Material Name: Hydrogen Selenide

Section 1 - PRODUCT AND COMPANY IDENTIFICATION

Material Name
Hydrogen Selenide

Synonyms
Selenium hydride; Hydrogen selenide, anhydrous; Hydroselenic acid, anhydrous; Dihydrogen selenide; Selenium dihydride; Selane; H2Se

Chemical Family
Acids, inorganic, hydride

Product Use
Industrial and Specialty Gas Applications.

Restrictions on Use
None known.

Details of the supplier of the safety data sheet
MATHESON TRI-GAS, INC.
150 Allen Road, Suite 302
Basking Ridge, NJ 07920

General Information: 1-800-416-2505
Emergency #: 1-800-424-9300 (CHEMTREC)
Outside the US: 703-527-3887 (Call collect)

Section 2 - HAZARDS IDENTIFICATION

Classification in accordance with paragraph (d) of 29 CFR 1910.1200.
Flammable Gases - Category 1
Gases Under Pressure - Liquefied gas
Acute Toxicity - Oral - Category 3
Acute Toxicity - Inhalation - Gas - Category 1
Skin Corrosion/Irritation - Category 2
Serious Eye Damage/Eye Irritation - Category 2A
Specific Target Organ Toxicity - Single Exposure - Category 1 (circulatory system, heart, liver, respiratory system, Hematopoietic System)
Specific Target Organ Toxicity - Repeated Exposure - Category 1 (respiratory system)
Specific Target Organ Toxicity - Repeated Exposure - Category 2 (Nervous System)

GHS Label Elements

Symbol(s)

Signal Word
Danger

Hazard Statement(s)
Extremely flammable gas.
Contains gas under pressure; may explode if heated.
Fatal if inhaled.
Causes skin irritation.
Safety Data Sheet

Material Name: Hydrogen Selenide

Causes serious eye irritation.
Causes damage to organs.
Causes damage to organs through prolonged or repeated exposure.
May cause damage to organs through prolonged or repeated exposure.

Precautionary Statement(s)

Prevention
Keep away from heat/sparks/open flame/hot surfaces - No smoking.
Do not breathe dust/fume/gas/mist/vapors/spray.
Use only outdoors or in a well-ventilated area.
Wear protective gloves/protective clothing/eye protection/face protection.
Wear respiratory protection.
Wash thoroughly after handling.
Do not eat, drink or smoke when using this product.
Avoid release to the environment.

Response
Leaking gas fire: Do not extinguish, unless leak can be stopped safely.
Eliminate all ignition sources if safe to do so.
IF exposed.
Call a POISON CENTER or doctor/physician.
IF INHALED.
Remove person to fresh air and keep comfortable for breathing.
Immediately call a POISON CENTER or doctor/physician.
Specific treatment is urgent, see first aid section of Safety Data Sheet.
IF ON SKIN.
Wash with plenty of water.
If skin irritation occurs.
Get medical advice/attention.
Take off contaminated clothing and wash before reuse.
IF IN EYES.
Rinse cautiously with water for several minutes.
Remove contact lenses, if present and easy to do.
Continue rinsing.
If eye irritation persists.
Get medical advice/attention.

Storage
Store locked up.
Protect from sunlight. Store in a well-ventilated place.
Keep container tightly closed.
Keep separated from incompatible substances.

Disposal
Dispose in accordance with all applicable regulations.

Other Hazards
May cause frostbite upon sudden release of liquefied gas.

Section 3 - COMPOSITION / INFORMATION ON INGREDIENTS

<table>
<thead>
<tr>
<th>CAS</th>
<th>Component Name</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>7783-07-5</td>
<td>Hydrogen Selenide</td>
<td>100</td>
</tr>
</tbody>
</table>
**Section 4 - FIRST AID MEASURES**

**Inhalation**
IF INHALED: Remove person to fresh air and keep comfortable for breathing. Give artificial respiration if not breathing. If breathing is difficult, oxygen should be administered by qualified personnel. Get immediate medical attention.

**Skin**
If frostbite or freezing occur, immediately flush with plenty of lukewarm water (105-115°F; 41-46°C). DO NOT USE HOT WATER. If warm water is not available, gently wrap affected parts in blankets. Get immediate medical attention.

**Eyes**
Flush eyes with plenty of water for at least 15 minutes. Then get immediate medical attention.

**Ingestion**
If swallowed, get medical attention.

**Most Important Symptoms/Effects**

**Acute**
Frostbite, respiratory tract irritation, skin irritation, eye irritation, blood damage, heart damage, liver damage, respiratory system damage

**Delayed**
respiratory system damage, nervous system damage

**Note to Physicians**
For inhalation, consider oxygen. Consider olive oil, epinephrine sulfate, local anesthetics, hot and cold compresses.

**Section 5 - FIRE FIGHTING MEASURES**

**Extinguishing Media**

**Suitable Extinguishing Media**
Small fires: regular dry chemical, carbon dioxide, water spray, regular foam, Large fires: Use water spray, fog or regular foam.

**Unsuitable Extinguishing Media**
Do not use high-pressure water streams.

**Special Hazards Arising from the Chemical**
Extremely flammable gas. The vapor is heavier than air. Vapors or gases may ignite at distant ignition sources and flash back. Vapor/air mixtures are explosive above flash point. Containers may rupture or explode if exposed to heat.

**Hazardous Combustion Products**
Hydrogen, selenium.

**Fire Fighting Measures**
Move container from fire area if it can be done without risk. Cool containers with water spray until well after the fire is out. Stay away from the ends of tanks. For fires in cargo or storage area: Cool containers with water from unmanned hose holder or monitor nozzles until well after fire is out. If this is impossible then take the following precautions: Keep unnecessary people away, isolate hazard area and deny entry. Let the fire burn. Withdraw immediately in case of rising sound from venting safety device or any discoloration of tanks due to fire. For tank, rail car or tank truck, evacuation radius: 1600 meters (1 mile).

**Special Protective Equipment and Precautions for Firefighters**
Wear full protective fire fighting gear including self contained breathing apparatus (SCBA) for protection against possible exposure.

**Section 6 - ACCIDENTAL RELEASE MEASURES**

**Personal Precautions, Protective Equipment and Emergency Procedures**
Wear personal protective clothing and equipment, see Section 8.
Methods and Materials for Containment and Cleaning Up
Avoid heat, flames, sparks and other sources of ignition. All equipment used when handling the product must be grounded. Fully encapsulating, vapor protective clothing should be worn for spills and leaks with no fire. Do not touch or walk through spilled material. Stop leak if possible without personal risk. Reduce vapors with water spray. Avoid allowing water runoff to contact spilled material. Let burn unless leak can be stopped immediately. Keep unnecessary people away, isolate hazard area and deny entry. Isolate area until gas has dispersed.

Environmental Precautions
Avoid release to the environment. Collect spillage.

Section 7 - HANDLING AND STORAGE
Precautions for Safe Handling
Keep away from heat/sparks/open flame/hot surfaces - No smoking. Use only outdoors or in a well-ventilated area. Wear protective gloves/protective clothing/eye protection/face protection. Do not breathe dust/fume/gas/mist/vapors/spray. Wear respiratory protection. Wash thoroughly after handling. Avoid release to the environment.

Conditions for Safe Storage, Including any Incompatibilities
Store locked up.
Protect from sunlight. Store in a well-ventilated place.
Keep container tightly closed.
Keep separated from incompatible substances.
Store and handle in accordance with all current regulations and standards. Subject to storage regulations: U.S. OSHA 29 CFR 1910.101. Notify State Emergency Response Commission for storage or use at amounts greater than or equal to the TPQ (U.S. EPA SARA Section 302). SARA Section 303 requires facilities storing a material with a TPQ to participate in local emergency response planning (U.S. EPA 40 CFR 355.30).

Incompatible Materials
Acids, halo carbons, Hydrogen peroxide, oxidizing materials, nitric acid, peroxides, Water

Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION
Component Exposure Limits

<table>
<thead>
<tr>
<th>Component</th>
<th>Exposure Limits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydrogen Selenide</td>
<td>7783-07-5</td>
</tr>
<tr>
<td>ACGIH:</td>
<td>0.05 ppm TWA as Se</td>
</tr>
<tr>
<td>NIOSH:</td>
<td>0.05 ppm TWA ; 0.2 mg/m3 TWA</td>
</tr>
<tr>
<td></td>
<td>1 ppm IDLH</td>
</tr>
<tr>
<td>Europe:</td>
<td>0.02 ppm TWA ; 0.07 mg/m3 TWA</td>
</tr>
<tr>
<td></td>
<td>0.05 ppm STEL ; 0.17 mg/m3 STEL</td>
</tr>
<tr>
<td>OSHA (US):</td>
<td>0.05 ppm TWA as Se ; 0.2 mg/m3 TWA as Se</td>
</tr>
<tr>
<td>Mexico:</td>
<td>0.05 ppm TWA [VLE-PPT ]</td>
</tr>
</tbody>
</table>

ACGIH - Threshold Limit Values - Biological Exposure Indices (BEI)
There are no biological limit values for any of this product's components.

Engineering Controls
Ventilation equipment should be explosion-resistant if explosive concentrations of material are present. Provide local exhaust or process enclosure ventilation system. Ensure compliance with applicable exposure limits.
Section 8 - INCIPIENT HAZARDS

Individual Protection Measures, such as Personal Protective Equipment

Eye/face protection
Wear splash resistant safety goggles with a faceshield. Contact lenses should not be worn. Provide an emergency eye wash fountain and quick drench shower in the immediate work area.

Skin Protection
For the gas: Wear appropriate chemical resistant clothing. For the liquid: Wear appropriate protective, cold insulating clothing.

Respiratory Protection
The following respirators and maximum use concentrations are drawn from NIOSH and/or OSHA. 0.5 ppm. Any supplied-air respirator. 1 PPM. Any supplied-air respirator operated in a continuous-flow mode. Any self-contained breathing apparatus with a full facepiece. Emergency or planned entry into unknown concentrations or IDLH conditions -. Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode. Any supplied-air respirator with a full facepiece that is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive-pressure mode. Escape -. Any air-purifying full-facepiece respirator (gas mask) with a chin-style, front-mounted or back-mounted canister providing protection against the compound of concern. Only non-oxidizable sorbents are allowed (not charcoal). Any appropriate escape-type, self-contained breathing apparatus.

Glove Recommendations
For the gas: Wear appropriate chemical resistant gloves. For the liquid: Wear insulated gloves.

<table>
<thead>
<tr>
<th>Section 9 - PHYSICAL AND CHEMICAL PROPERTIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appearance</td>
</tr>
<tr>
<td>Odor</td>
</tr>
<tr>
<td>Odor Threshold</td>
</tr>
<tr>
<td>Melting Point</td>
</tr>
<tr>
<td>Boiling Point Range</td>
</tr>
<tr>
<td>Evaporation Rate</td>
</tr>
<tr>
<td>Autoignition Temperature</td>
</tr>
<tr>
<td>Lower Explosive Limit</td>
</tr>
<tr>
<td>Upper Explosive Limit</td>
</tr>
<tr>
<td>Vapor Density (air=1)</td>
</tr>
<tr>
<td>Water Solubility</td>
</tr>
<tr>
<td>Viscosity</td>
</tr>
</tbody>
</table>
Safety Data Sheet

Material Name: Hydrogen Selenide

<table>
<thead>
<tr>
<th>Solubility (Other)</th>
<th>Density</th>
<th>Not available</th>
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</thead>
<tbody>
<tr>
<td>Physical Form</td>
<td>Molecular Formula</td>
<td>Liquified gas</td>
</tr>
<tr>
<td>Molecular Weight</td>
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<td>80.98</td>
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</tbody>
</table>

Solvent Solubility
Soluble
carbonyl chloride, carbon disulfide, Phosgene

<table>
<thead>
<tr>
<th>Solubility (Other)</th>
<th>Density</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not available</td>
<td>Not available</td>
</tr>
</tbody>
</table>

Section 10 - STABILITY AND REACTIVITY

Chemical Stability
Decomposes rapidly in air to form elemental selenium and water.

Possibility of Hazardous Reactions
Will not polymerize.

Conditions to Avoid
Avoid heat, flames, sparks and other sources of ignition. Minimize contact with material. Avoid inhalation of material or combustion by-products. Keep out of water supplies and sewers.

Incompatible Materials
Acids, halo carbons, Hydrogen peroxide, oxidizing materials, nitric acid, peroxides, Water

Hazardous decomposition products
oxides of selenium, selenium

Section 11 - TOXICOLOGICAL INFORMATION

Information on Likely Routes of Exposure

Inhalation
Fatal if inhaled. May cause irritation of: upper respiratory tract, nose, eyes. May cause: nausea, vomiting, coughing, garlic breath, difficulty breathing, fatigue, diarrhea, metallic taste, weakness, dizziness, headache, bronchitis, pulmonary edema (effects may be delayed), death. Animal data: spleen damage, lung damage, liver damage.

Skin Contact
irritation (possibly severe), rash, burns, allergic reactions, frostbite.

Eye Contact
irritation (possibly severe), conjunctivitis, eye damage, frostbite.

Ingestion
Ingestion of a gas in unlikely.

Acute and Chronic Toxicity
Fatal if inhaled.

Component Analysis - LD50/LC50
The components of this material have been reviewed in various sources and no selected endpoints have been identified.

Product Toxicity Data
Acute Toxicity Estimate

| Oral | 100 mg/kg |

Immediate Effects
Fatal if inhaled. Frostbite, respiratory tract irritation, skin irritation, eye irritation, blood damage, heart damage, liver damage, respiratory system damage.

Delayed Effects
respiratory system damage, nervous system damage

Irritation/Corrosivity Data
Material Name: Hydrogen Selenide

May cause respiratory tract irritation, skin irritation, and eye irritation.

**Respiratory Sensitization**
No data available.

**Dermal Sensitization**
No data available.

**Component Carcinogenicity**

<table>
<thead>
<tr>
<th>Material</th>
<th>CAS Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydrogen Selenide</td>
<td>7783-07-5</td>
</tr>
</tbody>
</table>

**IARC:**
Supplement 7 [1987]; Monograph 9 [1975] (related to Selenium compounds) (Group 3 (not classifiable))

**DFG:**
Category 3B (could be carcinogenic for man)

**Germ Cell Mutagenicity**
No data available.

**Tumorigenic Data**
No data available.

**Reproductive Toxicity**
No data available.

**Specific Target Organ Toxicity - Single Exposure**
Respiratory system, blood, heart, liver

**Specific Target Organ Toxicity - Repeated Exposure**
Respiratory system, nervous system

**Aspiration hazard**
No data available.

**Medical Conditions Aggravated by Exposure**
liver disorders, respiratory disorders

### Section 12 - ECOLOGICAL INFORMATION

**Ecotoxicity**
Avoid release to the environment. Collect spillage.

**Component Analysis - Aquatic Toxicity**
No LOLI ecotoxicity data are available for this product’s components.

**Persistence and Degradability**
No data available.

**Bioaccumulative Potential**
No data available.

**Mobility**
No data available.

### Section 13 - DISPOSAL CONSIDERATIONS

**Disposal Methods**
Dispose in accordance with all applicable regulations.

**Component Waste Numbers**
The U.S. EPA has not published waste numbers for this product’s components.

### Section 14 - TRANSPORT INFORMATION

**ADR Information:**

**Shipping Name:** HYDROGEN SELENIDE, ANHYDROUS
Material Name: Hydrogen Selenide

Hazard Class: 2
UN#: UN2202
Required Label(s): 2.3, 2.1

US DOT Information:
Shipping Name: HYDROGEN SELENIDE, ANHYDROUS
Hazard Class: 2.3
UN/NA #: UN2202
Required Label(s): 2.3, 2.1

IMDG Information:
Shipping Name: HYDROGEN SELENIDE, ANHYDROUS
Hazard Class: 2.3
UN#: UN2202
Required Label(s): 2.1 2.3

International Bulk Chemical Code
This material does not contain any chemicals required by the IBC Code to be identified as dangerous chemicals in bulk.

Section 15 - REGULATORY INFORMATION

U.S. Federal Regulations
This material contains one or more of the following chemicals required to be identified under SARA Section 302 (40 CFR 355 Appendix A), SARA Section 313 (40 CFR 372.65), CERCLA (40 CFR 302.4), TSCA 12(b), and/or require an OSHA process safety plan.

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS</th>
<th>CA</th>
<th>MA</th>
<th>MN</th>
<th>NJ</th>
<th>PA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydrogen Selenide</td>
<td>7783-07-5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SARA 302:</td>
<td>10 lb TPQ</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SARA 313:</td>
<td>1 % de minimis concentration (related to Selenium compounds)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OSHA (safety):</td>
<td>150 lb TQ</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>SARA 304:</td>
<td>10 lb EPCRA RQ</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

SARA Section 311/312 (40 CFR 370 Subparts B and C) reporting categories
Flammable; Gas Under Pressure; Acute toxicity; Skin Corrosion/Irritation; Serious Eye Damage/Eye Irritation; Specific Target Organ Toxicity

U.S. State Regulations
The following components appear on one or more of the following state hazardous substances lists:

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS</th>
<th>CA</th>
<th>MA</th>
<th>MN</th>
<th>NJ</th>
<th>PA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydrogen Selenide</td>
<td>7783-07-5</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

California Safe Drinking Water and Toxic Enforcement Act (Proposition 65)
Not listed under California Proposition 65.

Component Analysis - Inventory
Hydrogen Selenide (7783-07-5)

|----|----|----|----|----|-----------|-----------|-------------------|-------------------|

Page 8 of 10
Material Name: Hydrogen Selenide

Yes DSL No Yes EIN No Yes Yes No

KR - REACH CCA MX NZ PH TH-TECI TW VN (Draft)
Yes Yes No Yes Yes No No

Section 16 - OTHER INFORMATION

NFPA Ratings
Health: 4 Fire: 4 Instability: 0
Hazard Scale: 0 = Minimal 1 = Slight 2 = Moderate 3 = Serious 4 = Severe

Summary of Changes
Updated: 01/05/2016

Key / Legend
ACGIH - American Conference of Governmental Industrial Hygienists; ADR - European Road Transport; AU - Australia; BOD - Biochemical Oxygen Demand; C - Celsius; CA - Canada; CA/MA/MN/NJ/PA - California/Massachusetts/Minnesota/New Jersey/Pennsylvania®; CAS - Chemical Abstracts Service; CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act; CFR - Code of Federal Regulations (US); CLP - Classification, Labelling, and Packaging; CN - China; CPR - Controlled Products Regulations; DFG - Deutsche Forschungsgemeinschaft; DOT - Department of Transportation; DSD - Dangerous Substance Directive; DSL - Domestic Substances List; EC - European Commission; EEC - European Economic Community; EIN - European Inventory of (Existing Commercial Chemical Substances); EINECS - European Inventory of Existing Commercial Chemical Substances; ENCS - European Inventory of Existing Commercial Chemicals List; EC - Japan Existing and New Chemical Substance Inventory; EPA - Environmental Protection Agency; EU - European Union; F - Fahrenheit; F - Background (for Venezuela Biological Exposure Indices); IARC - International Agency for Research on Cancer; IATA - International Air Transport Association; ICAO - International Civil Aviation Organization; IDL - Ingredient Disclosure List; IDLH - Immediately Dangerous to Life and Health; IMDG - International Maritime Dangerous Goods; ISHL - Japan Industrial Safety and Health Law; IUCLID - International Uniform Chemical Information Database; JP - Japan; kow - Octanol/water partition coefficient; KR KECI Annex 1 - Korea Existing Chemicals Inventory (KECI) / Korea Existing Chemicals List (KECL); KR KECI Annex 2 - Korea Existing Chemicals Inventory (KECI) / Korea Existing Chemicals List (KECL), KR - Korea; LD50/LC50 - Lethal Dose/ Lethal Concentration; LEL - Lower Explosive Limit; LLV - Level Limit Value; LOLI - List Of Lists™ - ChemADVISOR’s Regulatory Database; MAK - Maximum Concentration Value in the Workplace; MEL - Maximum Exposure Limits; MX – Mexico; Ns - Non-solvent; NTIS - National Technical Information Service; NZ - New Zealand; OSHA - Occupational Safety and Health Administration; PEL- Permissible Exposure Limit; PH - Philippines; RCRA - Resource Conservation and Recovery Act; REACH-Registration, Evaluation, Authorisation, and restriction of Chemicals; RID - European Rail Transport; SARA - Superfund Amendments and Reauthorization Act; Sc - Semi-quantitative; STEL - Short-term Exposure Limit; TCCA - Korea Toxic Chemicals Control Act; TDG - Transportation of Dangerous Goods; TLV - Threshold Limit Value; TSCA - Toxic Substances Control Act; TW – Taiwan; TW - Time Weighted Average; UEL - Upper Explosive Limit; UN/NA - United Nations/North American; US - United States; VLE - Exposure Limit Value (Mexico); VN (Draft) - Vietnam (Draft); WHMIS - Workplace Hazardous Materials Information System (Canada).

Other Information
Disclaimer:

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Safety Data Sheet

Material Name: Hydrogen Selenide

compensatory, consequential, exemplary, or otherwise, resulting from any publication, use or reliance upon the information herein.