

Safety Data Sheet

According to OSHA HCS 2012 (29 CFR 1910.1200)



SECTION 1: Identification

Product Identifier **Sulfur**
Other means of identification Sulphur
Elemental Sulfur
Formed Sulphur
Prilled Sulfur
Soil Sulfur (screened)
Soil Sulfur (ROP)
Soil Sulfur (Distressed)
Cake Sulfur
SDS Number **002074**
Relevant identified uses Feedstock
Uses advised against All others
24 Hour Emergency Phone Number CHEMTREC 1-800-424-9300
CANUTEC 613-996-6666
CHEMTREC Mexico 01-800-681-9531

Manufacturer/Supplier Phillips 66 Company
P.O. Box 4428
Houston, Texas 77210
SDS Information
Phone: 800-762-0942
Email: SDS@P66.com
URL: www.Phillips66.com

SECTION 2: Hazard identification

Classified Hazards

H315 -- Skin corrosion/irritation -- Category 2

Hazards Not Otherwise Classified (HNOC)

PHNOC: May form combustible dust concentrations in enclosed spaces during handling.

HHNOC: May contain or release poisonous hydrogen sulfide gas.

Label Elements



WARNING

May form combustible dust concentrations in enclosed spaces during handling.
Causes skin irritation
May contain or release poisonous hydrogen sulfide gas.

Avoid breathing dust/fume/gas/mist/vapours/spray; Wash skin thoroughly after handling; Wear protective gloves/protective clothing and eye/face protection; IF ON SKIN: Wash with plenty of soap and water; If skin irritation occurs: Get medical advice/attention; Take off contaminated clothing and wash before reuse

SECTION 3: Composition/information on ingredients

Chemical Name	CASRN	Concentration ¹
Sulfur	7704-34-9	>99
Hydrogen sulfide	7783-06-4	Trace

¹ All concentrations are percent by weight unless ingredient is a gas. Gas concentrations are in percent by volume.

SECTION 4: First aid measures

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

Skin Contact: Remove contaminated shoes and clothing, and flush affected area(s) with large amounts of water. If skin surface is damaged, apply a clean dressing and seek medical attention. If skin surface is not damaged, cleanse affected area(s) thoroughly by washing with mild soap and water or a waterless hand cleaner. If irritation or redness develops, seek medical attention. Wash contaminated clothing before reuse.

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; however, if swallowed and symptoms develop, seek medical attention.

Most important symptoms and effects, both acute and delayed: Effects of overexposure may include irritation of the respiratory tract, irritation of the digestive tract, headaches, coughing, runny nose, vomiting, diarrhea, shortness of breath, abdominal pain and chest pain.

Notes to Physician: 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. Amyl nitrite inhalers (found in the cyanide antidote kit) can be used for 30 seconds every minute until an I.V line is established. 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.

Other Comments: 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.

SECTION 5: Firefighting measures

NFPA 704 Hazard Class

Health: 2 Flammability: 1 Instability: 0



0 (Minimal)
1 (Slight)
2 (Moderate)
3 (Serious)
4 (Severe)

Extinguishing Media: Dry chemical, carbon dioxide, foam, water spray, sand or earth is recommended. Carbon dioxide can displace oxygen. Use caution when applying carbon dioxide in confined spaces.

Specific hazards arising from the chemical

Unusual Fire & Explosion Hazards: Avoid generating dust; fine dust dispersed in air in sufficient concentrations, and in the presence of an ignition source is a potential dust explosion hazard. Flash point varies depending on the impurities present in the product. Sulfur burns easily in air when ignited by flame or excess heat. Solid material may burn, but will not ignite readily. Dust may form an explosive mixture with air. Sulfur can form explosive mixtures with oxidizers (see Section 10). 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.

Hazardous Combustion Products: Combustion may yield oxides of sulfur. (See Section 10)

Special protective actions for firefighters: 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 the hazard area and deny entry to unnecessary and unprotected personnel. Contain spill if it can be done safely. Move undamaged containers from immediate hazard area if it can be done safely. Cool equipment exposed to fire with water, if it can be done safely.

See Section 9 for Flammable Properties including Flash Point and Flammable (Explosive) Limits

SECTION 6: Accidental release measures

Personal precautions, protective equipment and emergency procedures: This material may burn, but will not ignite readily. Keep all sources of ignition away from spill/release. Avoid creating dust. 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: Contain spill 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 material for containment and cleaning up: Notify relevant authorities in accordance with all applicable regulations. Clean up spills in a manner that does not disperse dust into air. Use non-sparking tools and equipment. Reduce airborne dust and prevent scattering by moistening with water. 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. See Section 13 for information on appropriate disposal.

SECTION 7: Handling and storage

Precautions for safe handling: May contain or release dangerous levels of hydrogen sulfide. 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. Cleaning methods (e.g. compressed air) which can generate potentially combustible dust clouds should not be used. Wear protective gloves/protective clothing/eye protection/face protection. 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.

Conditions for safe 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. Soil Sulfur bulk storage bins and handling equipment should have large openings to minimize bridging. Bin walls should be designed to carry the loading of the material. Steel and concrete are suitable materials of construction if properly coated.

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 area away from heat and all sources of ignition. Store only in approved containers. Keep away from any incompatible material (see Section 10). Protect container(s) against physical damage.

SECTION 8: Exposure controls/personal protection

Chemical Name	ACGIH	OSHA	Other
Sulfur	TWA:10 mg/m ³ TWA-Total 3 mg/m ³ -Resp. as Nuisance Dust, If Generated	TWA: 15 mg/m ³ -Total TWA: 5 mg/m ³ -Resp. as Nuisance Dust, If Generated	---
Hydrogen sulfide	STEL: 5 ppm TWA: 1 ppm	Ceiling: 20 ppm	TWA: 5 ppm 8hr TWA: 2.5 ppm 12hr STEL: 15 ppm (Phillips 66 Guidelines)

Note: 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.

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 (such as exhaust ducts, dust collectors, vessels, and processing equipment) are designed in a manner to prevent the escape of dust into enclosed work areas (i.e., there is no leakage from the equipment).

Eye/Face Protection: The use of eye protection that meets or exceeds ANSI Z.87.1 is recommended to protect against potential eye contact, irritation, or injury. Depending on conditions of use, a face shield may be necessary.

Skin/Hand Protection: 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. Depending on exposure and use conditions, additional protection may be necessary to prevent skin contact including use of items such as chemical resistant boots, aprons, arm covers, hoods, coveralls, or encapsulated suits. Suggested protective materials: Nitrile

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.

Other Protective Equipment: Eye wash and quick-drench shower facilities should be available in the work area. Thoroughly clean shoes and wash contaminated clothing before reuse.

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.

SECTION 9: Physical and chemical properties

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.

Appearance: Bright yellow

Physical Form: Solid

Odor: Rotten egg / sulfurous

Odor Threshold: No data

pH: Not applicable

Vapor Density (air=1): >1

Upper Explosive Limits (vol % in air): 1400 g/m³

Lower Explosive Limits (vol % in air): 35 g/m³

Evaporation Rate (nBuAc=1): No data

Particle Size: Not applicable

Percent Volatile: No data

Flammability (solid, gas): May Ignite

Flash Point: 405 °F / 207 °C

Test Method: Cleveland Open Cup (COC), ASTM D92

Initial Boiling Point/Range: 832 °F / 444 °C

Vapor Pressure: 1mm Hg @ 363°F / 184°C

Partition Coefficient (n-octanol/water) (Kow): No data

Melting/Freezing Point: 246 °F / 119 °C

Auto-ignition Temperature: 450 °F / 232 °C

Decomposition Temperature: No data

Specific Gravity (water=1): 1.80 @ 68°F (20°C)

Bulk Density: 15 lbs/gal

Viscosity: No data

Solubility in Water: Insoluble

SECTION 10: Stability and reactivity

Reactivity: Stable under normal ambient and anticipated conditions of use.

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

Possibility of hazardous reactions: Hazardous reactions not anticipated.

Conditions to avoid: Avoid all possible sources of ignition. Avoid high levels of airborne dust. Avoid heating above flashpoint.

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: Not anticipated under normal conditions of use.

SECTION 11: Toxicological information

Information on Toxicological Effects

Substance / Mixture

Acute Toxicity	Hazard	Additional Information	LC50/LD50 Data
Inhalation	Unlikely to be harmful	May contain or release poisonous hydrogen sulfide gas - see Other Comments.	>9 mg/L (dust)
Dermal	Unlikely to be harmful		> 2g/kg
Oral	Unlikely to be harmful		> 8.4 g/kg

Aspiration Hazard: Not applicable

Skin Corrosion/Irritation: Causes skin irritation.

Serious Eye Damage/Irritation: Causes mild eye irritation.

Skin Sensitization: Not expected to be a skin sensitizer. Allergic skin responses after repeated contact with sulfur have been reported but are not common.

Respiratory Sensitization: No information available.

Specific Target Organ Toxicity (Single Exposure): Not expected to cause organ effects from single exposure.

Specific Target Organ Toxicity (Repeated Exposure): Not known to cause organ damage.

Carcinogenicity: Not expected to cause cancer.

Germ Cell Mutagenicity: Not expected to cause heritable genetic effects.

Reproductive Toxicity: No information available.

Other Comments: 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

GHS Classification:
No classified hazards

Toxicity: 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.

Persistence and Degradability: 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: Sulfur is not expected to have bioaccumulation or food chain contamination potential.

Mobility in Soil: 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.

Other adverse effects: None anticipated.

SECTION 13: Disposal considerations

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.

SECTION 14: Transport information

U.S. Department of Transportation (DOT)

UN Number: NA1350

UN proper shipping name: Sulfur

Transport hazard class(es): 9

Packing Group: III

Environmental Hazards: This product does not meet the DOT/UN/IMDG/IMO criteria of a marine pollutant

Special precautions for user: *Solid sulfur is not regulated if transported in non-bulk packaging or if formed to a specific shape, such as prills, granules, pellets, pastilles, or flakes. [49CFR 172.102, Special Provision 30]*

Alternative shipping description may be:

UN1350, Sulfur, 4.1, III

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code: Not applicable

SECTION 15: Regulatory information

CERCLA/SARA - Section 302 Extremely Hazardous Substances and TPQs (in pounds):

This material contains the following chemicals subject to the reporting requirements of SARA 302 and 40 CFR 372:

Chemical Name	TPQ	EPCRA RQ
Hydrogen sulfide	500 lb	100 lb

CERCLA/SARA - Section 311/312 (Title III Hazard Categories)

Acute Health Hazard: Yes
Chronic Health Hazard: No
Fire Hazard: No
Pressure Hazard: No
Reactive Hazard: No

CERCLA/SARA - Section 313 and 40 CFR 372:

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

EPA (CERCLA) Reportable Quantity (in pounds):

This material does not contain any chemicals with CERCLA Reportable Quantities.

California Proposition 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.

International Hazard Classification

Canada:

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the SDS contains all the information required by the Regulations.

International Inventories

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

All components are either on the DSL, or are exempt from DSL listing requirements.

U.S. Export Control Classification Number: EAR99

SECTION 16: Other information

Issue Date:	Previous Issue Date:	SDS Number	Status:
07-Jan-2016	31-Jan-2013	002074	FINAL

Revised Sections or Basis for Revision:

Periodic review and update; Regulatory information (Section 15)

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; INSHT = 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)

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