RQ = 175 LBS)
Transport hazard class(es)	
Class	6.1(PGIII)
Subsidiary risk	-
Label(s)	6.1
Packing group	III
Special precautions for user	Read safety instructions, SDS and emergency procedures before handling.
Special provisions	IB8, IP3, T1, TP33
Packaging exceptions	153
Packaging non bulk	213
Packaging bulk	240

IATA

UN number	UN3288
UN proper shipping name	Toxic solid, inorganic, n.o.s. (Selenium)
Transport hazard class(es)	
Class	6.1(PGIII)
Subsidiary risk	-
Packing group	III
Environmental hazards	Yes
ERG Code	6L
Special precautions for user	Not available.
Other information	
Passenger and cargo aircraft	Allowed with restrictions.
Cargo aircraft only	Allowed with restrictions.

IMDG

UN number	UN3288
UN proper shipping name	TOXIC SOLID, INORGANIC, N.O.S. (Selenium), MARINE POLLUTANT
Transport hazard class(es)	
Class	6.1(PGIII)
Subsidiary risk	-
Packing group	III
Environmental hazards	
Marine pollutant	Yes
EmS	F-A, S-A
Special precautions for user	Not available.

DOT



IATA; IMDG



Marine pollutant



General information

DOT Regulated Marine Pollutant. IMDG Regulated Marine Pollutant.

15. Regulatory information

US federal regulations

All components are on the U.S. EPA TSCA Inventory List.
This product is a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.

Toxic Substances Control Act (TSCA)

TSCA Section 12(b) Export Notification (40 CFR 707, Subpt. D)

Not regulated.

CERCLA Hazardous Substance List (40 CFR 302.4)

Selenium (CAS 7782-49-2) Listed.

SARA 304 Emergency release notification

Not regulated.

OSHA Specifically Regulated Substances (29 CFR 1910.1001-1052)

Not regulated.

Superfund Amendments and Reauthorization Act of 1986 (SARA)

SARA 302 Extremely hazardous substance

Not listed.

SARA 313 (TRI reporting)

Chemical name	CAS number	% by wt.
Selenium	7782-49-2	12 - 57

Other federal regulations

Clean Air Act (CAA) Section 112 Hazardous Air Pollutants (HAPs) List

Selenium (CAS 7782-49-2)

Clean Air Act (CAA) Section 112(r) Accidental Release Prevention (40 CFR 68.130)

Not regulated.

Safe Drinking Water Act (SDWA) Not regulated.

US state regulations California Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65): This material is not known to contain any chemicals currently listed as carcinogens or reproductive toxins.

California Proposition 65

US. California. Candidate Chemicals List. Safer Consumer Products Regulations (Cal. Code Regs, tit. 22, 69502.3, subd. (a))

Selenium (CAS 7782-49-2)

16. Other information, including date of preparation or last revision

Issue date	10-16-2013
Revision date	07-14-2015
Version #	04
Further information	HMIS® is a registered trade and service mark of the NPCA.

References

ACGIH
EPA: AQUIRE database
NLM: Hazardous Substances Data Base
US. IARC Monographs on Occupational Exposures to Chemical Agents
Korea. Accidental Release Prevention Substances (Presidential Decree of Toxic Chemical Control Law, Executive Order No. 19203)
Korea. Dangerous Substances Threshold Quantity (Presidential Decree of Dangerous Substances Safety Management Act No. 18406, Schedule 1)
Korea. Harmful Substances Prohibited from Manufacturing (Presidential Decree on the Industrial Safety and Health Act (No. 13053), Article 29)
Korea. Harmful Substances Requiring Permission for Manufacture or Use (Presidential Decree on the Industrial Safety and Health Act (No. 13053), Article 30)
Korea. Non-Toxic Chemicals List (National Institute of Environment Research (NIER) Public Notice No. 1997-10, as amended)
Korea. Observational Chemicals (Ministerial Decree of TCCL Article 6)
Korea. OELs. Regulation for Permitted Concentration of Hazardous Substances (Ministry of Labor (MOL) Public Notice No. 1986-45, as amended)
Korea. Prohibited Chemical Substances (TCCL Article 11)
Korea. Regulated volatile organic compounds (VOCs) (MOE Notice No. 2001-36, March 8, 2001, as amended)
Korea. Restricted Chemical Substances (TCCL Article 11)
Korea. Toxic Chemical Control Law (TCCL), Existing Chemicals Inventory (KECI)
Korea. Toxic Chemical Control Law (TCCL), pre-1997 List
Korea. Toxic Chemicals (TCCL Article 10)
Korea. Toxic Release Inventory (TRI) Chemicals (TCCL Article 14)
Taiwan. Dangerous Materials (Rules on Hazard Communication of Dangerous Materials and Toxic Materials)
Taiwan. Industrial Precursor Chemicals (Categories and Regulations Governing Inspection and Declaration of Industrial Precursor Chemicals, MOEA Decree No. 87, as amended)
Taiwan. OELs. (Standards on Workplace Atmosphere of Dangerous and Hazardous Materials)
Taiwan. Toxic Chemical Substances (TCS) (List of Toxic Chemical Substances announced by the Environmental Protection Administration)
Taiwan. Toxic Materials (Rules on Hazard Communication of Dangerous Materials and Toxic Materials)
HSDB® - Hazardous Substances Data Bank
IARC Monographs. Overall Evaluation of Carcinogenicity
National Toxicology Program (NTP) Report on Carcinogens
ACGIH Documentation of the Threshold Limit Values and Biological Exposure Indices
Japan Society for Occupational Health, Recommendation of Occupational Exposure Limits
GOST 30333-2007 - Chemical production safety passport. General requirements
JJIS Z 7250: 2010 Safety data sheet for chemical products-Content and order of sections
JIS Z 7251: 2010 Labeling of chemicals based on GHS

Disclaimer

Additional information is given in the Material Safety Data Sheet.
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.