Standard Operating Procedure

Chlorotrifluoroethylene

*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.*

Print a copy and insert into your   
*Laboratory Safety Manual* and *Chemical Hygiene Plan*.   
Refer to instructions for assistance.

|  |  |
| --- | --- |
| **Department:** | Click here to enter text. |
| **Date SOP was written:** | Click here to enter a date. |
| **Date SOP was approved by PI/lab supervisor:** | Click here to enter a date. |
| **Principal Investigator:** | Click here to enter text. |
| **Internal Lab Safety Coordinator/Lab Manager:** | Click here to enter text. |
| **Lab Phone:** | Click here to enter text. |
| **Office Phone:** | Click here to enter text. |
| **Emergency Contact:** | Click here to enter text. |
| *(Name and Phone Number)* |
| **Location(s) covered by this SOP:** | Click here to enter text. |
| *(Building/Room Number)* |

**Type of SOP:**  Process Hazardous Chemical  Hazardous Class

**Purpose**

**Chlorotrifluoroethylene** (**CTFE**) is a [chlorofluorocarbon](http://en.wikipedia.org/wiki/Chlorofluorocarbon) with chemical formula [C](http://en.wikipedia.org/wiki/Carbon)[F](http://en.wikipedia.org/wiki/Fluorine)2[C](http://en.wikipedia.org/wiki/Carbon)[Cl](http://en.wikipedia.org/wiki/Chlorine)[F](http://en.wikipedia.org/wiki/Fluorine). It is commonly used as a [refrigerant](http://en.wikipedia.org/wiki/Refrigerant) in cryogenic applications. CTFE has a carbon-carbon [double bond](http://en.wikipedia.org/wiki/Double_bond) and so can be [polymerized](http://en.wikipedia.org/wiki/Polymerization) to form [polychlorotrifluoroethylene](http://en.wikipedia.org/wiki/Polychlorotrifluoroethylene) (PCTFE) or copolymerized to produce the plastic [ECTFE](http://en.wikipedia.org/wiki/ECTFE). PCTFE has the trade name Neoflon PCTFE from [Daikin Industries](http://en.wikipedia.org/wiki/Daikin_Industries) in Japan, and used to be produced under the trade name Kel-F from [3M Corporation](http://en.wikipedia.org/wiki/3M_Corporation) in Minnesota.

It is also used as an intermediate/monomer for CTFE resins, in telomerization with carbon tetrachloride or chloroform for use as inert fluids, hydraulic fluids, or lubricants, and an intermediate in the production of the inhalation anesthetic halothane. An inhibitor is added to stabilize this material.

Synonyms: CTFE, *Trfluorochloroethylene, stabilized* (DOT), and Trifluorovinyl chloride.

**Physical & Chemical Properties/Definition of Chemical Group**

CAS#: 79-38-9

Class: **Highly toxic, Highly Flammable**

Molecular Formula: C2ClF3

Form (physical state): gas

Color: colorless

Boiling point: -28.4°C (-19.4°F)

**Potential Hazards/Toxicity**

Flash Point: -27.8°C (-18°F)

Chlorotrifluoroethylene(CTFE) mixes well with air, explosive mixtures are formed easily. On combustion, CTFE forms toxic and corrosive gases including: hydrogen chloride and hydrogen fluoride. It ships as a USDOT Zone C Poison Inhalation Hazard (UN1082).

**Acute toxicity**

**Oral LD50**

LD50 Oral - mouse - 268 mg/kg

**Inhalation LC50**

LC50 Inhalation - rat - 4 h - 1000 ppm

Remarks: Lungs, Thorax, or Respiration:Other changes. Gastrointestinal:Other changes.

**Potential health effects**

**Inhalation** Toxic if inhaled. May cause respiratory tract irritation.

**Ingestion** Toxic if swallowed.

**Skin** May be harmful if absorbed through skin. May cause skin irritation.

**Eyes** May cause eye irritation.

**Signs and Symptoms of Exposure**

Pulmonary edema. Effects may be delayed., Dizziness, Nausea, Vomiting, renal failure, Cardiac arrhythmias, Asphyxia,

Symptoms of renal malfunction may be delayed., Liver injury may occur., Kidney injury may occur.

**Personal Protective Equipment (PPE)**

**Respirator Protection**

Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type ABEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Respirators should be used only under any of the following circumstances:

* As a last line of defense (i.e., after engineering and administrative controls have been exhausted).
* When Permissible Exposure Limit (PEL) has exceeded or when there is a possibility that PEL will be exceeded.
* Regulations require the use of a respirator.
* An employer requires the use of a respirator.
* There is potential for harmful exposure due to an atmospheric contaminant (in the absence of PEL)
* As PPE in the event of a chemical spill clean-up process

Lab personnel intending to use/wear a respirator mask must be trained and fit-tested by ORS and should contact occhealt@uga.edu. This is a UGA requirement described in more detail in the [UGA Respiratory Protection Plan](https://esd.uga.edu/sites/default/files/respiratoryprotection.pdf) and supported by the [Office of Research Occupational Health and Safety Program](https://research.uga.edu/ohsp/).

**Hand Protection**

Handle with insulated PVC/butyl gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

NOTE: Consult with your preferred glove manufacturer to ensure that the gloves you plan on using are compatible with Chlorotrifluoroethylene-gas.

Refer to glove selection chart from the links below:

<http://www.ansellpro.com/download/Ansell_8thEditionChemicalResistanceGuide.pdf>

OR

<http://www.allsafetyproducts.biz/page/74172>

OR

<http://www.showabestglove.com/site/default.aspx>

OR

<http://www.mapaglove.com/>

**Eye Protection**

ANSI approved properly fitting safety glasses or chemical splash goggles. Face shield is also recommended.

**Skin and Body Protection**

Flame resistant lab coats should be worn. These laboratory coats must be appropriately sized for the individual and be buttoned to their full length. Laboratory coat sleeves must be of a sufficient length to prevent skin exposure while wearing gloves. 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 should not be exposed.

**Hygiene Measures**

Wash thoroughly and immediately after handling. Remove any contaminated clothing and wash before reuse.

**Engineering Controls**

Work with this chemical in a certified ducted fume hood. Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower.

**First Aid Procedures**

**If inhaled**

Move into the fresh air immediately and give oxygen. If not breathing give artificial respiration. Seek medical attention immediately.

**In case of skin contact**

Immediately flush skin with plenty of water for at least 15 minutes. If contact with liquid form, treat like frostbite and do not remove any clothing. Seek medical attention immediately. Wash any contaminated clothing before reuse. Thoroughly clean shoes before reuse.

**In case of eye contact**

Rinse thoroughly with plenty of water for at least 15 minutes. If possible, check for and remove any contact lenses and consult a physician.

**If swallowed**

Do NOT induce vomiting unless directed by medical personnel. Never give anything by mouth to an unconscious person. Seek medical attention immediately.

**Special Handling and Storage Requirements**

**Precautions for safe handling**: Avoid contact with skin and eyes and inhalation. Do not breathe gas. Avoid of vapors, mist, or gas. Use only with adequate ventilation or respiratory protection. Keep sparks, flames, and other sources of ignition away.

**Materials to avoid**:

Strong oxidizing agents, Strong bases, Strong oxidizing agents, Reacts violently with water.

**Conditions for safe storage**: Keep container tightly closed in a cool, dry, and well-ventilated fire-proof place away from incompatible materials and conditions. Store in original container.

**Spill and Accident Procedure**

**Chemical Spill Dial 911**

**24-7 On-Call Response to Research, Environment, Health or Safety Concerns Dial 2-5561 from a campus phone or 706-542-5561 from a non-campus line.**

**Spill** – Follow the procedures set out in the [UGA Chemical and Laboratory Safety Manual.](http://research.uga.edu/docs/units/safety/manuals/Chemical-Laboratory-Safety-Manual.pdf)

[If there are any chemical-specific protocols for responding to a spill, insert them here or mark “none”:]

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# **Medical Emergency Dial 911**

**Life Threatening Emergency, After Hours, Weekends And Holidays** – Dial **911** or the emergency phone numbers listed at the beginning of the UGA Chemical and Laboratory Safety Manual

*Note: All incidents that result in an injury or property damage must be reported to ORS / ESD using a University Incident/Accident Report.*

**Non-Life Threatening Emergency** – Follow the instructions in the UGA Chemical and Laboratory Safety Manual.

*Note: All incidents that result in an injury or property damage must be reported to ORS / ESD using a University Incident/Accident Report.*

**Decontamination/Waste Disposal Procedure**

**For general hazardous waste disposal procedures, see Appendix H of the UGA Chemical and Laboratory Safety Manual.**

**Chemical Specific Procedures: [to be inserted or marked as “none”]**

For Spills: Ensure adequate ventilation in the spill area. Remove all ignition sources. Remove vapor with fine water spray. Personal protection: self-contained breathing apparatus.

For Disposal:

Use proper personal protective equipment for Chlorotrifluoroethylene and properly dispose chemical and contaminated disposables as hazardous waste.

**Safety Data Sheet (SDS) Location**

UGA personnel can access Online SDS through a link in the upper left corner of the ESD home page (<https://esd.uga.edu>) and logging in by using their UGA email user name and password.

**Protocol/Procedure (Add lab specific Protocol/Procedure here)**

Click here to enter text.

**NOTE**

Any deviation from this SOP requires approval from PI.

**Documentation of Training** (signature of all users is required)

* Prior to conducting any work with Chlorotrifluoroethylene-gas, designated personnel must provide training to his/her laboratory personnel specific to the hazards involved in working with this substance, work area decontamination, and emergency procedures.
* The Principal Investigator must provide his/her laboratory personnel with a copy of this SOP and access to the SDS provided by the manufacturer.
* The Principal Investigator must ensure that his/her laboratory personnel have attended appropriate laboratory safety training or refresher training within the last 12 months.

**Principal Investigator or Lab Supervisor SOP Approval**

Print name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_Signature\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Approval Date:

I have read and understand the content of this SOP:

|  |  |  |
| --- | --- | --- |
| **Name** | **Signature** | **Date** |
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