Section 1: Chemical Product and Company Identification

Material Name: Sulfur dioxide
Chemical formula of principal gas: \( \text{SO}_2 \)
Synonyms: Sulfurous Acid Anhydride, Sulfurous Oxide, Sulphur Dioxide, Sulfur Oxide, Fermenticide Liquid, Sulfurous Anhydride, Sulfurous Oxide

Manufacturer: Voltaix, LLC: Post Office Box 5357, North Branch, New Jersey 08876-5357 USA
Voice: 908-231-9060 or 800-VOLTAIX, Facsimile: 908-231-9063

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Section 2: Composition/Information on Ingredients

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS Registry Number</th>
<th>Molar (volume) concentration</th>
<th>Exposure Guidelines</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sulfur Dioxide</td>
<td>7446-09-5</td>
<td>100%</td>
<td>0.5 ppm (NIOSH) REL (TWA) 2 ppm (ACGIH)TWA 2 ppm (OSHA) PEL 5 ppm (NIOSH/OSHA) STEL 10 ppm (NIOSH/OSHA) Ceiling 100 ppm (OSHA) IDLH (See Section 11)</td>
</tr>
</tbody>
</table>

Section 3: Hazards Identification

Emergency Overview

Sulfur dioxide is a colorless gas with an irritating odor.

DANGER!

May be fatal if inhaled.

Causes severe respiratory tract, eye and skin burns.

Contents under pressure.

Causes damage to the following organs: lungs, respiratory tract, skin, eyes, eye lens or cornea.

Possible cancer hazard.

May cause cancer based on animal data.

Do not get in eyes, on skin or clothing. Do not breathe gas. Do not puncture or incinerate container. Keep container closed. Use only with adequate ventilation. Wash thoroughly after handling. Risk of cancer depends on duration and level of exposure.
Contact with rapidly expanding gases can cause frostbite.

**NFPA 704 Rating (determined by Voltaix):** Health 3  Fire 0  Reactivity 0  Special None

**Potential Health Effects**

**Routes of Exposure:** The typical routes of exposure are inhalation, through the skin and through the eyes.

**Acute Effects:**

**Eyes:** Severely corrosive to eyes.

**Dermal:** Severely corrosive to the skin. Possible allergic reactions.

**Inhalation:** Very toxic by inhalation. Severely corrosive to the respiratory system. Possible allergic reactions.

**Chronic Effects:** Possible allergic reactions. Possible carcinogenic effects. A4 (Not classified for humans or animals), ACGIH. 3 (Not classified for humans), IARC

**Target Organs:** Lungs, Respiratory Tract, Eyes.

**Signs and Symptoms of Exposure:** Inhalation and contact irritant. Burns.

**Medical Conditions that may be Aggravated by Exposure:** Repeated exposure to a highly toxic material may produce general deterioration of health by an accumulation in one or many human organs.

**Reported Carcinogenic and Reproductive Effects:**

**Carcinogenic:** A4 by ACGIH, 3 by IARP.

**Mutagenic:** None known to Voltaix.

**Teratogenic:** None known to Voltaix.
Section 4: First Aid Measures

Inhalation
This is the primary route of exposure.

1) Remove the affected person from the gas source or contaminated area. Note: Personal Protective Equipment (PPE), including positive pressure, self contained breathing apparatus, may be required to assure the safety of the rescuer.
2) If the affected person is not breathing spontaneously, administer rescue breathing.
3) If the affected person does not have a pulse, administer CPR.
4) If medical oxygen and appropriately trained personnel are available, administer 100% oxygen to the affected person.
5) Summon an emergency ambulance. If an ambulance is not available, contact a physician, hospital, or poison control center for instruction.
6) Keep the affected person warm, comfortable, and at rest while awaiting professional medical care. Monitor the breathing and pulse continuously. Administer rescue breathing or CPR if necessary.

Skin Contact
Flush with a copious stream of water while removing contaminated clothing. Continue flushing until the professional medical assistance arrives, but for no less than fifteen minutes. Treat thermal burns by assuring that affected area is cool by flushing with cool water, then apply dry sterile dressings. If the patient is burned on the face, neck, head, or chest, assume that the airway may also have been burned and obtain professional medical assistance immediately.

Eye Contact
Flush continuously with clean water until the professional medical assistance arrives, but for no less than fifteen minutes. Continuation of flushing until patient is transferred to an ophthalmologist or emergency physician is recommended.

Ingestion
Ingestion is not an observed route of exposure to gaseous hazardous materials.

Frostbite
Try to warm the frozen tissues and obtain immediate medical attention.

Note to Physicians:
For inhalation, consider administering oxygen.
Section 5: Fire Fighting Measures

Flammability and Explosivity

Flash Point: Not applicable, this material is a gas.

Flammability Limits in Air: Sulfur dioxide is non-flammable. Consider extinguishing media suitable for surrounding area fires.

Autoignition Temperature: Not applicable.


Known or Anticipated Hazardous Products of Combustion: None known.

Properties that may Initiate or Intensify Fire: Heating cylinder to the point of activation of a pressure relief device.

Extinguishing Media

CO₂, foam, dry chemical, water. Media suitable for surrounding area fires.

Fire Fighting Instructions

If this material is involved in a fire event, shut off flow immediately, if it can be done without risk. Move container from fire area if it can be done without risk. Cool the cylinder and surroundings with water from a suitable distance.

Excessive pressure may develop in gas cylinders exposed to fire, which may result in explosion, regardless of the cylinder's content. Cylinders with pressure relief devices (PRD's) may release their contents through such devices if the cylinder is exposed to fire. Cylinders without PRD's have no provision for controlled release and are therefore more likely to explode if exposed to fire.

Positive pressure, self-contained breathing apparatus is required for all fire fighting involving hazardous materials. Full structural fire fighting (bunker) gear is the minimum acceptable attire. The need for proximity, entry, and flashover protection and special protective clothing should be determined for each incident by a competent fire fighting safety professional.

Section 6: Accidental Release Measures

Containment:

This material is usually a gas at atmospheric conditions and the means of containment is the enclosure of the space into which the materials are released.
Clean Up
Clean up consists of passing the entire gas volume of the enclosure through appropriate exhaust gas treatment equipment (EGTE). Purge the enclosure with a non-reactive gas, such as nitrogen, through the EGTE until an acceptably low level of contamination remains. Equipment contaminated by this material must then be cleaned or decommissioned appropriately.

Evacuation
If the release is not contained in an appropriate device or system, all personnel not appropriately protected (see Section 8) must evacuate the contaminated spaces. Consider evacuation of additional areas, as a precaution against the spread of the release or subsequent explosion or fire.

Special Instructions
Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.
**Section 7: Handling and Storage**

**Handling**

Handle this material only in sealed, purged systems. The design of handling systems for hazardous materials is beyond the scope of this MSDS, and should be performed by a competent, experienced professional.

Do not get in eyes, on skin or clothing. Keep container closed. Use only with adequate ventilation. Do not puncture or incinerate container. Wash thoroughly after handling. High pressure gas. Use equipment rated for cylinder pressure. Close valve after each use and when empty. Protect cylinders from physical damage; do not drag, roll, slide or drop. Use a suitable handtruck for cylinder movement.

Handle sealed gas cylinders in accordance with CGA P-1, *Safe Handling of Compressed Gases in Containers*.

Some material may have accumulated behind the outlet plug. Face the outlet away from you and wear appropriate protective equipment when removing the plug to connect the cylinder to your system.

Never introduce any substance into a gas cylinder. If you believe your cylinder may have been contaminated, notify Voltaix immediately. Provide as much information as possible on the nature and quantity of contamination.

**Storage**

Store cylinders in accordance with CGA P-1, *Safe Handling of Compressed Gases in Containers*, local building and fire codes and other relevant regulations. Materials should be segregated by the hazards they comprise for storage.

Protect the cylinders from direct sunlight, precipitation, mechanical damage, and temperatures above 52 °C (125 °F).

Ship and store cylinders with the outlet plug and valve protective cap in place.
Section 8: Exposure Control/Personal Protection

Engineering Controls
Local exhaust is required. Secondary containment, with appropriate exhaust gas treatment, is strongly encouraged and is required in some jurisdictions.

Monitor the work area and the secondary containment continuously for release of the material. Automatic alerting of personnel and automatic shutdown of flow are appropriate in most applications and are required in some jurisdictions.

Purge all primary containment systems with a nonreactive gas, such as nitrogen, before introducing Sulfur Dioxide.

Personal Protective Equipment (PPE)

Respiratory Protection: Positive pressure, full face, air supplied breathing apparatus should be used for work within the secondary containment equipment if a leak is suspected or the primary containment is to be opened, e.g., for a cylinder change. Air supplied breathing apparatus is required for response to demonstrated or suspected releases from the primary containment.

Eye/Face Protection: This is usually provided by the respiratory protection equipment. For handling sealed cylinders, wear safety glasses.

Skin Protection: Wear appropriate gloves when handling sealed cylinders. Use gloves and other skin protection, as assigned by a competent safety professional, when working within the secondary enclosure with the primary enclosure compromised, e.g., cylinder changing, to protect both from exposure to the material and from fire that may result from its release to the air.

Other Protection: Wear appropriate protective footwear when moving cylinders.

Exposure Guidelines
The OSHA Permissible Exposure Limit and the ACGIH Time Weighted Average is 2 ppm. (See Section 11.)
**Section 9: Physical and Chemical Properties**

Notes: 1) "N/A" means not applicable.
2) Unless otherwise specified, properties are reported at 0 °C (32 °F) and 1 atmosphere (1.0 bar, 14.7 psia).

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appearance</td>
<td>Colorless</td>
</tr>
<tr>
<td>Odor</td>
<td>Sharp, irritating</td>
</tr>
<tr>
<td>Physical state</td>
<td>Gas</td>
</tr>
<tr>
<td>pH</td>
<td>N/A</td>
</tr>
<tr>
<td>Vapor Pressure</td>
<td>34 psig</td>
</tr>
<tr>
<td>Vapor Density</td>
<td>2.2 (Air = 1)</td>
</tr>
<tr>
<td>Boiling point</td>
<td>-9.99 °C (14 °F)</td>
</tr>
<tr>
<td>Freezing point</td>
<td>-75.55 °C (-104 °F)</td>
</tr>
<tr>
<td>Solubility in water (v/v)</td>
<td>Soluble</td>
</tr>
<tr>
<td>Specific Volume (ft³/lb)</td>
<td>5.92</td>
</tr>
<tr>
<td>Molecular weight</td>
<td>64.06</td>
</tr>
</tbody>
</table>

**Section 10: Stability and Reactivity**

Chemical Stability: This material is stable.

Conditions to Avoid: Exposure to air and/or moisture.

Incompatibility with Other Materials: Extremely reactive with moisture and alkalis.

**Section 11: Toxicological Information**

Acute Data (by route): LC₅₀, rat, 1 hr. inhalation = 2590 ppm.

LC₅₀, mouse, 0.5 hr. inhalation = 3000 ppm.

Chronic Data: Carcinogenicity; Rated A4 (not classifiable for human and animals), ACGIH; 3 (not classifiable in humans), IARC. Questionable carcinogen with experimental tumorigenic and teratogenic data reported.

Human mutation data has been reported.

Causes damage to the following organs: lungs, upper respiratory tract, skin, eyes, eye lens or cornea.

NIOSH REL (TLV) = 0.5 ppm. OSHA PEL and ACGIH TLV = 2 ppm. STEL = 5 ppm. Ceiling = 10 ppm. IDLH = 100 ppm.
Section 12: Ecological Information

Ecotoxicity: The products of degradation, sulfur oxides, are less toxic than the substance itself.

Environmental Fate: None known to Voltaix.

Section 13: Disposal Considerations

Classification under RCRA, 40 CFR 261: This material is not listed. However, it does demonstrate the characteristic of corrosivity.

US EPA waste number and descriptions: D002 (corrosivity).

Special Instructions and Limitations: Treat process and other exhaust streams appropriately before release to the atmosphere.

Notice: The information above is derived from Voltaix's interpretation of the US federal laws, regulations and policies concerning the material, as shipped by Voltaix, at the time this MSDS was prepared. Federal controls are subject to change and state and local controls may also apply. Proper waste disposal is the responsibility of the owner of the waste. The user is encouraged to consult with appropriate experts in developing a disposal plan.

Section 14: Transport Information

Basic Description: Sulfur Dioxide, Division 2.3 (Toxic Gas), UN 1079 Inhalation Hazard Zone C.

Secondary Hazard: Corrosive

Additional Information for shipment by air: Transportation by air is forbidden.

Section 15: Regulatory Information

TSCA Status: Listed on the Inventory of Chemical Substances.

CERCLA Reportable Quantity (40CFR302.40): This material is not listed. The Reportable Quantity (RQ) for “Unlisted Hazardous Wastes Characteristic of Corrosivity” (D002) of 45.4 kg (100 lbs.) therefore applies.

SARA 302/304/311/312: Extremely Hazardous Substances, Sulfur Dioxide.

SARA 302/304: Emergency Planning and Notification, Sulfur Dioxide.

SARA 302/304/311/312: Hazardous Chemicals, Sulfur Dioxide.

SARA 311/312: MSDS Distribution – chemical inventory – hazard identification Sulfur Dioxide.

CLEAN AIR ACT (CAA) 112: Extremely Hazardous Substance, Sulfur Dioxide.

Pennsylvania RTK: Sulfur Dioxide

New Jersey RTK: Sulfur Dioxide

Massachusetts RTK: Sulfur Dioxide
Section 16: Other Information

References


Code of Federal Regulations, Title 40

Code of Federal Regulations, Title 29.1910

Code of Federal Regulations, Title 49


NIOSH Pocket Guide to Chemical Hazards, 2004

Revision Indication

This is the original version of this Material Safety Data Sheet.

Disclaimer

Voltaix cannot guarantee that these are the only hazards that exist. Users are solely responsible for the safe storage, handling, use and disposal of this material, and for compliance with the applicable laws, regulations and accepted practices.

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