SAFE OPERATING PROCEDURE – Using Triphosgene in Lab

This is an SOP template and is not complete until: 1) lab specific information is entered into the box below 2) lab specific protocol/procedure is added to the protocol/procedure section and
3) SOP has been signed and dated by the PI and relevant lab personnel.

DO NOT USE TRIPHOSGENE UNTIL YOU HAVE OBTAINED THE NECESSARY TRAINING.

Print a copy and insert into your *Lab-Specific Chemical Hygiene Plan*.

Section 1 – Lab Specific Information

Room(s) covered by this SOP:	Click here to enter text.
Department:	Chemistry
Principal Investigator Name:	Click here to enter text.
Principal Investigator Signature:	
Date:	Click here to enter text.

Section 2 – Hazards

Refer also to the Safety Data Sheet (SDS) in the Appendix

Triphosgene (solid) is potentially fatal; it is especially damaging to the lungs.
Causes severe skin burns and eye damage.
The product causes burns of eyes, skin and mucous membranes. Contact with water liberates toxic gas.
Fatal if inhaled.

Section 3 – Engineering Controls and Personal Protective Equipment (PPE)

Engineering Controls: Use of triphosgene must be conducted in a properly functioning chemical fume hood (see Fume Hood Use SOP). Install a phosgene sensor outside of the fume hood in the lab to ensure the exposure limit is never exceeded.

Hygiene Measures: Immediately change contaminated clothing. Apply preventive skin protection. Wash hands and face after working with substance.

Hand Protection: Wearing a pair of vinyl gloves and a pair of nitrile gloves, the vinyl gloves provide additional protection in case outer layer of nitrile gloves are contaminated or punctured. Gloves must be of enough length as to overlap the lab coat cuffs, not letting any exposed skin. Taping the gloves over the lab coat cuff would help to keep them in place. Contaminated gloves (even just a few drops) must be disposed of as hazardous waste immediately. **NOTE:** Consult with your preferred glove manufacturer to ensure that the gloves you plan on using are compatible with the specific chemical being used.

Eye Protection: Use equipment for eye protection tested and approved under appropriate government standards such as CSA compliant, NIOSH (US) or EN 166(EU). Tightly fitting safety goggles.

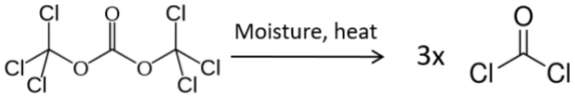
Skin and Body Protection: Flame resistant laboratory coats with cuffs must be worn, be appropriately sized for the individual and buttoned to their full length. Personnel must also wear full-length pants, or equivalent, and close-toed shoes. Full-length pants and close-toed shoes must be worn at all times by all individuals that are occupying the laboratory area. The area of skin between the shoe and ankle must not be exposed.

Respiratory Protection: triphosgene should never be exposed to open air outside of a chemical fume hood or glove box.

Section 4 – Special Handling and Storage Requirements

- Do not over-purchase; only purchase what can be safely stored in the laboratory.
- Avoid contact with skin, eyes, and clothing. Avoid inhalation of vapor or mist.
- Always use inside of a chemical fume hood. Weighing triphosgene must be conducted in a sealed container and under a chemical fume hood. Therefore, extreme care should be taken when handling; always work under a chemical fume hood.
- When working with triphosgene, use explosion-proof equipment. Keep away from sources of ignition. Decomposition of triphosgene solid creates hazardous gases over time during heating or in contact with moisture. Take measures to prevent the buildup heat and moisture.
- Keep the container upright and tightly closed in a dry and well-ventilated place. Containers should remain closed when not in use. Store in a dark, refrigerated (2 to 8 °C), spark-proof environment. Store in a corrosive drawer.
- May decompose over time, do not store past manufacturer-recommended date.
- Containers that are opened must be carefully resealed.
- Keep away from strong oxidizing agents, amines, ammonia, alcohols, and moisture.
- Use in the smallest practical quantities for the experiment being performed.

- Containers should be labelled appropriately (WHMIS-2015).



Solid

Toxic gas (similar to Cl_2)

Quenched by water: $COCl_2 + H_2O \rightarrow CO_2 + 2\ HCl$

Quenched by ammonia: $COCl_2 + 4\ NH_3 \rightarrow CO(NH_2)_2 + 2\ NH_4Cl$

Section 5 – Spill and Accident Procedures

If a leak occurs and triphosgene is decomposed, Immediately, evacuate the lab and alert others. **Call Environmental Protection Services at: 416.978.7000 (8:00-4:00, Weekdays) After hours call** Campus Safety 416-978-2222. Ensure others in the vicinity evacuate immediately. If personnel have become exposed and need medical assistance, call Emergency Services at **911**.

1. Evacuate immediate area. Call Environmental Protection Services at: 416.978.7000 (8:00-4:00pm, Weekdays) After hours call Campus Security: 416.978.2222-St. George Campus
2. State your name, location, chemical(s) involved, and the amount spilled.
3. Attend to any persons who may have been contaminated. Consult the Safety Data Sheet for first aid information. Refer to "Chemical Spills on Body" for further information.
4. Wait in a safe area for the response team. Your knowledge of the area will assist the team.
5. Do not allow unauthorized personnel to enter the contaminated area.
6. Report the incident to your supervisor and the Office of Environmental Health & Safety. Use the online Accident/Incident Report form.

Avoid breathing dusts, gases, mist, or vapors and EVACUATE the lab. Eliminate all sources of ignition only if safe to do so on your way out of the lab and evacuate personnel to safe areas. Beware of vapor accumulation, particularly in low areas as it can form an explosive vapor-air mixture. Prevent further leakage if it is safe to do so. Never allow triphosgene waste to enter a drain or the environment as it can be environmentally destructive.

First Aid & Emergencies: If you believe that you may have been exposed to triphosgene by any route, SEEK MEDICAL ATTENTION IMMEDIATELY. The effects of phosgene poisoning may be delayed. Rescue of a person exposed to phosgene should only be attempted by trained personnel equipped with self-contained breathing apparatus if the presence of phosgene fumes is suspected. Artificial respiration should only be attempted by trained medical personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation.

Section 6 – Waste Disposal Procedures

Quench before disposing of if applicable. Store hazardous waste in a closed container that is properly labelled. Do not mix waste with incompatible chemicals and collect separately if possible. Do not accumulate waste for long periods of time. Store waste containers in separate secondary containment.

Any contaminated disposable wastes such as gloves or clothing should be disposed of as solid hazardous waste.

Decontamination Rinse any equipment which may have come in contact with triphosgene with water inside of a chemical fume hood, then wash with soap and water.

Section 7 – Protocol

Each lab must use this section to fill out their own protocol and must submit entire SOP to chem.safety@utoronto.ca for approval, before starting work.

Section 8 – Documentation of Training (signature of all users is required)

Prior to conducting any work with triphosgene, the Principal Investigator must ensure that all laboratory personnel receive training on the content of this SOP.

I have read and understand the content of this SOP:

Name	Signature	Date

Appendix

SAFETY DATA SHEET

Version 6.2
Revision Date 28.07.2021
Print Date 29.01.2022

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1 Product identifiers

Product name : Triphosgene

Product Number : 330752
Brand : Aldrich
CAS-No. : 32315-10-9

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

Identified uses : Laboratory chemicals, Synthesis of substances

1.3 Details of the supplier of the safety data sheet

Company : MilliporeSigma Canada Ltd
2149 WINSTON PARK DRIVE
OAKVILLE ON L6H 6J8
CANADA

Telephone : +1 905 829-9500
Fax : +1 905 829-9292

1.4 Emergency telephone

Emergency Phone # : 800-424-9300 CHEMTREC (USA)
+1-703-527-3887 CHEMTREC (International)
24 Hours/day; 7 Days/week

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

GHS Classification in accordance with Hazardous Products Regulations (HPR) (SOR/2015-17)

Acute toxicity, Inhalation (Category 1), H330
Skin corrosion (Category 1B), H314
Serious eye damage (Category 1), H318

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram

Signal word Danger

Hazard statement(s)

H314	Causes severe skin burns and eye damage.
H330	Fatal if inhaled.

Precautionary statement(s)

P260	Do not breathe dust/ fume/ gas/ mist/ vapors/ spray.
P264	Wash skin thoroughly after handling.
P271	Use only outdoors or in a well-ventilated area.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P284	Wear respiratory protection.
P301 + P330 + P331	IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.
P303 + P361 + P353	IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water.
P304 + P340 + P310	IF INHALED: Remove person to fresh air and keep comfortable for breathing. Immediately call a POISON CENTER/ doctor.
P305 + P351 + P338 + P310	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER/ doctor.
P363	Wash contaminated clothing before reuse.
P403 + P233	Store in a well-ventilated place. Keep container tightly closed.
P405	Store locked up.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS

Lachrymator.

- none

SECTION 3: Composition/information on ingredients

3.1 Substances

Synonyms	:	Bis(trichloromethyl) carbonate
Formula	:	$C_3Cl_6O_3$
Molecular weight	:	296.75 g/mol
CAS-No.	:	32315-10-9
EC-No.	:	250-986-3

Component	Classification	Concentration *
bis(trichloromethyl) carbonate		
	Acute Tox. 1; Skin Corr. 1B; Eye Dam. 1; H330, H314, H318	<= 100 %
* Weight %		

For the full text of the H-Statements mentioned in this Section, see Section 16.

SECTION 4: First aid measures

4.1 Description of first-aid measures

General advice
First aiders need to protect themselves. Show this material safety data sheet to the doctor in attendance.

If inhaled
After inhalation: fresh air. Immediately call in physician. If breathing stops: immediately apply artificial respiration, if necessary also oxygen.

In case of skin contact
In case of skin contact: Take off immediately all contaminated clothing. Rinse skin with water/ shower. Call a physician immediately.

In case of eye contact
After eye contact: rinse out with plenty of water. Immediately call in ophthalmologist. Remove contact lenses.

If swallowed
After swallowing: make victim drink water (two glasses at most), avoid vomiting (risk of perforation). Call a physician immediately. Do not attempt to neutralise.

4.2 Most important symptoms and effects, both acute and delayed
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed
No data available

SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media
Carbon dioxide (CO2) Dry powder

Unsuitable extinguishing media
Foam Water

5.2 Special hazards arising from the substance or mixture
Carbon oxides
Hydrogen chloride gas
Combustible.
Development of hazardous combustion gases or vapours possible in the event of fire.

5.3 Advice for firefighters
Stay in danger area only with self-contained breathing apparatus. Prevent skin contact by keeping a safe distance or by wearing suitable protective clothing.

5.4 Further information
Suppress (knock down) gases/vapors/mists with a water spray jet. Prevent fire extinguishing water from contaminating surface water or the ground water system.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

Advice for non-emergency personnel: Avoid generation and inhalation of dusts in all circumstances. Avoid substance contact. Ensure adequate ventilation. Evacuate the danger area, observe emergency procedures, consult an expert.
For personal protection see section 8.

6.2 Environmental precautions

Do not let product enter drains.

6.3 Methods and materials for containment and cleaning up

Cover drains. Collect, bind, and pump off spills. Observe possible material restrictions (see sections 7 and 10). Take up carefully. Dispose of properly. Clean up affected area. Avoid generation of dusts.

6.4 Reference to other sections

For disposal see section 13.

SECTION 7: Handling and storage

7.1 Precautions for safe handling

Advice on safe handling
Work under hood. Do not inhale substance/mixture.

Hygiene measures
Immediately change contaminated clothing. Apply preventive skin protection. Wash hands and face after working with substance.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Storage conditions
Tightly closed. Dry. Keep in a well-ventilated place. Keep locked up or in an area accessible only to qualified or authorized persons.

Storage stability
Recommended storage temperature
2 - 8 °C

Moisture sensitive. Heat sensitive.
Storage class (TRGS 510): 6.1A: Combustible, acute toxic Cat. 1 and 2 / very toxic hazardous materials

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

SECTION 8: Exposure controls/personal protection

8.1 Control parameters

8.2 Exposure controls

Appropriate engineering controls
Immediately change contaminated clothing. Apply preventive skin protection. Wash hands and face after working with substance.

Personal protective equipment

Eye/face protection
Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU). Tightly fitting safety goggles

Skin protection
This recommendation applies only to the product stated in the safety data sheet, supplied by us and for the designated use. When dissolving in or mixing with other substances and under conditions deviating from those stated in EN374 please contact the supplier of CE-approved gloves (e.g. KCL GmbH, D-36124 Eichenzell, Internet: www.kcl.de).
Full contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested:KCL 741 Dermatril® L

This recommendation applies only to the product stated in the safety data sheet, supplied by us and for the designated use. When dissolving in or mixing with other substances and under conditions deviating from those stated in EN374 please contact the supplier of CE-approved gloves (e.g. KCL GmbH, D-36124 Eichenzell, Internet: www.kcl.de).
Splash contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested:KCL 741 Dermatril® L

Body Protection
protective clothing

Respiratory protection
required when dusts are generated.
Our recommendations on filtering respiratory protection are based on the following standards: DIN EN 143, DIN 14387 and other accompanying standards relating to the used respiratory protection system.

Control of environmental exposure
Do not let product enter drains.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: solid Color: beige
b)	Odor	No data available
c)	Odor Threshold	No data available
d)	pH	No data available
e)	Melting point/freezing point	Melting point/range: 79 - 83 °C (174 - 181 °F) - lit.
f)	Initial boiling point and boiling range	203 - 206 °C 397 - 403 °F - lit.

g)	Flash point	()No data available
h)	Evaporation rate	No data available
i)	Flammability (solid, gas)	No data available
j)	Upper/lower flammability or explosive limits	No data available
k)	Vapor pressure	No data available
l)	Vapor density	No data available
m)	Density	No data available
	Relative density	No data available
n)	Water solubility	No data available
o)	Partition coefficient: n-octanol/water	No data available
p)	Autoignition temperature	No data available
q)	Decomposition temperature	No data available
r)	Viscosity	No data available
s)	Explosive properties	No data available
t)	Oxidizing properties	No data available

9.2 Other safety information
No data available

SECTION 10: Stability and reactivity

10.1 Reactivity
The following applies in general to flammable organic substances and mixtures: in correspondingly fine distribution, when whirled up a dust explosion potential may generally be assumed.

10.2 Chemical stability
The product is chemically stable under standard ambient conditions (room temperature) .

10.3 Possibility of hazardous reactions
Generates dangerous gases or fumes in contact with:
Water
Alcohols
amides
Amines
ferric oxide
alkalines
Activated charcoal

10.4 Conditions to avoid
no information available

10.5 Incompatible materials
No data available

10.6 Hazardous decomposition products
In the event of fire: see section 5

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity
LD50 Oral - Rat - > 2,000 mg/kg
LC50 Inhalation - 4 h - 0.005 mg/l
Inhalation: No data available
LD50 Dermal - Rat - > 2,000 mg/kg
No data available

Skin corrosion/irritation
No data available

Serious eye damage/eye irritation
No data available

Respiratory or skin sensitization
No data available

Germ cell mutagenicity
No data available

Carcinogenicity
No data available

Reproductive toxicity
No data available
No data available

Specific target organ toxicity - single exposure
No data available

Specific target organ toxicity - repeated exposure
No data available

Aspiration hazard
No data available

11.2 Additional Information

burning sensation, Cough, wheezing, laryngitis, Shortness of breath, spasm, inflammation and edema of the larynx, spasm, inflammation and edema of the bronchi, pneumonitis, pulmonary edema, Material is extremely destructive to tissue of the mucous membranes and upper respiratory tract, eyes, and skin., To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

SECTION 12: Ecological information

12.1 Toxicity
No data available

12.2 Persistence and degradability
No data available

12.3 Bioaccumulative potential
No data available

12.4 Mobility in soil
No data available

12.5 Results of PBT and vPvB assessment
PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects
No data available

SECTION 13: Disposal considerations

13.1 Waste treatment methods

Product
Waste material must be disposed of in accordance with the national and local regulations. Leave chemicals in original containers. No mixing with other waste. Handle uncleaned containers like the product itself. See www.retrologistik.com for processes regarding the return of chemicals and containers, or contact us there if you have further questions.

SECTION 14: Transport information

TDG
UN number: 2928 Class: 6.1 (8) Packing group: II
Proper shipping name: TOXIC SOLID, CORROSIVE, ORGANIC, N.O.S. (bis(trichloromethyl) carbonate)
Subsidiary risk : 8
Labels: 6.1
(8)ERG Code: 154
Marine pollutant: no

IMDG
UN number: 2928 Class: 6.1 (8) Packing group: II EMS-No: F-A, S-B
Proper shipping name: TOXIC SOLID, CORROSIVE, ORGANIC, N.O.S. (bis(trichloromethyl) carbonate)

IATA
UN number: 2928 Class: 6.1 (8) Packing group: II
Proper shipping name: Toxic solid, corrosive, organic, n.o.s. (bis(trichloromethyl) carbonate)

SECTION 15: Regulatory information

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

SECTION 16: Other information

Further information

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

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