Material Safety Data Sheet (MSDS)

According to the Directives 91/155/CEE-2001/58/CE-ISO 11014-1

Revision Number: 1

Product Name:

Sulfur

Reactivity
Flammability
Health

1. IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND THE COMPANY/ UNDERTAKING

Identification of the substance or preparation: **Sulfur**

CAS Number: **7704-34-9**
Synonyms: **Brimstone; Sulphur**

Manufacturer subcontractor: **None**

Association/Organization: **None**
Use of the substance/Preparation:

2. COMPOSITION/INFORMATION ON INGREDIENTS

Hazardous substances: **Sulfur**
Hazardous label(s): **No data available**
Toxicological characteristics: **Hazardous in case of skin contact (irritant, sensitizer), of eye contact (irritant), of ingestion, of inhalation.**

Substances present at a concentration below the minimum danger: **Hydrogen Sulfide (H_2S) may be present in trace quantities (by weight) in molten sulfur but may accumulate to toxic or flammable concentrations in enclosed spaces such as molten sulfur storage pits, tanks, or tanker/railcar headspaces. H_2S is not considered a hazard associated with solid sulfur.**

Other component:

3. IDENTIFICATION OF HAZARDS

Risk phrases: **Flammable liquid and solid.**
Skin contact: **Prolonged contact with sulfur dust in a localized area may result in irritation, primarily from abrasive action. Molten sulfur may cause 1st, 2nd, or 3rd degree thermal burns.**

Eye contact: **Contact with molten sulfur may cause serious burns and blindness. Sulfur vapor may cause eye irritation. Dust contact with eyes may cause mechanical irritation (abrasion), characterized**

by a scratchy discomfort. This may progress to burning and tearing, with blurring of vision upon repeated or prolonged exposure. These symptoms are generally reversible once exposure is discontinued. Excessive may cause more severe symptoms such as redness, pain, sensitivity to light, and conjunctivitis. Some severe exposure cases have resulted in permanent damage. Exposure to approximately 8 PPM sulfur vapor has been shown to cause eye irritation. Exposure to approximately 8 PPM sulfur vapor has been shown to cause eye irritation.

If swallowed:

Ingestion of small amounts of solid sulfur should not cause significant health effects. Large does can produce mucous membrane irritation, difficult swallowing, redness of the throat and tongue, stomach, and urinary disturbances. Vomiting, abdominal pain and diarrhea may also occur. Long-term ingestion of small amounts may have a laxative effect. Ingestion of very large amounts may cause sore throat, nausea, headache, and possibly unconsciousness in severe cases. May be converted into hydrogen sulfide in the intestine.

Other information:

WARNING: Irritating and toxic hydrogen sulfide gas may be found in confined vapor spaces. Greater than 15 - 20 PPM continuous exposures can cause mucous membrane and respiratory tract irritation. 50 - 500 PPM can cause headache, nausea, and dizziness, loss of reasoning and balance, difficulty in breathing, fluid in the lungs, and possible loss of consciousness. Greater than 500 PPM can cause rapid or immediate unconsciousness due to respiratory paralysis and death by suffocation unless the victim is removed from exposure and successfully resuscitated.

The "rotten egg" odor of hydrogen sulfide is not a reliable indicator for warning of exposure, since olfactory fatigue (loss of smell) readily occurs, especially at concentrations above 50 PPM. At high concentrations, the victim may not even recognize the odor before becoming unconscious.

4. FIRST AID MEASURES

As a general rule, in case of doubt or if symptoms persist, always call a doctor
NEVER induce swallowing in an unconscious person.

Skin contact :	**Remove contaminated clothing .Wash contaminated area with water and soap. If irritation persists obtain medical attention.**
In case of exposure by inhalation:	**Remove person to fresh air. If person is not breathing provide artificial respiration. If necessary, provide additional oxygen once breathing is restored if trained to do so. Seek medical attention immediately.**
In case of splashes or contact with eyes:	**In case of contact with eyes, immediately flush with clean, low-pressure water for at least 15 min. Hold eyelids open to ensure adequate flushing. Seek medical attention.**
In case of swallowing: **Note of physician:**	**DO NOT INDUCE VOMITING. Do not give liquids. Obtain immediate medical attention. If spontaneous vomiting occurs, lean victim forward to reduce the risk of aspiration. Monitor for breathing difficulties. Small amounts of material which enter the mouth should be rinsed out until the taste is dissipated.**

5. FIRE FIGHTING MEASURES

Flammable class:	
Suitable extinguishing media:	**SMALL FIRES: Any extinguisher suitable for Class B fires, dry chemical, CO2, water spray, fire fighting foam, or Halon. LARGE FIRES: Water spray, fog or fire fighting foam. Water may be ineffective for fighting the fire, but may be used to cool fire-exposed containers.**
Special exposure hazards arising from the substance or preparation itself, combustion products, resulting gases:	**Flammable solid with a relatively low ignition temperature. Sulfur dust ignites easily in air. Grinding sulfur may produce an explosion hazard. Static discharge may ignite sulfur dust.**
Special protective equipment for fire fighting :	**Small fires in the incipient (beginning) stage may typically be extinguished using handheld portable fire extinguishers and other fire fighting**

equipment.

Firefighting activities that may result in potential exposure to high heat, smoke or toxic by-products of combustion should require NIOSH/MSHA- approved pressure-demand self-contained breathing apparatus with full facepiece and full protective clothing.

Isolate area around container involved in fire. Cool tanks, shells, and containers exposed to fire and excessive heat with water. For massive fires the use of unmanned hose holders or monitor nozzles may be advantageous to further minimize personnel exposure. Major fires may require withdrawal, allowing the tank to burn. Large storage tank fires typically require specially trained personnel and equipment to extinguish the fire, often including the need for properly applied fire fighting foam.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions:

Evacuate nonessential personnel and remove or secure all ignition sources. Consider wind direction; stay upwind and uphill, if possible. Evaluate the direction of product travel, diking, sewers, etc. to confirm spill areas. Product may release substantial amounts of flammable vapors and gases (e.g., methane, ethane, and propane), at or below ambient temperature depending on source and process conditions and pressure.

Environmental precautions:

Carefully contain and stop the source of the spill, if safe to do so. Protect bodies of water by diking, absorbents, or absorbent boom, if possible. Do not flush down sewer or drainage systems, unless system is designed and permitted to handle such material. The use of fire fighting foam may be useful in certain situations to reduce vapors. The proper use of water spray may effectively disperse product vapors or the liquid itself, preventing contact with ignition sources or areas/equipment that require protection - do not discharge solid

	water stream patterns into the liquid resulting in splashing.
Methods for cleaning up and disposal:	**Take up with sand or other oil absorbing materials. Carefully shovel, scoop or sweep up into a waste container for reclamation or disposal. Response and clean-up crews must be properly trained and must utilize proper protective equipment (see Section 8).**
Other information:	

7. HANDLING AND STORAGE

The regulations relating to storage premises apply to workshop where the product is handled:

Handling:	**Store solid sulfur in a well ventilated area away from incompatible materials. The hazards of hydrogen sulfide should be considered when storing or transporting molten sulfur. H2S can accumulate in confined spaces such as sulfur pits and headspaces of truck trailers and railcars. Exposure to H2S is possible during product transfer into/out of truck trailers and railcars.**
Storage:	**Use appropriate engineering controls or respiratory protection. Sulfur pits should be vented away from possible worker exposure areas. Prohibit smoking in storage and work areas. Electrical installations and equipment in hazardous locations should be installed according to articles 501 and 502 of the National Electric Code. Reference also NFPA 655 Standard for the Prevention of Sulfur Fires and Explosions.**
Other information:	**Protect against hot liquid. Emergency eye wash capability should be available in the near proximity to operations presenting a potential splash exposure. Use good personal hygiene practices. Avoid repeated and/or prolonged skin exposure. Wash hands before eating, drinking, smoking, or using toilet facilities. Do not use gasoline or solvents (naphtha, kerosene, etc.) for washing this product from exposed skin areas. Waterless hand cleaners are effective. Promptly remove contaminated clothing and launder before reuse. Consider the need to**

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Exposure limit values:	**PEL = None established** **TLV = None established**
Exposure controls:	**Use adequate ventilation to keep vapor, hydrogen sulfide and dust concentrations of this product below occupational exposure limits and flammability limits, particularly in confined spaces. Use explosion-proof equipment and lighting in classified/controlled areas.**
Personal protective equipment:	**Splash goggles. Full suit. Dust respirator. Boots. Gloves. A self-contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist before handling this product.**
Eye protection:	**Safety goggles are recommended for excessive dust exposure. Use faceshield for protection against molten sulfur.**
Respiratory protection:	**If a hydrogen sulfide hazard is present (that is, exposure potential above H_2S permissible exposure limit), use a positive-pressure SCBA or Type C supplied air respirator with escape bottle.**
Hand protection:	**Avoid repeated or prolonged skin contact. For protection from molten sulfur, gloves and skin protection constructed of leather or heat resistant materials are recommended.**
Skin and body protection:	**Avoid repeated or prolonged skin contact. For protection from molten sulfur, gloves and skin protection constructed of leather or heat resistant materials are recommended.**
Health measures:	**N/A**
Environmental exposure controls:	**Use a positive pressure, air-supplied respirator if there is a potential for uncontrolled release, exposure levels are not known, in oxygen-deficient atmospheres, or any other circumstance where an air-purifying respirator may not provide adequate protection.**

9. PHYSICAL AND CHEMICAL PROPERTIES

General information:	**Sulfur**
Appearance (at 20°C):	**Yellow solid in block or pellet for; easily crushed into yellow dust. Hot, yellow liquid**
Colour:	**Yellow**
Odour:	**Pure sulfur is odorless and tasteless. However, trace hydrocarbon impurities may give it a faint oily and/or rotten egg odor.**
PH (at 20°C):	**Not applicable.**
Boiling point/range (°C):	**832 °F (445 °C)**
Flash point (°C):	**Closed cup: 207°C (404.6°F). (Pensky-Martens.)**
Flammability:	**Flammable. Slightly flammable to flammable in presence of open flames, sparks and static discharge.**
Auto-ignition temperature:	**232°C (449.6°F)**
Explosive properties:	**Hazardous in contact with oxidizing materials, forming explosive mixtures. Sulfur burns with a pale blue flame that may be difficult to see in daylight**
Oxidising properties:	**These products are sulfur dioxide and sulfur trioxide (SO2, SO3).**
Vapour pressure (at 20°C):	**4x10-6 mm Hg @ 86 °F (30 °C)**
Density (at 20°C):	**(H_2O = 1): AP 1.96 (varies)**
Solubility (at 20°C):	**water solubility: Insoluble in water**
	solubility in fats:
Viscosity (40°C):	**Solid: Not**
Evaporation rate:	**Not applicable.**
Other information:	**MELTING POINT: 235 to 248 °F (113 to 120 °C)**

10. STABILITY AND REACTIVITY

Stability:	**Stable. Hazardous polymerization will not occur.**
Conditions to avoid:	**Avoid high temperatures, open flames, welding, and smoking and ignitions sources. Under certain conditions, H_2S can react to form pyrophoric iron compounds in enclosed**

	spaces such as sulfur pits. Exposure of pyrophoric compounds to air or moisture can cause excessive heat generation, smoke and toxic gases, and fire.
Material to avoid:	**Sulfur is incompatible with a number of chemical materials including, but not limited to, chlorates, nitrates, other oxidizers, carbides, halogens, phosphorus, and heavy metals. This incompatibility may result in fire, excessive heat generation, uncontrolled reaction, release of toxic products and/or explosion.** **A comprehensive list of incompatible materials may be found in the latest edition of Sax's "Dangerous Properties of Industrial Materials" and the NFPA "Hazardous Materials Guide".**
Hazardous decomposition products:	**Sulfur burns to sulfur dioxide. Sulfur reactions with hydrocarbons and other organic materials may produce hydrogen sulfide and carbon disulfide. Other possibly toxic reaction or decomposition products are highly dependent on the incompatible material.**

11. TOXICOLOGICAL INFORMATION

Acute toxicity:	**Large doses (15 grams) by mouth may lead to hydrogen sulfide production in the body, chiefly due to bacterial action within the colon.** **Rat-oral LD50 = 175 mg/kg**
Sub chronic – chronic toxicity: **Sensibilization:** **Carcinogenicity:** **Reproductive effects:** **Human experience:** **Other information:**	**Prolonged inhalation of dust over several years (as demonstrated in miners) may cause respiratory disease, complicated by emphysema and bronchiectasis. Asthma and inflammation of the frontal and maxillary sinuses are frequent complications. Pulmonary function may be reduced showing increased oxygen consumption, reduced respiratory volume, and impaired carbon dioxide diffusion capacity. Radiological examinations have revealed irregular opacities in the lungs and nodulation.**

12. ECOLOGICAL INFORMATION

Ecotoxicity: Keep out of sewers, drainage areas, and waterways. Report spills and releases, as applicable, under Federal and State regulations.

Bio accumulative potential: The products of biodegradation are toxic but are not typically released to the atmosphere as a result of This degradation. They are instead incorporated into new compounds or combined with water to form a sulfur acid.

Mobility:

Persistence and degradability: These products are sulfur oxides (SO2, SO3).

Other adverse effects:

13. DISPOSAL CONSIDERATIONS

Disposal of product: Consult federal, state and local waste regulations to determine appropriate disposal options.

Disposal of packaging: Waste must be disposed of in accordance with federal, state and local environmental control regulations.

14. TRANSPORT INFORMATION

Land transport:

HAZARD CLASS, PACKING GROUP:		**9, PG III**	**4.1, PG III**

ADR/RID: **Class:**

	DOMESTIC SHIPMENT	**INTERNATIONAL SHIPMENT**
PROPER SHIPPING NAME:	**SULFUR**	**SULFUR**
HAZARD CLASS, PACKING GROUP:	**9, PG III**	**4.1, PG III**

Packaging group:

	HAZARD CLASS, PACKING GROUP:	**9, PG III**	**4.1, PG III**
Maritime transport:	**HAZARD CLASS, PACKING GROUP:**	**9, PG III**	**4.1, PG III**

Air transport:	**HAZARD CLASS, PACKING GROUP:**	**9, PG III**	**4.1, PG III**

15. REGULATORY INFORMATION

SARA SECTION 311/312 - HAZARD CLASSES

Hazardous label(s):

ACUTE HEALTH **CHRONIC HEALTH** **FIRE**

HEALTH: 1 **REACTIVITY: 0** **FIRE: 1**

Safety phrases: **Any spill or release of this product to "navigable waters" (essentially any surface water, including certain wetlands) or adjoining shorelines sufficient to cause a visible sheen or deposit of a sludge or emulsion must be reported immediately to the National Response Center (1-800-424-8802) as required by U.S. Federal Law. Also contact appropriate state and local regulatory agencies as required.**

Risk phrases: **Any spill or uncontrolled release of this product, including any substantial threat of release, may be subject to federal, state and/or local reporting requirements. This product and/or its constituents may also be subject to other regulations at the state and/or local level. Consult those regulations applicable to your facility/operation.**

16. OTHER INFORMATION

None

The contents and format of this MSDS are in accordance with EEC Commission Directive 2001/58/EC

Disclaimer of liability:

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