Product Safety Summary

Phosphorus Oxychloride

CAS No. 10025-87-3

This Product Safety Summary is intended to provide a general overview of the chemical substance. The information in the summary is basic information and is not intended to provide emergency response information, medical information or treatment information. The summary should not be used to provide in-depth safety and health information. In-depth safety and health information can be found in the Safety Data Sheet (SDS) for the chemical substance.

Names

- Phosphorus oxychloride
- Phosphorus trichloride oxide
- Phosphoric trichloride
- $POCl_3$

Product Overview

Solvay Novecare does not sell phosphorus oxychloride directly to consumers. Phosphorus oxychloride ($POCl_3$) is used as a chemical intermediate to produce a variety of products which are used in several applications including manufacture of triarylphosphate esters which are used as flame retardants as well as an intermediate in the production of pharmaceutical, textile and agricultural chemicals.

Phosphorus oxychloride is used in industrial applications and other processes where workplace exposures can occur. Consumer exposure does not occur as phosphorus oxychloride is not used in any commercially available product. **Phosphorus oxychloride is dangerous to human health. Phosphorus oxychloride may be fatal if inhaled, highly toxic if swallowed, harmful if absorbed through skin and can cause severe burns which may result in scarring.**

Phosphorus oxychloride is consumed in manufacturing processes. $POCl_3$ can make its way into the environment through unintentional releases (spills). $POCl_3$ will not bioaccumulate but is not biodegradable. $POCl_3$ in higher concentrations can be harmful to aquatic life due to formation of acids from the hydrolysis of $POCl_3$.

When released into the atmosphere, phosphorus oxychloride exists as vapor. The vapors hydrolyze to hydrochloric and phosphoric acids from reaction with humidity in the air.

Manufacture of Product

Phosphorus oxychloride is produced primarily by the following two methods. The first is by the reaction of phosphorus trichloride with oxygen.

$$2PCl_3 + O_2 \rightarrow 2POCl_3$$

The second method involves reacting phosphorus trichloride with chlorine and phosphorus pentoxide as depicted in the following reactions.

$$6PCl_3 + 6Cl_2 \rightarrow 6PCl_5$$

$$6PCl_5 + P_4O_{10} \rightarrow 10\ POCl_3$$

Product Description

Phosphorus oxychloride is a colorless fuming liquid with a pungent odor. Typical physical properties for PCl_3 are provided in Table 1.

Table 1: Typical physical properties of phosphorus oxychloride

	$POCl_3$
Purity	➢ 99.5%
Specific gravity	1.67 at 59°F (15°C)
Boiling point	223°F (106°C) at 760 mmHg
Freezing point	34°F (1.2°C)
Flammability	Not flammable
Flash Point	Not applicable

Product Uses

Phosphorus oxychloride is used as a chemical intermediate to produce a wide range of chemicals. The most important use is in the production of triphenyl phosphate and tricresyl phosphate which are used as flame retardants and plasticizers. $POCl_3$ is also used to produce trialkyl esters of which tributyl phosphate is used as a liquid-liquid extraction solvent in nuclear reprocessing and other applications such as purifying technical grade phosphoric acid into food grade phosphoric acid. It is used in the semiconductor industry to provide a phosphorus source which acts as a dopant used to create N-type layers on silicon wafer. In laboratories it is used as a dehydrating agent. It is also used as an intermediate to produce a variety of chemicals which are subsequently used to synthesize compounds for the pharmaceutical industry. $POCl_3$ can be used to produce nerve gas chemical weapons by multistage chemical synthesis. Because of this, its production, use and export are stringently controlled by an International Chemical Weapons Convention treaty. **Solvay**

Novecare does not sell phosphorus oxychloride directly to consumers.

Exposure Potential

- **Workplace Exposure** - $POCl_3$ is toxic by ingestion, inhalation or contact with skin and eyes. Exposures can occur at a $POCl_3$ manufacturing facility or at a manufacturing facility that uses $POCl_3$ as an intermediate to produce other chemicals or when used in other applications. Exposure may also occur in the event of a transportation incident. Persons involved in maintenance, sampling and testing activities, or in the loading and unloading of $POCl_3$ containers are at greater risk of exposure. Following good safe handling practices will minimize the likelihood of $POCl_3$ exposure. Persons involved in higher risk activities should always wear proper personal protective equipment such as an air-supplied positive pressure respirator, rubber gloves and boots, a chemical resistant suit, goggles, face shield and a hard hat. Under emergency conditions the use of a full-face positive pressure air-supplied respirator equipped with an emergency escape supply unit or a self-contained breathing apparatus should be used

  Solvay Novecare conducts an on-site inspection of potential industrial customers, prior to selling them $POCl_3$. The group also works closely with customers to ensure that they have the ability (the equipment and the expertise) to handle this material safely and securely. Because of the sensitive nature of this product access to the Safety Data Sheet is limited to approved customers. Please consult the appropriate Safety Data Sheet for more information on $POCl_3$ exposures and for information concerning exposure limits.

- **Consumer Exposure to Products Containing Phosphorus Oxychloride** - Solvay Novecare does not sell $POCl_3$ directly to consumers and there are no known uses of $POCl_3$ other than as a chemical intermediate or limited specific uses in laboratories or other industries. Therefore consumer exposures are not anticipated.

- **Environmental Releases** - Spills of $POCl_3$ create an emergency situation and require evacuation of the area. Personnel, except properly equipped and trained emergency responders, should be excluded from the spill area. The leak should be stopped if safe to do so and the area diked using absorbent or impervious materials. Any free liquid can be pumped to an appropriate closed container. Material can be absorbed with vermiculite or other inert absorbent. Clean-up of residual material can be done using a 2-5% solution of soda ash. Disposal should be in accordance with applicable local, state or federal regulations. Persons attempting to clean up $POCl_3$ spills should wear proper personal protective equipment, (See guidelines in the Safety Data Sheet.) If required by law, report spills to the appropriate local, state and federal authorities.

- **Fires** - $POCl_3$ is not flammable. However, $POCl_3$ reacts violently with water releasing heat and corrosive materials. Under fire conditions, toxic, corrosive fumes are emitted. Water is not recommended as an extinguishing method. Recommended methods include: dry sand, carbon dioxide, or dry chemical. For additional information concerning PCl_3 emergency response procedures, please consult the Safety Data Sheet.

Health Information

$POCl_3$ is corrosive and toxic by ingestion, inhalation or contact with skin and eyes. Effects can be immediate. In the event of exposure to the skin or eyes the area should be washed with water for at least 30 minutes. Please consult the Safety Data Sheet for additional information.

Exposures to $POCl_3$ can produce the following adverse health effects:

- **Contact** - Skin exposures to phosphorus oxychloride can cause severe burns due to formation of acid hydrolysis products. Eye exposures to $POCl_3$ may result in severe eye irritation, burns or even blindness.
- **Inhalation** - $POCl_3$ is corrosive to the respiratory tract if inhaled. It can cause upper respiratory tract irritation, lung irritation, chest pain, wheezing, and shortness of breath, a burning sensation, tickling of the nose and throat and sneezing. Exposure to high levels of $POCl_3$ may cause severe lung damage including pulmonary edema and may be fatal
- **Ingestion** - Phosphorus oxychloride is harmful if ingested. It can cause irritation, abdominal pain, corrosion, burns to mouth and esophagus and death.
- **Other Effects** - Phosphorus oxychloride is quickly hydrolyzed at first contact with water therefore it is very unlikely that $POCl_3$ will reach tissues distant from the point of entry. Systemic effects are not anticipated. Some sources mention chronic kidney toxicity but this appears to be based on chronic phosphorus poisoning. The amount of phosphoric acid produced from inhalation exposures is not sufficient to cause chronic phosphorus poisoning from workplace or acute accidental exposures. $POCl_3$ has not been studied for carcinogenicity or reproductive effects. For more information on health effects or for information concerning proper first aid measures, please consult the Safety Data Sheet.

Environmental Information

Phosphorus oxychloride is rapidly hydrolyzed upon contact with water and will therefore be degraded within the wastewater treatment process. Due to this rapid degradation, an exposure to surface waters is expected to be negligible. Since ecotoxicological effects of the substance solely result from changes in pH, $POCl_3$ is not considered to be acutely harmful to aquatic organisms except for possible effects from acidity. Further, phosphorus oxychloride does not accumulate in the food chain.

For more ecological and environmental information concerning this product, please consult the Safety Data Sheet.

Physical Hazard Information

$POCl_3$ is stable under normal handling and storage conditions. Conditions to be avoided include combustible materials, heat, water, extreme humidity, moisture, strong oxidizing agents, bases, acids, metals, ketones, organic material, alcohols, amines, and alkali materials.

For more information concerning the physical hazards of this product, please consult the Safety Data Sheet.

Regulatory Information

Regulations may exist that govern the manufacture, sale, export, import, storage, transportation, use and/or disposal of this chemical. These regulations can vary by city, state, country or geographic region. Information may be found by consulting the relevant Safety Data Sheet specific to your country or region.

Additional Information

- Solvay USA Inc. www.solvaynorthamerica.com
- NJ Department of Health & Senior Services Hazardous Substance Fact Sheets http://web.doh.state.nj.us/rtkhsfs/factsheets.aspx
- This summary was prepared in December, 2013.

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