

Sulfur (Solid or Molten)

SECTION 1. IDENTIFICATION

Product Identifier	Sulfur (Solid or Molten)
Other Means of Identification	Sulphur (Solid), Sulphur (Molten), Brimstone
Product Family	Petroleum Residue
Recommended Use	Raw material for the manufacture of sulphuric acid, fertilizers, rubber vulcanization, and other chemical processes.
Restrictions on Use	Not recommended for uses other than those listed, or for non-industrial purposes.
Manufacturer/Supplier Identifier	Keyera and Affiliates Suite 200, The Ampersand, West Tower 144 - 4th Avenue SW Calgary, Alberta T2P 3N4
Main Phone No.	(403) 205-8300 / 1 (888) 699-4853 (Mon. - Fri. 8 AM - 5 PM)
Transportation Emergencies Only	CANUTEC (CAN), Ph.: 1-888-CAN-UTEC (226-8832) Cell: *666, (24 hr) CHEMTREC (US), 1-800-424-9300, (24 hr)

SECTION 2. HAZARD IDENTIFICATION

Classification

Flammable liquid - Category 1; Combustible dust - Category 1; Skin corrosion - Category 1

Label Elements



Signal Word:
Danger

Hazard Statement(s):

Flammable solid.
Combustible liquid.
Causes severe skin burns and eye damage.
May ignite and burn at elevated temperatures.
May be corrosive to metals.
Harmful if inhaled.

Precautionary Statement(s):

Do not handle until all safety precautions have been read and understood.
Avoid breathing dust/fume/gas/mist/vapours/spray.
Do not get in eyes, on skin, or on clothing.
Wash hands and skin thoroughly after handling.
Do not eat, drink or smoke when using this product.
Wear protective Sulfur (Solid or Molten)

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Response:

- IF SWALLOWED: Immediately call a POISON CENTRE or doctor.
- IF ON SKIN: Immerse in cool water or wrap in wet bandages. Take off contaminated clothing and wash it before reuse.
- IF INHALED: If breathing is difficult, remove person to fresh air and keep comfortable for breathing.
- IF INHALED: Call a POISON CENTRE or doctor if you feel unwell.
- IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

Storage:

- Store in a well-ventilated place. Keep container tightly closed.
- Store in accordance with local, regional, national and international regulations.

Disposal:

- Dispose of contents and container in accordance with local, regional, national and international regulations.

Other Hazards

- Molten material may contain dangerous levels of hydrogen sulfide and sulfur dioxide.
- Contact with hot product will cause thermal burns.

CONTAINS HYDROGEN SULFIDE. Product may contain significant quantities of dissolved hydrogen sulfide gas. H₂S has a broad range of effects dependent on the airborne concentration and length of exposure: 0.02 ppm odor threshold, smell of rotten eggs; 10 ppm eye and respiratory tract irritation; 100 ppm coughing, headache, dizziness, nausea, eye irritation, loss of sense of smell in minutes; 200 ppm potential for pulmonary edema after >20-30 minutes; 500 ppm loss of consciousness after short exposures, potential for respiratory arrest; >1000 ppm immediate loss of consciousness, may lead rapidly to death, prompt cardiopulmonary resuscitation may be required. Do not depend on sense of smell for warning. H₂S causes rapid olfactory fatigue (deadens sense of smell). There is no evidence that H₂S will accumulate in the body tissue after repeated exposure.

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

Chemical Name	CAS No.	%	Other Identifiers
Sulfur (Solid or Molten)	7704-34-9	99.9+	Brimstone
Hydrogen Sulfide	7783-06-4	0 -0.1	Sulphur hydride, acid gas
Sulfur dioxide	7446-09-5	0 - 0.1	Not available

Notes

- Concentrations are expressed in % weight/weight.
- May contain traces of hydrogen sulfide and/or sulfur dioxide.

SECTION 4. FIRST-AID MEASURES

First-aid Measures

Inhalation

- CONTAINS HYDROGEN SULFIDE. In case of oxygen deficiency: take precautions to ensure your own safety before attempting a rescue (e.g. wear appropriate protective equipment). Move to fresh air. Do NOT perform rescue breathing if the victim inhaled or ingested the material; induce artificial respiration with a respiratory medical device. Obtain medical attention immediately.

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Skin Contact

Take off immediately contaminated clothing, shoes and leather goods (e.g. watchbands, belts). Wash off immediately with plenty of water for at least 15 minutes. If persistent irritation occurs, obtain medical attention. If in contact with molten material, flush area with lukewarm water immediately. Do NOT attempt to pull off clothing or solidified material from the skin! Obtain medical attention immediately.

Eye Contact

If irritation or redness develops from exposure, flush eyes with clean water. If persistent irritation occurs, obtain medical attention.

For contact with hot material:

Gently open eyelids and flush affected eye(s) with cold (not icy) water. Seek medical attention immediately.

For contact with cold material:

Immediately flush the contaminated eye(s) with lukewarm, gently flowing water for 15-20 minutes, while holding the eyelid(s) open. If eye irritation persists, get medical advice or attention.

Ingestion

Not a likely route of exposure. Rinse mouth with water. Obtain medical attention.

Most Important Symptoms and Effects, Acute and Delayed

CONTAINS HYDROGEN SULPHIDE. Hydrogen sulfide is extremely toxic. H₂S has a broad range of effects dependent on the airborne concentration and length of exposure: 0.02 ppm odour threshold, smell of rotten eggs; 10 ppm eye and respiratory tract irritation; 100 ppm coughing, headache, dizziness, nausea, eye irritation, loss of sense of smell in minutes, 200 ppm potential for pulmonary edema after >20-30 minutes; 500 ppm loss of consciousness after short exposures, potential for respiratory arrest; >1000 ppm immediate loss of consciousness, may lead rapidly to death, prompt cardiopulmonary resuscitation may be required. Do NOT depend on sense of smell for warning. H₂S causes rapid olfactory fatigue (deadens sense of smell). There is no evidence that H₂S will accumulate in the body tissue after repeated exposure.

Contact with molten material:

Will burn the skin. Permanent scarring may result.

Immediate Medical Attention and Special Treatment

Special Instructions

Treat symptomatically. Hydrogen sulfide (H₂S) - CNS asphyxiant. May cause rhinitis, bronchitis, and occasionally pulmonary edema after severe exposure. Consider oxygen therapy. Consult a Poison Control Centre for guidance.

SECTION 5. FIRE-FIGHTING MEASURES

Extinguishing Media

Suitable Extinguishing Media

Carbon dioxide, dry chemical powder, appropriate foam, water spray or fog. Sand (smothering agent).

Unsuitable Extinguishing Media

None known.

Specific Hazards Arising from the Product

Molten material can cause severe thermal burns upon contact.

CONTAINS HYDROGEN SULFIDE : TOXIC BY INHALATION.

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Special Protective Equipment and Precautions for Fire-fighters

Fight fire from a safe distance or a protected location. For a massive fire, immediately evacuate the area and use unmanned hose holder or monitor nozzles. Wear full protective clothing and self-contained breathing apparatus. Chemical protective clothing (e.g. chemical splash suit) and positive pressure SCBA may be necessary.

SECTION 6. ACCIDENTAL RELEASE MEASURES

Personal Precautions, Protective Equipment, and Emergency Procedures

Evacuate the area immediately. Isolate the hazard area. Keep out unnecessary and unprotected personnel. Use the personal protective equipment recommended in Section 8 of this safety data sheet. Eliminate all ignition sources. Use grounded, explosion-proof equipment. Remove or isolate incompatible materials as well as other hazardous materials.

Environmental Precautions

It is good practice to prevent releases into the environment. Do not allow into any sewer, on the ground or into any waterway. If the spill is inside a building, prevent product from entering drains, ventilation systems and confined areas.

Methods and Materials for Containment and Cleaning Up

Stop or reduce leak if safe to do so. Do not use absorbents. Contain spill using noncombustible material such as vermiculite, earth or sand. Do NOT use combustible materials such as sawdust. Place used absorbent into suitable, covered, labelled containers for disposal. Avoid generating dust. Avoid dry sweeping. If necessary, use a dust suppressant such as water. Do not use compressed air for clean-up. Use water fog or spray curtain to reduce amount of dust in air.

SECTION 7. HANDLING AND STORAGE

Precautions for Safe Handling

Solid Sulfur does not represent significant hazards. Avoid generating dusts. Eliminate heat and ignition sources such as sparks, open flames, hot surfaces and static discharge. Post "No Smoking" signs. Do not use near welding operations or other high energy sources. Do not weld, cut or perform hot work on empty container until all traces of product have been removed. Good housekeeping is extremely important. Prevent dust accumulation on ALL surfaces including ceiling rafters and other hidden surfaces. Prevent accidental contact with incompatible chemicals. Adequate ventilation is required when working in areas containing or when handling molten Sulfur. Molten Sulfur should not be put into any tank, rail car, or truck trailer that contains trace quantities of hydrocarbons, or more than trace amounts of moisture. This material may contain or release poisonous hydrogen sulfide gas.

Thoroughly clean clothing, shoes and leather goods before reuse or dispose of safely. Launder clothes before re-wearing. Inform laundry personnel of product hazard(s). Properly dispose of any contaminated items, including shoes, that cannot be decontaminated. DO NOT re-use.

Conditions for Safe Storage

Molten Sulfur storage and loading/unloading temperature range is 127°C to 150°C (260°F to 300°F). Store in a well ventilated area away from all sources of ignition. Avoid storage in confined spaces or near incompatible materials, oxidizers, or materials that support combustion. Protect from conditions listed in Conditions to Avoid in Section 10 (Stability and Reactivity).

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SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Control Parameters	ACGIH TLV®		OSHA PEL		AIHA WEEL	
	TWA	STEL	TWA	Ceiling	8-hr TWA	TWA
Sulfur (Solid or Molten)			10 mg/m ³			
Hydrogen Sulfide	1 ppm	5 ppm		20 ppm		
Sulfur dioxide	2 ppm	5 ppm				

Appropriate Engineering Controls

Do not allow product to accumulate in the air in work or storage areas, or in confined spaces. Use local exhaust ventilation, if general ventilation is not adequate to control amount in the air. If current ventilation practices are not adequate to maintain airborne concentrations below the established exposure limits, additional engineering controls may be required.

Individual Protection Measures

Eye/Face Protection

When working with molten Sulfur:

Wear chemical safety goggles and face shield when contact is possible.

Skin Protection

The use of insulated gloves impervious to the 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 the use of items such as chemical resistant boots, aprons, arm covers, hoods, coveralls, or encapsulated suits.

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 is not detected, a NIOSH certified air purifying respirator equipped with R or P95 filters may be used.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Basic Physical and Chemical Properties

Appearance	Yellow solid.
Odour	Slight hydrocarbon, possibly faint rotten egg smell
Odour Threshold	0.005 - 0.01 ppm (Hydrogen Sulfide)
Melting Point/Freezing Point	121.7 °C (melting); Not available (freezing)
Boiling point/Initial boiling point	444.6 °C
Flash Point	188 °C (closed cup)
Evaporation Rate	Not applicable
Flammability (solid, gas)	Flammable solid.
Upper/Lower Flammability or Explosive Limit	Not available (upper); Not available (lower)
Vapour Pressure	Not available
Vapour Density (air = 1)	Not applicable
Relative Density (water = 1)	1.80 at 120°C (as liquid sulphur)

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Solubility	Insoluble in water; Soluble in aromatic hydrocarbons (e.g. toluene).
Partition Coefficient, n-Octanol/Water (Log Kow)	Not available
Auto-ignition Temperature	190 °C
Decomposition Temperature	Not available
Viscosity	Not available (kinematic)
Other Information	
Physical State	Solid
Molecular Formula	S, S8
Molecular Weight	32 g/mol as S, 256.5 as S8
Surface Tension	60.8 dynes/cm at 120°C (as liquid sulphur)

SECTION 10. STABILITY AND REACTIVITY

Reactivity

Not reactive under normal conditions of use.

Chemical Stability

Unstable under certain conditions - see Conditions to Avoid.

Possibility of Hazardous Reactions

Contact with incompatible materials may cause fire, excessive heat generation, uncontrolled reaction, release of toxic products and/or explosion.

Conditions to Avoid

High temperatures. Open flames, sparks, static discharge, heat and other ignition sources. Generation of dust. Prolonged contact with water, moisture or humidity.

Incompatible Materials

Reacts with: chlorates, nitrates, oxidizing agents (e.g. peroxides), carbides, halogens (e.g. chlorine), phosphorus, heavy metals.

Corrosive to: carbon steel, iron, steel, and other metals.

Hazardous Decomposition Products

Sulfur burns to sulfur dioxide. Sulfur reactions with hydrocarbons and other organic materials may produce hydrogen sulfide and carbon disulfide. Other possible toxic reactions or decomposition products are highly dependent on the incompatible material.

SECTION 11. TOXICOLOGICAL INFORMATION

Likely Routes of Exposure

Inhalation; skin contact; eye contact; ingestion.

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Acute Toxicity

Sulfur (Solid or Molten)	>9.23 mg/L (rat) (4-hour exposure)	>3000 mg/kg (rat)	>2000 mg/kg (rabbit)
Hydrogen Sulfide	444 ppm (rat) (4-hour exposure)	Not available	Not available
Sulfur dioxide		2520 ppm (rat) (1-hour exposure)	Not available

Skin Corrosion/Irritation

Human experience shows mild irritation. Elevated temperature material can cause severe burns.

Serious Eye Damage/Irritation

Human experience shows mild irritation. May be irritating to eyes. Symptoms may include redness, swelling, pain, tearing, and blurred or hazy vision.

STOT (Specific Target Organ Toxicity) - Single Exposure

Inhalation

May cause nose and throat irritation.

Skin Absorption

Hot material can cause severe burns.

Ingestion

Large doses (15 grams) by mouth may lead to hydrogen sulphide production in the body, chiefly due to bacterial action within the colon.

Aspiration Hazard

Not known to be an aspiration hazard.

STOT (Specific Target Organ Toxicity) - Repeated Exposure

Prolonged inhalation of dust over several years may cause respiratory complications such as asthma and inflammation of the frontal and maxillary sinuses, and may cause respiratory diseases like emphysema and bronchiectasis.

Respiratory and/or Skin Sensitization

Not known to be a respiratory sensitizer. Not known to be a skin sensitizer.

Carcinogenicity

Not specifically listed.

Reproductive Toxicity

Development of Offspring

Not hazardous according to OSHA/WHMIS criteria.

Sexual Function and Fertility

Not hazardous according to OSHA/WHMIS criteria.

Effects on or via Lactation

No information was located.

Germ Cell Mutagenicity

Not hazardous according to OSHA/WHMIS criteria.

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Interactive Effects

None known.

SECTION 12. ECOLOGICAL INFORMATION

Ecotoxicity

No information was located.

Persistence and Degradability

No ingredient of this product or its degradation products is known to be highly persistent.

Bioaccumulative Potential

This product and its degradation products are not likely to bioaccumulate.

Mobility in Soil

If released into the environment, this product is not expected to move through the soil, based on physical and chemical properties.

Other Adverse Effects

There is no information available.

SECTION 13. DISPOSAL CONSIDERATIONS

Disposal Methods

Disposal should be in accordance with applicable regional, national, and local laws and regulations. Local regulations may be more stringent than regional or national requirements and must be complied with.

SECTION 14. TRANSPORT INFORMATION

Regulation	UN No.	Proper Shipping Name	Transport Hazard Class(es)	Packing Group
Canadian TDG	1350	SULPHUR, or SULFUR	4.1	III
US DOT	1350	SULPHUR, or SULFUR	4.1	III
Canadian TDG	2448	MOLTEN SULFUR; MOLTEN SULPHUR; SULFUR, MOLTEN; or SULPHUR, MOLTEN	4.1	III
US DOT	2448	MOLTEN SULFUR; MOLTEN SULPHUR; SULFUR, MOLTEN; or SULPHUR, MOLTEN	4.1	III

Environmental Hazards

Environmentally Hazardous Substance

Special Precautions

Please note: CONTAINS HYDROGEN SULFIDE : May evolve hazardous levels of H2S in headspace volumes of closed tanks and vessels. TOXIC BY INHALATION.

Transport in Bulk according to International Maritime Organization Instruments

Not applicable

Emergency Response Guide No.

GUIDE 133

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SECTION 15. REGULATORY INFORMATION

Safety, Health and Environmental Regulations

This section is not required by WHMIS.

SECTION 16. OTHER INFORMATION

NFPA Rating **Health - Not assig** | **Flammability - 1** **Instability - 0**

SDS Prepared By Bureau Veritas Canada
Phone No. 1-800-386-7247

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Revision Indicators All sections revised form original Keyera SDS last revision date of August 31, 2015.

Key to Abbreviations ACGIH® = American Conference of Governmental Industrial Hygienists
 OSHA = US Occupational Safety and Health Administration
 RTECS® = Registry of Toxic Effects of Chemical Substances

References CHEMINFO database. Canadian Centre for Occupational Health and Safety (CCOHS).
 Registry of Toxic Effects of Chemical Substances (RTECS®) database. Dassault
 Systèmes/BIOVIA ("BIOVIA"). Available from Canadian Centre for Occupational Health and
 Safety (CCOHS).

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