

SECTION 1: Product and company identification

1.1. Product identifier

Product form : Substance
 Substance name : Phosphine
 CAS-No. : 7803-51-2
 Formula : PH₃
 Other means of identification : Hydrogen phosphide, Phosphorous hydride, Phosphorous trihydride, Phosphorated hydrogen

1.2. Relevant identified uses of the substance or mixture and uses advised against

Use of the substance/mixture : Industrial use; Use as directed.

1.3. Details of the supplier of the safety data sheet

Praxair, Inc.
 10 Riverview Drive
 Danbury, CT 06810-6268 - USA
 T 1-800-772-9247 (1-800-PRAXAIR) - F 1-716-879-2146
www.praxair.com

1.4. Emergency telephone number

Emergency number : Onsite Emergency: 1-800-645-4633

CHEMTREC, 24hr/day 7days/week
 — Within USA: 1-800-424-9300, Outside USA: 001-703-527-3887
 (collect calls accepted, Contract 17729)

SECTION 2: Hazard identification

2.1. Classification of the substance or mixture

GHS-US classification

Pyr. Gas H250
 Flam. Gas 1 H220
 Press. Gas (Liq.) H280
 Acute Tox. 1 (Inhalation:gas) H330
 Skin Corr. 1B H314
 Eye Dam. 1 H318
 Aquatic Acute 1 H400

2.2. Label elements

GHS-US labeling

Hazard pictograms (GHS-US) :



Signal word (GHS-US) :

Danger

Hazard statements (GHS-US) :

H220 - EXTREMELY FLAMMABLE GAS
 H250 - **CATCHES FIRE SPONTANEOUSLY IF EXPOSED TO AIR**
 H280 - CONTAINS GAS UNDER PRESSURE; MAY EXPLODE IF HEATED
 H314 - Causes severe skin burns and eye damage
 H330 - FATAL IF INHALED
 H400 - VERY TOXIC TO AQUATIC LIFE
 CGA-HG04 - MAY FORM EXPLOSIVE MIXTURES WITH AIR
 CGA-HG11 - SYMPTOMS MAY BE DELAYED

Precautionary statements (GHS-US) :

P202 - Do not handle until all safety precautions have been read and understood.
 P210 - Keep away from Heat, Open flames, Sparks, Hot surfaces. - No smoking

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- P260 - Do not breathe gas
- P271+P403 - Use and store only outdoors or in a well-ventilated place.
- P273 - Avoid release to the environment.
- P280+P284 - Wear protective gloves, protective clothing, eye protection, respiratory protection, and/or face protection.
- P377 - Leaking gas fire: Do not extinguish, unless leak can be stopped safely.
- P381 - Eliminate all ignition sources if safe to do so.
- P405 - Store locked up.
- P501 - Dispose of contents/container in accordance with container Supplier/owner instructions
- CGA-PG05 - Use a back flow preventive device in the piping.
- CGA-PG17 - Use only with equipment purged with inert gas or evacuated prior to discharge from cylinder.
- CGA-PG20+CGA-PG10 - Use only with equipment of compatible materials of construction and rated for cylinder pressure.
- CGA-PG12 - Do not open valve until connected to equipment prepared for use.
- CGA-PG18 - When returning cylinder, install leak tight valve outlet cap or plug.
- CGA-PG06 - Close valve after each use and when empty.
- CGA-PG02 - Protect from sunlight when ambient temperature exceeds 52°C (125°F).

2.3. Other hazards

Other hazards not contributing to the classification : May ignite spontaneously in contact with air.

2.4. Unknown acute toxicity (GHS US)

No data available

SECTION 3: Composition/Information on ingredients

3.1. Substances

Name	Product identifier	%
Phosphine (Main constituent)	(CAS-No.) 7803-51-2	100

3.2. Mixtures

Not applicable

SECTION 4: First aid measures

4.1. Description of first aid measures

- First-aid measures after inhalation : Remove to fresh air and keep at rest in a position comfortable for breathing. If not breathing, give artificial respiration. If breathing is difficult, trained personnel should give oxygen. Call a physician.
- First-aid measures after skin contact : In case of contact, immediately flush affected areas with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Call a physician. Wash clothing before reuse. Discard contaminated shoes. The liquid may cause frostbite. For exposure to liquid, immediately warm frostbite area with warm water not to exceed 105°F (41°C). Water temperature should be tolerable to normal skin. Maintain skin warming for at least 15 minutes or until normal coloring and sensation have returned to the affected area. In case of massive exposure, remove clothing while showering with warm water. Seek medical evaluation and treatment as soon as possible.
- First-aid measures after eye contact : Immediately flush eyes thoroughly with water for at least 15 minutes. Hold the eyelids open and away from the eyeballs to ensure that all surfaces are flushed thoroughly. Contact an ophthalmologist immediately..
- First-aid measures after ingestion : Ingestion is not considered a potential route of exposure.

4.2. Most important symptoms and effects, both acute and delayed

No additional information available

4.3. Indication of any immediate medical attention and special treatment needed

CONTACT WITH THIS PRODUCT REQUIRES IMMEDIATE MEDICAL ATTENTION! Symptoms may be delayed. Seek medical attention even if no symptoms are present.

SECTION 5: Firefighting measures

5.1. Extinguishing media

Suitable extinguishing media : Carbon dioxide, Dry chemical, Water spray or fog.

5.2. Special hazards arising from the substance or mixture

- Fire hazard : **DANGER! Toxic, flammable, corrosive, liquid and gas under pressure.** . If venting or leaking gas catches fire, do not extinguish flames. Flammable vapors may spread from leak, creating an explosive reignition hazard. Vapors can be ignited by pilot lights, other flames, smoking, sparks, heaters, electrical equipment, static discharge, or other ignition sources at locations distant from product handling point. Explosive atmospheres may linger. Before entering an area, especially a confined area, check the atmosphere with an appropriate device.
- Reactivity : Can form explosive mixtures with air. May ignite spontaneously in contact with air.

5.3. Advice for firefighters

- Firefighting instructions : **DANGER! Toxic, flammable, corrosive, liquid and gas under pressure.**
- Evacuate all personnel from the danger area. Use self-contained breathing apparatus (SCBA) and protective clothing. Immediately cool containers with water from maximum distance. Stop flow of gas if safe to do so, while continuing cooling water spray. Remove ignition sources if safe to do so. Remove containers from area of fire if safe to do so. On-site fire brigades must comply with OSHA 29 CFR 1910.156 and applicable standards under 29 CFR 1910 Subpart L—Fire Protection.
- Special protective equipment for fire fighters : Wear gas tight chemically protective clothing in combination with self contained breathing apparatus. Standard protective clothing and equipment (Self Contained Breathing Apparatus) for fire fighters.
- Other information : Containers are equipped with a pressure relief device. (Exceptions may exist where authorized by DOT.).

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

- General measures : **DANGER! Toxic, flammable, corrosive, liquid and gas under pressure.** . If venting or leaking gas catches fire, do not extinguish flames. Flammable vapors may spread from leak, creating an explosive reignition hazard. Vapors can be ignited by pilot lights, other flames, smoking, sparks, heaters, electrical equipment, static discharge, or other ignition sources at locations distant from product handling point. Explosive atmospheres may linger. Before entering an area, especially a confined area, check the atmosphere with an appropriate device.

6.1.1. For non-emergency personnel

No additional information available

6.1.2. For emergency responders

No additional information available

6.2. Environmental precautions

Try to stop release. Reduce vapor with fog or fine water spray. Prevent waste from contaminating the surrounding environment. Prevent soil and water pollution. Dispose of contents/container in accordance with local/regional/national/international regulations. Contact supplier for any special requirements.

6.3. Methods and material for containment and cleaning up

No additional information available

6.4. Reference to other sections

See also sections 8 and 13.

SECTION 7: Handling and storage

7.1. Precautions for safe handling

Precautions for safe handling

: **DANGER! Toxic, flammable, corrosive, liquid and gas under pressure.**

Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking. Use only non-sparking tools. Use only explosion-proof equipment.

Wear leather safety gloves and safety shoes when handling cylinders. Protect cylinders from physical damage; do not drag, roll, slide or drop. While moving cylinder, always keep in place removable valve cover. Never attempt to lift a cylinder by its cap; the cap is intended solely to protect the valve. When moving cylinders, even for short distances, use a cart (trolley, hand truck, etc.) designed to transport cylinders. Never insert an object (e.g. wrench, screwdriver, pry bar) into cap openings; doing so may damage the valve and cause a leak. Use an adjustable strap wrench to remove over-tight or rusted caps. Slowly open the valve. If the valve is hard to open, discontinue use and contact your supplier. Close the container valve after each use; keep closed even when empty. Never apply flame or localized heat directly to any part of the container. High temperatures may damage the container and could cause the pressure relief device to fail prematurely, venting the container contents. For other precautions in using this product, see section 16.

Safe use of the product

: Do not breathe gas/vapors. Use only with adequate ventilation or respiratory protection. Do not get liquid or vapor in eyes, on skin, or on clothing. Have safety showers and eyewash fountains immediately available.

7.2. Conditions for safe storage, including any incompatibilities

Storage conditions

: Store only where temperature will not exceed 125°F (52°C). Post "No Smoking/No Open Flames" signs in storage and use areas. There must be no sources of ignition. Separate packages and protect against potential fire and/or explosion damage following appropriate codes and requirements (e.g. NFPA 30, NFPA 55, NFPA 70, and/or NFPA 221 in the U.S.) or according to requirements determined by the Authority Having Jurisdiction (AHJ). Always secure containers upright to keep them from falling or being knocked over. Install valve protection cap, if provided, firmly in place by hand when the container is not in use. Store full and empty containers separately. Use a first-in, first-out inventory system to prevent storing full containers for long periods. For other precautions in using this product, see section 16.

OTHER PRECAUTIONS FOR HANDLING, STORAGE, AND USE: When handling product under pressure, use piping and equipment adequately designed to withstand the pressures to be encountered. Never work on a pressurized system. Use a back flow preventive device in the piping. Gases can cause rapid suffocation because of oxygen deficiency; store and use with adequate ventilation. If a leak occurs, close the container valve and blow down the system in a safe and environmentally correct manner in compliance with all international, federal/national, state/provincial, and local laws; then repair the leak. Never place a container where it may become part of an electrical circuit.

7.3. Specific end use(s)

None.

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

Phosphine (7803-51-2)		
ACGIH	ACGIH TLV-TWA (ppm)	0.05 ppm
ACGIH	ACGIH TLV-C (ppm)	0.15 ppm
USA OSHA	OSHA PEL (TWA) (mg/m ³)	0.4 mg/m ³
USA OSHA	OSHA PEL (TWA) (ppm)	0.3 ppm
USA IDLH	US IDLH (ppm)	50 ppm

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8.2. Exposure controls

Appropriate engineering controls	: Use in a closed system. In semiconductor process gas and other suitable applications, Praxair recommends the use of engineering controls such as gas cabinet enclosures, automatic gas panels (used to purge systems on cylinder changeout), excess-flow valves throughout the gas distribution system, double containment for the distribution system, and continuous gas monitors.
Eye protection	: Provide readily accessible eye wash stations and safety showers. Wear safety glasses when handling cylinders; vapor-proof goggles and a face shield during cylinder changeout or whenever contact with product is possible. Select eye protection in accordance with OSHA 29 CFR 1910.133.
Skin and body protection	: Wear metatarsal shoes and work gloves for cylinder handling, and protective clothing where needed. Wear appropriate chemical gloves during cylinder changeout or wherever contact with product is possible. Select per OSHA 29 CFR 1910.132, 1910.136, and 1910.138.
Respiratory protection	: When workplace conditions warrant respirator use, follow a respiratory protection program that meets OSHA 29 CFR 1910.134, ANSI Z88.2, or MSHA 30 CFR 72.710 (where applicable). Use an air-supplied or air-purifying cartridge if the action level is exceeded. Ensure that the respirator has the appropriate protection factor for the exposure level. If cartridge type respirators are used, the cartridge must be appropriate for the chemical exposure. For emergencies or instances with unknown exposure levels, use a self-contained breathing apparatus (SCBA).
Thermal hazard protection	: Wear cold insulating gloves when transfilling or breaking transfer connections.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

Physical state	: Gas
Appearance	: Colorless gas.
Molecular mass	: 34 g/mol
Color	: Colorless.
Odor	: Rotten fish.
Odor threshold	: No data available
pH	: Not applicable.
Relative evaporation rate (butyl acetate=1)	: No data available
Relative evaporation rate (ether=1)	: Not applicable.
Melting point	: -134 °C
Freezing point	: No data available
Boiling point	: -87.7 °C
Flash point	: No data available
Critical temperature	: 51.6 °C
Auto-ignition temperature	: 38 °C
Decomposition temperature	: 365 °C
Flammability (solid, gas)	: 1.2 - 98 vol %
Vapor pressure	: 3460 kPa
Critical pressure	: 6540 kPa
Relative vapor density at 20 °C	: No data available
Relative density	: 0.74
Relative gas density	: 1.2
Solubility	: Water: 300 mg/l
Log Pow	: Not applicable.
Log Kow	: Not applicable.
Viscosity, kinematic	: Not applicable.
Viscosity, dynamic	: Not applicable.

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Explosive properties : Not applicable.
Oxidizing properties : None.
Explosion limits : No data available

9.2. Other information

Gas group : Press. Gas (Liq.)
Additional information : Pure phosphine has an autoignition temperature of approximately 38°C, but because of the presence of other phosphorus hydrides, particularly diphosphine (P₂H₄), as impurities, phosphine often ignites spontaneously at room temperature (IPCS INCHEM online, 26 Mar 2012).
Gas/vapor heavier than air. May accumulate in confined spaces, particularly at or below ground level.

SECTION 10: Stability and reactivity

10.1. Reactivity

Can form explosive mixtures with air. May ignite spontaneously in contact with air.

10.2. Chemical stability

Stable under normal conditions.

10.3. Possibility of hazardous reactions

May occur.

10.4. Conditions to avoid

Temperatures in excess of 365°C (689°F). Hazardous decomposition may occur.

10.5. Incompatible materials

Halogenated hydrocarbons. Halogens. Oxidizing agents. (especially oxygen and halogen). Acids. Aluminum and its alloys.

10.6. Hazardous decomposition products

Hydrogen. Phosphorous. Phosphorus oxides.

SECTION 11: Toxicological information

11.1. Information on toxicological effects

Acute toxicity : Inhalation:gas: FATAL IF INHALED.

Phosphine (f)7803-51-2	
LC50 inhalation rat (ppm)	10 ppm/4h
ATE US (gases)	10 ppmV/4h

Skin corrosion/irritation : Causes severe skin burns and eye damage.
pH: Not applicable.
Serious eye damage/irritation : CAUSES SERIOUS EYE DAMAGE.
pH: Not applicable.
Respiratory or skin sensitization : Not classified
Germ cell mutagenicity : Not classified
Carcinogenicity : Not classified
Reproductive toxicity : Not classified
Specific target organ toxicity – single exposure : Not classified
Specific target organ toxicity – repeated exposure : Not classified
Aspiration hazard : Not classified

SECTION 12: Ecological information

12.1. Toxicity

Ecology - general : VERY TOXIC TO AQUATIC LIFE.

12.2. Persistence and degradability

Phosphine (7803-51-2)	
Persistence and degradability	Not applicable for inorganic gases.

12.3. Bioaccumulative potential

Phosphine (7803-51-2)	
Log Pow	Not applicable.
Log Kow	Not applicable.
Bioaccumulative potential	No ecological damage caused by this product.

12.4. Mobility in soil

Phosphine (7803-51-2)	
Mobility in soil	No data available.
Ecology - soil	Because of its high volatility, the product is unlikely to cause ground or water pollution.

12.5. Other adverse effects

Other adverse effects : May cause pH changes in aqueous ecological systems.

Effect on ozone layer : None.

Effect on the global warming : No known effects from this product.

SECTION 13: Disposal considerations

13.1. Waste treatment methods

Regional legislation (waste) : U.S. - RCRA (Resource Conservation & Recovery Act) - Hazardous Constituents - Appendix VIII to 40 CFR 261. U.S. - RCRA (Resource Conservation & Recovery Act) - P Series Wastes - Acutely Toxic Wastes.

Product/Packaging disposal recommendations : Do not attempt to dispose of residual or unused quantities. Return container to supplier.

SECTION 14: Transport information

In accordance with DOT

Transport document description : UN2199 Phosphine, 2.3

UN-No.(DOT) : UN2199

Proper Shipping Name (DOT) : Phosphine

Class (DOT) : 2.3 - Class 2.3 - Poisonous gas 49 CFR 173.115

Hazard labels (DOT) :
Poison Gas
2.3 - Poison gas
2.1 - Flammable gas



DOT Special Provisions (49 CFR 172.102) : 1 - This material is poisonous by inhalation (see 171.8 of this subchapter) in Hazard Zone A (see 173.116(a) or 173.133(a) of this subchapter), and must be described as an inhalation hazard under the provisions of this subchapter.

Additional information

Emergency Response Guide (ERG) Number : 119;173

Other information : No supplementary information available.

Special transport precautions : Avoid transport on vehicles where the load space is not separated from the driver's compartment. Ensure vehicle driver is aware of the potential hazards of the load and knows what to do in the event of an accident or an emergency. Before transporting product containers:
- Ensure there is adequate ventilation. - Ensure that containers are firmly secured. - Ensure cylinder valve is closed and not leaking. - Ensure valve outlet cap nut or plug (where provided) is correctly fitted. - Ensure valve protection device (where provided) is correctly fitted.

Transport by sea

UN-No. (IMDG) : 2199
Proper Shipping Name (IMDG) : PHOSPHINE
Class (IMDG) : 2 - Gases
Division (IMDG) : 2.3 - Toxic gases
MFAG-No : 119

Air transport

UN-No. (IATA) : 2199
Proper Shipping Name (IATA) : PHOSPHINE
Class (IATA) : 2
Civil Aeronautics Law : Gases under pressure/Gases toxic under pressure

SECTION 15: Regulatory information

15.1. US Federal regulations

Phosphine (7803-51-2)	
Listed on the United States TSCA (Toxic Substances Control Act) inventory	
Listed on the United States SARA Section 302	
Subject to reporting requirements of United States SARA Section 313	
CERCLA RQ	100 lb
SARA Section 302 Threshold Planning Quantity (TPQ)	500 lb
SARA Section 311/312 Hazard Classes	Immediate (acute) health hazard Sudden release of pressure hazard Fire hazard Delayed (chronic) health hazard Reactive hazard
SARA Section 313 - Emission Reporting	1 %

All components of this product are listed on the Toxic Substances Control Act (TSCA) inventory.

Chemical(s) subject to the reporting requirements of Section 313 or Title III of the Superfund Amendments and Reauthorization Act (SARA) of 1986 and 40 CFR Part 372.

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15.2. International regulations

CANADA

Phosphine (7803-51-2)	
Listed on the Canadian DSL (Domestic Substances List)	

EU-Regulations

Phosphine (7803-51-2)

Listed on the EEC inventory EINECS (European Inventory of Existing Commercial Chemical Substances)

15.2.2. National regulations

Phosphine (7803-51-2)

Listed on the AICS (Australian Inventory of Chemical Substances)
Listed on IECSC (Inventory of Existing Chemical Substances Produced or Imported in China)
Listed on the Japanese ENCS (Existing & New Chemical Substances) inventory
Listed on the Japanese ISHL (Industrial Safety and Health Law)
Listed on the Korean ECL (Existing Chemicals List)
Listed on NZIoC (New Zealand Inventory of Chemicals)
Listed on PICCS (Philippines Inventory of Chemicals and Chemical Substances)
Japanese Poisonous and Deleterious Substances Control Law
Listed on the Canadian IDL (Ingredient Disclosure List)
Listed on INSQ (Mexican National Inventory of Chemical Substances)
Listed on the TCSI (Taiwan Chemical Substance Inventory)

15.3. US State regulations

Phosphine(7803-51-2)

U.S. - California - Proposition 65 - Carcinogens List	No
U.S. - California - Proposition 65 - Developmental Toxicity	No
U.S. - California - Proposition 65 - Reproductive Toxicity - Female	No
U.S. - California - Proposition 65 - Reproductive Toxicity - Male	No
State or local regulations	U.S. - Massachusetts - Right To Know List U.S. - New Jersey - Right to Know Hazardous Substance List U.S. - Pennsylvania - RTK (Right to Know) - Environmental Hazard List U.S. - Pennsylvania - RTK (Right to Know) List

California Proposition 65 - This product does not contain any substances known to the state of California to cause cancer, developmental and/or reproductive harm

SECTION 16: Other information

Other information

: When you mix two or more chemicals, you can create additional, unexpected hazards. Obtain and evaluate the safety information for each component before you produce the mixture. Consult an industrial hygienist or other trained person when you evaluate the end product. Before using any plastics, confirm their compatibility with this product.

Praxair asks users of this product to study this SDS and become aware of the product hazards and safety information. To promote safe use of this product, a user should (1) notify employees, agents, and contractors of the information in this SDS and of any other known product hazards and safety information, (2) furnish this information to each purchaser of the product, and (3) ask each purchaser to notify its employees and customers of the product hazards and safety information.

The opinions expressed herein are those of qualified experts within Praxair, Inc. We believe that the information contained herein is current as of the date of this Safety Data Sheet. Since the use of this information and the conditions of use are not within the control of Praxair, Inc, it is the user's obligation to determine the conditions of safe use of the product.

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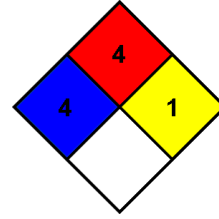
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NFPA health hazard : 4 - Materials that, under emergency conditions, can be lethal.

NFPA fire hazard : 4 - Materials that rapidly or completely vaporize at atmospheric pressure and normal ambient temperature or that are readily dispersed in air and burn readily.

NFPA reactivity : 1 - Materials that in themselves are normally stable but can become unstable at elevated temperatures and pressures.



Hazard Rating

Health : 4 Severe Hazard - Life-threatening, major or permanent damage may result from single or repeated overexposures

Flammability : 4 Severe Hazard

Physical : 3 Serious Hazard

SDS US (GHS HazCom 2012) - Praxair

This information is based on our current knowledge and is intended to describe the product for the purposes of health, safety and environmental requirements only. It should not therefore be construed as guaranteeing any specific property of the product.