



Hangzhou Tianlong Biotechnology Co., Ltd.
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MATERIAL SAFETY DATA SHEET

1. Chemical Product and company Identification

Product Name: Sulphur

Molecular Formula: S₈

Molecular Weight: 256.48

Chemical Name: Sulphur

CAS No.: 7704-34-9

Supplier: HANZHOU TIANLONG BIOTECHNOLOGY CO., LTD

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2. Composition / Information on Ingredients

Composition	CAS No.	Content %
Sulphur	7704-34-9	99.0
Other ingredients		1.0

3. Hazards Summarizing

Emergency overview: Sulfur is relatively non-toxic and poses little immediate health hazard to the environment or emergency response personnel unless it is involved in a fire. Both solid and liquid sulfur are combustible and generate large quantities of toxic and irritating sulfur dioxide gas on burning. Molten sulfur is hot enough to cause serious thermal burns to unprotected skin. Wear full protective clothing and positive pressure self-contained breathing apparatus in emergency situations involving burning sulfur.

Potential Health Effects: Sulfur is relatively non-toxic to humans, causing only mild local irritation to the eyes, nose, throat and upper airways. However, under certain circumstances it may release toxic hydrogen sulfide and/or sulfur dioxide gas. Sulfur is not listed as a carcinogen by OSHA, NTP, IARC or ACGIH.

Potential Environmental Effects: This product has the potential to pose ecological risks to organisms in both aquatic and terrestrial environments. Discharge of the product to soil and water should be prevented.

4. First Aid Measures

Eye Contact: Do not allow victim to rub eye(s). Let the eye(s) water naturally for a few minutes. If particle/dust does not dislodge, flush with lukewarm, gently flowing water for 5 minutes or until particle/dust is removed, while holding eyelid(s) open. If irritation persists, immediately

obtain medical attention. Do not attempt to manually remove anything stuck to the eye.

Skin Contact: Dry sulfur: No health effects expected. If irritation does occur, flush with lukewarm, gently flowing water for 5 minutes. If irritation persists, obtain medical advice. Molten sulfur: Flush contact area to solidify and cool but do not attempt to remove encrusted material or clothing. Cover burns and seek medical attention immediately.

Inhalation: Remove source of contamination or move victim from exposure area to fresh air immediately. Obtain medical advice. If breathing has stopped, trained personnel should begin artificial respiration. If the heart has stopped, immediately start cardiopulmonary resuscitation (CPR), or automated external defibrillation (AED). If either of the above adverse circumstances occur, quickly transport victim to an emergency care facility.

Ingestion: If swallowed, no specific intervention is indicated as this material is not likely to be hazardous by ingestion. However, if irritation or discomfort occurs, obtain medical advice.

5. Fire-Fighting Measures

Fire and Explosion Hazards: Both molten and solid forms are combustible and will ignite at high temperatures (200°C), burning with a pale blue flame that may be difficult to see in daylight. Sulfur dust suspended in air ignites easily and can cause explosions in confined spaces. Sulfur dust clouds can be ignited by friction, static electricity, heat, sparks or flames. Traces of hydrogen sulfide and sulfur vapor may present an explosion hazard if evolved into a confined space or enclosed space, particularly from molten sulfur. The LEL of hydrogen sulfide (4.3% by volume in air) may be exceeded in enclosed spaces above molten sulfur.

Extinguishing Media: Use water spray, fog or foam. Do not use direct water streams. Sand, dry chemical or fine earth/finely crushed stone may be used for small fires. Steam or inert gases are excellent extinguishers for use in containers that can be tightly closed.

Fire Fighting: Toxic fumes of sulfur dioxide will result from combustion. Fire fighters must be fully-trained and wear full protective clothing including an approved, self-contained breathing apparatus which supplies a positive air pressure within a full face-piece mask. Do not spray water directly into containers of molten sulfur due to the danger of boil over. Also avoid spraying direct streams of water that may scatter burning sulfur and spread the fire or create sulfur dust clouds and cause an explosion. Evacuate non-essential personnel from the fire area immediately. For large fires, consider evacuation of an area downwind of fire if necessary. Fire will rekindle until mass has been cooled to below approximately 150°C. Cool surrounding area and containers until well after the fire is out to prevent re-ignition.

6. Accidental Release Measures

Procedures for Cleanup: Control source of spillage if possible to do so

safely. Contain spill, isolate area, and deny entry to unauthorized personnel. Remove ignition sources. Ventilate area. Clean up spilled material immediately, observing precautions in Section 8, Personal Protection and using methods which will minimize dust generation (e.g., dampen material and shovel or wet sweep using natural fibre brooms and aluminum shovels to prevent sparks). Prevent spread of liquid by diking or ditching and allowing material to cool and solidify. Return uncontaminated spilled material to the process if possible. Place contaminated material in suitable labeled containers for later recovery or disposal. Treat or dispose of waste material in accordance with all local, regional, and national requirements. If molten sulfur is accidentally released into a confined or enclosed space, monitor for hydrogen sulfide and sulfur dioxide build-up in the vapor space above the spill.

Personal Precautions: Protective clothing, gloves, and an acid gas/particulate respirator are recommended for persons responding to an accidental release. Close-fitting safety goggles may also be necessary in some circumstances to prevent eye contact with sulfur dust.

Environmental Precautions: This product has the potential to pose ecological risks to organisms in both aquatic and terrestrial environments. Discharge of the product to soil and water should be prevented. Prevent spillage from entering sewers or natural watercourses.

7. Handling and Storage

Keep container closed and store in a dry, cool, covered, and well-ventilated area, away from flammable materials, sources of ignition and oxidizing agents. Hydrogen sulfide gas may accumulate in storage tanks and bulk transport compartments containing this material, particularly when molten, so always exercise caution when working around or opening bulk containers. Closed tanks or pits should be vented to the atmosphere using steam jacketed vent lines. Head space above molten sulfur may contain high concentrations of hydrogen sulfide or sulfur dioxide in the toxic and explosive range. Ventilate thoroughly before permitting entry. Avoid generating dust and the release of dust into the workplace as this creates a potential explosion hazard. Since dry sulfur may accumulate static charge build-up, which could become an ignition source, transfer using proper grounding procedures. See the latest edition of NFPA Standard 655 – Prevention of Sulfur Fires and Explosions for specific guidance on dust explosion prevention.

Precautions should be taken to minimize skin and eye contact with material. High standards of personal hygiene are necessary. Refrain from eating, drinking, or smoking in work areas. Thoroughly wash hands before eating, drinking, or smoking in appropriate designated areas.

8. Exposure Controls/Personal Protection

Protective Clothing: Gloves and coveralls, shop coat or other work clothing with long sleeves are recommended to prevent direct skin contact, particularly when handling molten sulfur. Eye protection should be worn

where fume or dust is generated. Chemical splash goggles and full face shield should be worn where any possibility exists that eye contact with liquid sulfur may occur. Respiratory protection may be required where fume or dust is generated. Workers should wear insulated gloves and heat- and chemical-resistant clothing when handling hot molten sulfur. Safety type boots are recommended.

Ventilation: Use adequate local or general ventilation to maintain the concentration of sulfur dioxide and hydrogen sulfide in the working environment well below recommended occupational exposure limits. Use a non-sparking, grounded ventilation system separate from other exhaust ventilation systems. Locate dust collectors outdoors if possible and provide dust collectors with explosion vents. Supply sufficient replacement air to make up for air removed by the exhaust system. Ventilation systems may need to be designed using steam tracing or other means to prevent plugging with sublimed sulfur.

Respiratory Protection: Where dust or sulfur dioxide are generated and cannot be controlled to within acceptable levels, use appropriate NIOSH-approved respiratory protection equipment (a combination of a 42CFR84 Class N, R or P-95 or 100 particulate filter and an acid gas cartridge). Where hydrogen sulfide is present or possibly present in confined spaces at hazardous levels a NIOSH-approved supplied air respirator or self-contained breathing apparatus (SCBA) is necessary.

9. Physical and Chemical Properties

Appearance: yellow or light yellow solid or liquid

Specific gravity: solid: 2.07

Melting Point: 112.8-119.3°C.

Boiling point: 444.6°C

Vapour Density: >1

Vapour Pressure (mm Hg at 20°C): solid, less than 0.0001 mm Hg

Solubility: Insoluble in water a little soluble in alcohol and aether.

Dissolve in CS₂, CCl₄ and benzene easily.

10. Stability and Reactivity

Stability and Reactivity: Sulfur is considered stable under normal temperatures and pressures. Hazardous polymerization or runaway reactions will not occur.

Incompatibilities: Oxidizing agents, alkali metals, hydrogen, chlorine, fluorine. Sulfur may form explosive mixtures with powerful oxidizing agents such as chlorates, perchlorates and/or nitrates. Damp sulfur may be corrosive to steel.

Hazardous Decomposition Products: Excessive heat may liberate sulfur dioxide and/or hydrogen sulfide under certain chemical conditions.

11. Toxicological Information

General: Sulfur itself is essentially non-toxic. Molten sulfur is a hazardous

material because of its high temperature (>122°C). Under certain conditions both heated and dry sulfur may evolve toxic hydrogen sulfide and sulfur dioxide gases. At increasing concentration levels, these gases can cause eye and respiratory irritation. Breathing failure, unconsciousness and death may result from exposure to high concentrations of hydrogen sulfide, without any warning odor being sensed.

Acute:

Skin/Eye: Molten: Skin contact with molten material will cause thermal burns. Molten sulfur in the eye will cause burns and permanent damage. Exposure to sulfur vapors may be irritating to the eyes. Dry: Eye contact with dusts may be irritating.

Inhalation: Dusts may be irritating to the throat and lungs. Inhalation of low levels of vapors containing hydrogen sulfide or sulfur dioxide can produce respiratory tract irritation characterized by sneezing, coughing, sore throat and chest pain. At increasing concentrations exposure to hydrogen sulfide and sulfur dioxide can result in pulmonary edema, dizziness, nausea, respiratory paralysis, unconsciousness and death. Asthmatics may be more susceptible to sulfur dioxide exposures.

Ingestion: Ingestion of dry sulfur may cause irritation of the mouth and sore throat.

Chronic: Repeated or prolonged contact with dry sulfur powder may be irritating to the eyes and skin in some individuals, leading to dermatitis, eczema, skin ulcers, and allergic reactions. Repeated inhalation exposure to dust may cause bronchitis and irritation to mucous membranes and the respiratory tract. Prolonged exposure to low levels of sulfur dioxide has produced respiratory problems in animals. Sulfur is not considered a human carcinogen by the Occupational Safety and Health Administration (OSHA), the National Toxicology Program (NTP), the American Conference of Governmental Industrial Hygienists (ACGIH) or the International Agency for Research on Cancer (IARC).

12. Ecological Information

There is minimal immediate ecological risk from spills of this product. However, over long-term exposure under aerobic conditions, sulfur can oxidize, yielding acidic runoff (water) or acidic conditions in soils; the oxidized form, due to its acid nature, has the potential to adversely affect aquatic and terrestrial organisms. In addition, under anaerobic conditions, elemental sulfur can be biochemically reduced to forms such as sulfide ion or hydrogen sulfide, which also have the potential to pose ecological risks.

13. Disposal Considerations

If material cannot be returned to process or salvage, dispose of in accordance with applicable regulations.

14. Transport Information

Class: 4.1

UN No: 2448

Packaging Group III

15. Regulatory Information

Safety Phrases: Keep out of reach of children

Keep away from food, drink and animal feeding stuff

Do not breathe spray

When using do not eat, drink or smoke

In case of contact with eyes, rinse immediately with plenty of water and seek medical advice

In case of accident or if you feel unwell, seek medical advice immediately (Show the label where possible)

Use appropriate containment to avoid environmental contamination

16. Other Information

All information and instructions provided in this Material Safety Data Sheet (MSDS) are based on the current state of scientific and technical knowledge at the date indicated on the present MSDS and are presented in good faith and believed to be correct. This information applies to the product as such. In case of new formulations or mixes, it is necessary to ascertain that a new danger will not appear. It is the responsibility of persons on receipt of this MSDS to ensure that the information contained herein is properly read and understood by all people who may use, handle, dispose or in any way come in contact with the product. If the recipient subsequently produce formulations containing this product, it is the recipients sole responsibility to ensure the transfer of all relevant information from this MSDS to their own MSDS.