

SAFETY DATA SHEET

SECTION 1 : IDENTIFICATION

Product identifier used on the label:

Product Name: **Sulfur, Solid**
SDS Manufacturer Number: 826064

Other means of identification:

Synonyms: Sulfur, Elemental Sulfur, Formed Sulfur, Soil Sulfur, Sulfur Cake

Recommended use of the chemical and restrictions on use:

Product Use/Restriction: Feedstock

Chemical manufacturer address and telephone number:

Manufacturer Name: Conoco Phillips
Address: 600 N. Dairy Ashford
Houston, TX 77079-1175
Website: www.conocophillips.com
General Phone Number: 855-244-0762.....E-mail: SDS@conocophillips.com

Emergency phone number:

Emergency Phone Number: Chemtrec: 800-424-9300 (24 Hours)

SECTION 2 : HAZARD(S) IDENTIFICATION

Classification of the chemical in accordance with CFR 1910.1200(d)(f):

GHS Pictograms:



Signal Word: Warning

GHS Class: Skin Irritant, Category 2. Acute Toxicity Inhalation, Category 4. Eye Irritant, Category 2B.

Hazard Statements: WARNING
May cause skin irritation
May contain or release poisonous hydrogen sulfide gas
May be harmful if inhaled. Causes eye irritation.

Precautionary Statements: Wash thoroughly after handling. (P264)*
Wear protective gloves/protective clothing/eye protection/face protection. (P280)*
Avoid breathing dust/fume/gas/mist/vapours/spray. (P261)*
IF ON SKIN: Wash with plenty of water. (P353)*
If skin irritation occurs: Get medical advice/attention. (P313)*
Take off contaminated clothing and wash it before reuse. (P362)*

*(Applicable GHS hazard code.) IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

Hazards not otherwise classified that have been identified during the classification process:

Potential Health Effects:

Eye: Causes eye irritation
Skin: May cause skin irritation.
Inhalation: Inhalation of dust may cause respiratory irritation.
Warning: Irritating and toxic hydrogen sulfide gas may be present.
Ingestion: Abdominal pain. May cause nausea, vomiting, and diarrhea. Ingestion is likely to be harmful or have adverse effects.

SECTION 3 : COMPOSITION/INFORMATION ON INGREDIENTS

Mixtures:

Chemical Name	CAS#	Ingredient Percent	EC Num.
Sulfur	7704-34-9	>99 by weight	
Hydrogen Sulfide	7783-06-4	<1 by Volume	

Notes : All concentrations are percent by weight unless ingredient is a gas. Gas concentrations are in percent by volume.

SECTION 4 : FIRST AID MEASURES

Description of necessary measures:

Eye Contact: If irritation or redness develops from exposure, flush eyes with clean water. If symptoms persist, seek medical attention.

Skin Contact: Clean exposed skin with mild soap and water. Seek medical attention if irritation persists.

Inhalation: If respiratory symptoms or other symptoms of exposure develop, move victim away from source of exposure and into fresh air in a position comfortable for breathing. If symptoms persist, seek immediate medical attention. If victim is not breathing, clear airway and immediately begin artificial respiration. If breathing difficulties develop, oxygen should be administered by qualified personnel. Seek immediate medical attention.

Ingestion: First aid is not normally required for the solid material; however, if swallowed and symptoms develop, seek medical attention.

Most important symptoms/effects, acute and delayed:

Other First Aid: Before attempting rescue, first responders should be alert to the possible presence of hydrogen sulfide, a poisonous gas with the smell of rotten eggs, and should consider the need for respiratory protection (see Section 8). Remove casualty to fresh air as quickly as possible. Immediately begin artificial respiration if breathing has ceased. Consider whether oxygen administration is needed. Obtain medical advice for further treatment.

Indication of immediate medical attention and special treatment needed:

Note to Physicians: At high concentrations hydrogen sulfide may produce pulmonary edema, respiratory depression, and/or respiratory paralysis. The first priority in treatment should be the establishment of adequate ventilation and the administration of 100% oxygen. Animal studies suggest that nitrites are a useful antidote, however, documentation of the efficacy of nitrites in humans is lacking. If the diagnosis of hydrogen sulfide poisoning is confirmed and if the patient does not respond rapidly to supportive care, the use of nitrites may be an effective antidote if delivered within the first few minutes of exposure. For adults the dose is 10 mL of a 3% NaNO₂ solution (0.5 gm NaNO₂ in 15 mL water) I.V. over 2-4 minutes. The dosage should be adjusted in children or in the presence of anemia, and methemoglobin levels, arterial blood gases, and electrolytes should be monitored closely.

SECTION 5 : FIRE FIGHTING MEASURES

Suitable and unsuitable extinguishing media:

Suitable Extinguishing Media: Dry chemical, carbon dioxide, foam, or water spray is recommended. Water or foam may cause frothing of materials heated above 212°F / 100°C. Carbon dioxide can displace oxygen. Use caution when applying carbon dioxide in confined spaces. Simultaneous use of foam and water on the same surface is to be avoided as water destroys the foam.

Specific hazards arising from the chemical:

Hazardous Combustion Byproducts: Combustion may yield sulfur dioxide and other oxides of sulfur.

Unusual Fire Hazards: Flash point varies depending on the impurities present in the product. Sulfur burns easily in air when ignited by flame or excess heat. Molten sulfur, at temperatures near the flash point, may flash and/or burn when exposed to air.

Flammability of headspace vapors containing hydrogen sulfide will differ appreciably from the values given for sulfur. Flammable and toxic hydrogen sulfide may form in closed tank headspaces. Sulfur can form explosive mixtures with oxidizers (see Section 10). Water or foam may cause frothing of molten sulfur, with further application leading to boil over. Steam explosions may occur due to contact or mixing of water with molten product.

If container is not properly cooled, it can rupture in the heat of a fire. Hazardous combustion/decomposition products, including hydrogen sulfide, may be released by this material when exposed to heat or fire. Use caution and wear protective clothing, including respiratory protection.

Special protective equipment and precautions for fire-fighters:

Protective Equipment: As in any fire, wear Self-Contained Breathing Apparatus (SCBA), MSHA/NIOSH (approved or equivalent) and full protective gear.

Fire Fighting Instructions: For fires beyond the initial stage, emergency responders in the immediate hazard area should wear protective clothing. When the potential chemical hazard is unknown, in enclosed or confined spaces, a self contained breathing apparatus should be worn. In addition, wear other appropriate protective equipment as conditions warrant (see Section 8).

Isolate immediate hazard area and keep unauthorized personnel out. Contain spill if it can be done safely. Move undamaged containers from immediate hazard area if it can be done safely. Water spray may be useful in minimizing or dispersing vapors and to protect personnel. Cool equipment exposed to fire with water, if it can be done safely. Avoid spreading burning liquid with water used for cooling purposes.

NFPA Ratings:

NFPA Health: 2
NFPA Flammability: 1
NFPA Reactivity: 0



SECTION 6 : ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures:

Personal Precautions: This material may burn, but will not ignite readily. Keep all sources of ignition away from spill/release. May contain or release poisonous hydrogen sulfide gas. If the presence of dangerous amounts of H₂S around the spilled product is suspected, additional or special actions may be warranted, including access restrictions and use of protective equipment. Stay upwind and away from spill/release. Avoid direct contact with material. For large spillages, notify persons down wind of the spill/release, isolate immediate hazard area and keep unauthorized personnel out. Wear appropriate protective equipment, including respiratory protection, as conditions warrant (see Section 8). See Sections 2 and 7 for additional information on hazards and precautionary measures.

Environmental precautions:

Environmental Precautions: Stop spill/release if it can be done safely. Prevent spilled material from entering sewers, storm drains, other unauthorized drainage systems, and natural waterways. Use water sparingly to minimize environmental contamination and reduce disposal requirements. If spill occurs on water notify appropriate authorities and advise shipping of any hazard. If spill/release in excess of EPA reportable quantity (see Section 15) is made into the environment, immediately notify the National Response Center (phone number 800-424-8802).

Methods and materials for containment and cleaning up:

Methods for containment: Containment of this material should not be necessary.

Methods for cleanup: Carefully shovel or sweep up spilled material and place in a suitable container. Minimize dust generation.

Recommended measures are based on the most likely spillage scenarios for this material; however local conditions and regulations may influence or limit the choice of appropriate actions to be taken.

SECTION 7 : HANDLING and STORAGE

Precautions for safe handling:

Handling: Under dusty conditions, avoid all sources of ignition, including sparks and static electricity. Minimize dust generation and accumulation in enclosed spaces. Routine housekeeping should be instituted to ensure that dusts do not accumulate on surfaces. Keep away from flames and hot surfaces. Wear protective gloves/clothing and eye/face protection. May contain or release dangerous levels of hydrogen sulfide. Wash thoroughly after handling. Use good personal hygiene practices and wear appropriate personal protective equipment (see section 8).

Do not wear contaminated clothing or shoes.

Hygiene Practices: Wash thoroughly after handling. Do not eat, drink or smoke when using this product. Contaminated work clothing should not be allowed out of the workplace.

Conditions for safe storage, including any incompatibilities:

Storage: Keep container(s) tightly closed and properly labeled. This material may contain or release poisonous hydrogen sulfide gas. In a tank, barge, or other closed container, the vapor space above this material may accumulate hazardous concentrations of hydrogen sulfide. Check atmosphere for oxygen content, H₂S, and flammability prior to entry. Use and store this material in cool, dry, well-ventilated area away from heat and all sources of ignition. Store only in approved containers or bins. Keep away from any incompatible material (see Section 10). Protect container(s) against physical damage.

Soil sulfur can contain residual moisture. Store away from other materials that may be damaged by moisture. Slabs should be designed to drain moisture away from the product. Use and store this material in cool, dry, well-ventilated areas away from heat and all sources of ignition. Store only in approved containers. Keep away from any incompatible material. Protect container(s) against physical damage.

SECTION 8: EXPOSURE CONTROLS, PERSONAL PROTECTION

EXPOSURE GUIDELINES:

Sulfur :

Guideline ACGIH: TLV-TWA: 10 mg/m³ (total)
TLV-TWA: 3 mg/m³ (respirable)
As nuisance dust, if generated

Guideline OSHA: PEL-TWA: 15 mg/m³ (total)
PEL-TWA: 5 mg/m³ (respirable)
As nuisance dust, if generated

Hydrogen Sulfide :

Guideline ACGIH: TLV-STEL: 5 ppm
TLV-TWA: 1 ppm
TLV-TWA: 1 ppm
TLV-STEL: 5 ppm

Guideline OSHA: PEL-Ceiling/Peak: 20 ppm
PEL-Ceiling/Peak: 50 ppm Peak

Guideline User Defined: ConocoPhillips Guidelines
TWA: 5 ppm 8hr
TWA: 2.5 ppm 12hr
STEL: 15 ppm

Appropriate engineering controls:

Engineering Controls: If current ventilation practices are not adequate to maintain airborne concentrations below the established exposure limits, additional engineering controls may be required. It is recommended that all dust control equipment such as local exhaust ventilation and material transport systems involved in handling of this product contain explosion relief vents or an explosion suppression system or an oxygen deficient environment. Ensure that dust-handling systems are designed in a manner to prevent

the escape of dust into enclosed work areas.

Individual protection measures:

- Eye/Face Protection:** The use of eye protection that meets or exceeds ANSI Z.87.1 is recommended when there is potential dust hazards associated with product useage. Depending on conditions of use, a face shield may be necessary.
- Skin Protection Description:** The use of gloves impervious to the specific material handled is advised to prevent skin contact. Depending on exposure and use conditions, additional protection may be necessary to prevent skin contact including items such as chemical resistant boots, aprons, arm covers, hoods, and coveralls. Suggested protective materials: Nitrile.
- Hand Protection Description:** The use of gloves impervious to the specific material handled is advised to prevent skin contact. Users should check with manufacturers to confirm the breakthrough performance of their products.
- Respiratory Protection:** Where there is potential for airborne exposure to hydrogen sulfide (H2S) above exposure limits, a NIOSH approved, self-contained breathing apparatus (SCBA) or equivalent operated in a pressure demand or other positive pressure mode should be used. Under conditions where hydrogen sulfide (H2S) is NOT detected, a NIOSH certified air purifying respirator equipped with R or P95 filters may be used.
- A respiratory protection program that meets or is equivalent to OSHA 29 CFR 1910.134 and ANSI Z88.2 should be followed whenever workplace conditions warrant a respirator's use. Air purifying respirators provide limited protection and cannot be used in atmospheres that exceed the maximum use concentration (as directed by regulation or the manufacturer's instructions), in oxygen deficient (less than 19.5 percent oxygen) situations, or under conditions that are immediately dangerous to life and health (IDLH).
- Other Protective:** Eye wash and quick-drench shower facilities should be available in the work area. Thoroughly clean shoes and wash contaminated clothing before reuse.

PPE Pictograms:



Note: Suggestions provided in this section for exposure control and specific types of protective equipment are based on readily available information. Users should consult with the specific manufacturer to confirm the performance of their protective equipment. Specific situations may require consultation with industrial hygiene, safety, or engineering professionals.

State, local or other agencies or advisory groups may have established more stringent limits. Consult an industrial hygienist or similar professional, or your local agencies, for further information.

SECTION 9 : PHYSICAL and CHEMICAL PROPERTIES

PHYSICAL AND CHEMICAL PROPERTIES:

- Physical State:** Solid phase.
- Physical State Appearance:** Yellow brown to bright yellow
- Odor:** Rotten egg-like. Sulfur like.
- Odor Threshold:** No Data
- Boiling Point:** 832°F (444°C)
- Melting Point:** 246°F (119°C)
- Density:** 15 lbs/gal
- Specific Gravity:** 1.8 @ 68°F (20°C) (water=1)
- Solubility:** Insoluble
- Vapor Density:** >38.9 (air=1)
- Vapor Pressure:** 1mm Hg @ 363°F (184°C)
- Percent Volatile:** Not determined.
- Evaporation Rate:** No Data
- pH:** Not applicable.
- Viscosity:** 6.5 cP @ 363°F (184°C)
- Coefficient of Water/Oil Distribution:** Not determined.
- Flash Point:** >405°F (>207°C)
- Flash Point Method:** Cleveland Open Cup (C.O.C).
- Lower Flammable/Explosive Limit:** No Data
- Upper Flammable/Explosive Limit:** No Data
- Auto Ignition Temperature:** No Data

9.2. Other information:

Note: Unless otherwise stated, values are determined at 20°C (68°F) and 760 mm Hg (1 atm). Data represent typical values and are not intended to be specifications.

SECTION 10 : STABILITY and REACTIVITY

Chemical Stability:

Chemical Stability: Stable under normal ambient and anticipated conditions of use.

Possibility of hazardous reactions:

Hazardous Polymerization:	Hazardous polymerization does not occur.
Conditions To Avoid:	
Conditions to Avoid:	Avoid all possible sources of ignition. Avoid overheating.
Incompatible Materials:	
Incompatible Materials:	Elemental sulfur can react with metals such as sodium, calcium, tin, nickel, or zinc under certain conditions. Avoid contact with strong oxidizing agents such as acids, chlorine, dichromates, or permanganates.
Hazardous Decomposition Products:	
Special Decomposition Products:	Thermal decomposition can release toxic vapors or gases. Combustion can yield sulfur oxides. In molten form sulfur reacts with hydrocarbons to form carbon disulfide and hydrogen sulfide. May contain or liberate poisonous hydrogen sulfide gas. Not anticipated under normal conditions of use.

SECTION 11 : TOXICOLOGICAL INFORMATION

TOXICOLOGICAL INFORMATION:

Acute Toxicity:	Effects of overexposure may include irritation of the digestive tract, irritation of the respiratory tract, headaches, coughing, runny nose, vomiting, diarrhea, shortness of breath, abdominal pain and chest pain.
Eye:	Dusts created may be abrasive and irritating to the eyes and cause stinging, watering, and redness.
Skin:	May cause skin irritation.
Sensitization:	Not expected to be a skin sensitizer. Allergic skin responses after repeated contact with sulfur have been reported but are not common.
Carcinogenicity:	Not expected to cause cancer. This substance is not listed as a carcinogen by IARC, NTP or OSHA.
Mutagenicity:	Not expected to cause heritable genetic effects.
Reproductive Toxicity:	Not available.
Notes :	This material may contain or liberate hydrogen sulfide, a poisonous gas with the smell of rotten eggs. The smell disappears rapidly because of olfactory fatigue so odor may not be a reliable indicator of exposure. Effects of overexposure include irritation of the eyes, nose, throat and respiratory tract, blurred vision, photophobia (sensitivity to light), and pulmonary edema (fluid accumulation in the lungs). Severe exposures can result in nausea, vomiting, muscle weakness or cramps, headache, disorientation and other signs of nervous system depression, irregular heartbeats, convulsions, respiratory failure, and death.

SECTION 12 : ECOLOGICAL INFORMATION

Ecotoxicity:

Ecotoxicity:	Sulfur is not classified as an environmental hazard. In six studies on ecological effects (involving bobwhite quail, two fish species, daphnia, mysid shrimp and honey bees), sulfur has been shown to be practically non-toxic to the species tested. While there is potential for non-target organisms to be exposed to sulfur, little hazard to these species is expected to result. Classification: No classified hazards.
Persistence and degradability:	
Biodegradation:	Sulfur is a component of the environment, and there is a natural cycle of oxidation and reduction reactions which transforms sulfur into both organic and inorganic products. Sulfur is amenable to microbial utilization. Therefore, this material can be degraded by microorganisms and is regarded as inherently biodegradable.
Bioaccumulative potential:	
Bioaccumulation:	Sulfur is not expected to have bioaccumulation or food chain contamination potential.
Mobility in soil:	
Mobility In Environmental Media:	Sulfur is not expected to be mobile in soil. Elemental sulfur is slowly converted to sulfate in soil by the action of autotrophic bacteria. Elemental sulfur leaches in soil as sulfate at a slow rate. About 3-6% of the sulfur (formulation and purity unspecified) applied at 56 kg/Ha leached through lysimeters of loam soil (soil depth unspecified) as a result of 40 inches of rain over a six-month period. After two years, 23-29% of the applied sulfur had leached.
Notes :	U.S. Export Control Classification Number - EAR99

SECTION 13 : DISPOSAL CONSIDERATIONS

Description of waste:

Waste Disposal:	The generator of a waste is always responsible for making proper hazardous waste determinations and needs to consider state and local requirements in addition to federal regulations. This material, if discarded as produced, would not be a federally regulated RCRA listed hazardous waste and is not believed to exhibit characteristics of hazardous waste. See Sections 7 and 8 for information on handling, storage and personal protection and Section 9 for physical/chemical properties. It is possible that the material as produced contains constituents which are not required to be listed in the SDS but could affect the hazardous waste determination. Additionally, use which results in chemical or physical change of this material could subject it to regulation as a hazardous waste. Container contents should be completely used and containers should be emptied prior to discard.
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SECTION 14 : TRANSPORT INFORMATION

DOT Shipping Name: Sulfur
 DOT UN Number: UN1350
 DOT Hazard Class: 4.1
 DOT Packing Group: III
 DOT Pictograms:



Canadian Shipping Name: Sulphur
 Canadian UN Number: UN1350
 Canadian Hazard Class: 4.1
 Canadian Packing Group: III
 Canadian Shipping Label: Class 4.1, Flammable Solid
 IMDG UN Number : UN1350
 IMDG Shipping Name : Sulphur
 IMDG Hazard Class : 4.1
 IMDG Packing Group : III

SECTION 15 : REGULATORY INFORMATION

Safety, health and environmental regulations specific for the product:

TSCA Inventory Status: All components are either listed on the US TSCA Inventory, or are not regulated under TSCA

CERCLA Section 302: This material contains the following chemicals subject to the reporting requirements of 40 CFR 302.4:
Hydrogen Sulfide

Section 311/312 Hazard Categories: Immediate (acute) health hazard
Fire Hazard

Section 313: This material does not contain any chemicals subject to the reporting requirements of SARA 313 and 40 CFR 372.

California PROP 65: This material does not contain any chemicals which are known to the State of California to cause cancer, birth defects or other reproductive harm at concentrations that trigger the warning requirements of California Proposition 65.

Canada WHMIS: WHMIS Hazard Class:
B4 - Flammable Solid
D2B

Sulfur :

TSCA Inventory Status: Listed

Hydrogen Sulfide :

TSCA Inventory Status: Listed

Section 302 EHS: TPQ 500 lb

Section 304 RQ: 100 lb

Canada DSL: Listed

SECTION 16 : ADDITIONAL INFORMATION

HMIS Ratings:

HMIS Health Hazard: 2*
 HMIS Fire Hazard: 1
 HMIS Reactivity: 0
 HMIS Personal Protection: 1

Health Hazard	2*
Fire Hazard	1
Reactivity	0
Personal Protection	1

* Chronic Health Effects

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SDS Author: Actio Corporation

Guide to Abbreviations: ACGIH = American Conference of Governmental Industrial Hygienists;
 CASRN = Chemical Abstracts Service Registry Number;
 CEILING = Ceiling Limit (15 minutes);
 CERCLA = The Comprehensive Environmental Response, Compensation, and Liability Act;
 EPA = Environmental Protection Agency;
 GHS = Globally Harmonized System;
 IARC = International Agency for Research on Cancer;
 INSH = National Institute for Health and Safety at Work;
 IOPC = International Oil Pollution Compensation;
 LEL = Lower Explosive Limit;
 NE = Not Established;
 NFPA = National Fire Protection Association;
 NTP = National Toxicology Program;
 OSHA = Occupational Safety and Health Administration;

PEL = Permissible Exposure Limit (OSHA);
SARA = Superfund Amendments and Reauthorization Act;
STEL = Short Term Exposure Limit (15 minutes);
TLV = Threshold Limit Value (ACGIH);
TWA = Time Weighted Average (8 hours);
UEL = Upper Explosive Limit;
WHMIS = Worker Hazardous Materials Information System (Canada)

Disclaimer:

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