Allyl chloroformate

sc-254942

Material Safety Data Sheet

Hazard Alert Code
Key:

EXTREME  HIGH  MODERATE  LOW

Section 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME
Allyl chloroformate

STATEMENT OF HAZARDOUS NATURE

NFPA

SUPPLIER
Santa Cruz Biotechnology, Inc.
2145 Delaware Avenue
Santa Cruz, California 95060
800.457.3801 or 831.457.3800

EMERGENCY
ChemWatch
Within the US & Canada: 877-715-9305
Outside the US & Canada: +800 2436 2255
(1-800-CHEMCALL) or call +613 9573 3112

SYNONYMS
C4-H5-Cl-O2, CICO2CH2CH=CH2, "formic acid, chloro-, allyl ester", "allyl chlorocarbonate", "chloroformic acid allyl ester"

Section 2 - HAZARDS IDENTIFICATION

CHEMWATCH HAZARD RATINGS

<table>
<thead>
<tr>
<th>Hazard Type</th>
<th>Min</th>
<th>Max</th>
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<tr>
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<td>Chronic</td>
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CANADIAN WHMIS SYMBOLS

Min/Nil=0
Low=1
Moderate=2
High=3
Extreme=4
EMERGENCY OVERVIEW
RISK
Reacts violently with water.
Harmful if swallowed.
Very toxic by inhalation.
Causes burns.
Risk of serious damage to eyes.
Flammable.

POTENTIAL HEALTH EFFECTS

ACUTE HEALTH EFFECTS

SWALLOWED
■ Accidental ingestion of the material may be harmful; animal experiments indicate that ingestion of less than 150 gram may be fatal or may produce serious damage to the health of the individual.
■ The material can produce chemical burns within the oral cavity and gastrointestinal tract following ingestion.
■ Ingestion of acidic corrosives may produce burns around and in the mouth, the throat and oesophagus. Immediate pain and difficulties in swallowing and speaking may also be evident.
■ Formic acid has a half life of 2.5 hours and may cause salivation, oral burning sensation, nausea, vomiting, diarrhoea, tissue damage, bleeding, shock and even death in severe cases.

EYE
■ The material can produce chemical burns to the eye following direct contact.
Vapors or mists may be extremely irritating.
■ If applied to the eyes, this material causes severe eye damage.
■ Irritation of the eyes may produce a heavy secretion of tears (lachrymation).
■ Direct eye contact with acid corrosives may produce pain, tears, sensitivity to light and burns.
Mild burns of the epithelia generally recover rapidly and completely.
■ Eye contact with formic acid liquid or its high vapor concentrations will produce irritation, inflamed conjunctiva with reddened eye and possibly corneal burns.

SKIN
■ The material can produce chemical burns following direct contact with the skin.
■ Skin contact with the material may damage the health of the individual; systemic effects may result following absorption.
■ Open cuts, abraded or irritated skin should not be exposed to this material.
■ Entry into the blood-stream, through, for example, cuts, abrasions or lesions, may produce systemic injury with harmful effects.
■ Skin contact with formic acid may cause irritation, burns, keloids and blisters.
Inability to speak, breathing and swallowing difficulty may occur depending on route and site of exposure.

INHALED
■ Inhalation of vapors or aerosols (mists, fumes), generated by the material during the course of normal handling, may produce severely toxic effects; these may be fatal.
■ Inhalation of quantities of liquid mist may be extremely hazardous, even lethal due to spasm, extreme irritation of larynx and bronchi, chemical pneumonitis and pulmonary oedema.
■ Hydrogen chloride (HCl) vapor or fumes present a hazard from a single acute exposure. Exposures of 1300 to 2000 ppm have been lethal to humans in a few minutes.
■ Corrosive acids can cause irritation of the respiratory tract, with coughing, choking and mucous membrane damage.
There may be dizziness, headache, nausea and weakness.
Excessive inhalation of formic acid vapor can produce respiratory symptoms, headache, nausea and weakness, but the warning properties of formic acid helps to deter exposure and hence prevent systemic effects.

Eye contact, inhalation or skin exposure to chloroformate and its products causes an irritant effect which may be initially difficult to perceive, but becomes progressively worse with prolonged exposure. It may lead to death by causing breathing difficulties and lasting damage to the respiratory system.

The material can cause respiratory irritation in some persons. The body's response to such irritation can cause further lung damage.

CHRONIC HEALTH EFFECTS

- Substance accumulation, in the human body, may occur and may cause some concern following repeated or long-term occupational exposure.

Chronic minor exposure to hydrogen chloride (HCl) vapor or fume may cause discoloration or erosion of the teeth, bleeding of the nose and gums; and ulceration of the nasal mucous membranes.

Repeated exposures of animals to concentrations of about 34 ppm HCl produced no immediate toxic effects. Workers exposed to hydrochloric acid suffered from gastritis and a number of cases of chronic bronchitis have also been reported.

Repeated or prolonged exposure to dilute solutions of HCl may cause dermatitis.

Repeated or prolonged exposure to acids may result in the erosion of teeth, swelling and/or ulceration of mouth lining. Irritation of airways to lung, with cough, and inflammation of lung tissue often occurs. Chronic exposure may inflame the skin or conjunctiva.

Chronic occupational exposures to formic acid may cause nausea and albumin or blood in the urine.

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**Section 3 - COMPOSITION / INFORMATION ON INGREDIENTS**

<table>
<thead>
<tr>
<th>NAME</th>
<th>CAS RN</th>
<th>%</th>
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<tbody>
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<td>hydrogen chloride</td>
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<td>formic acid</td>
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**Section 4 - FIRST AID MEASURES**

**SWALLOWED**

- For advice, contact a Poisons Information Centre or a doctor at once.
- Urgent hospital treatment is likely to be needed.
- If swallowed do NOT induce vomiting.
- If vomiting occurs, lean patient forward or place on left side (head-down position, if possible) to maintain open airway and prevent aspiration.

**EYE**

If this product comes in contact with the eyes

- Immediately hold eyelids apart and flush the eye continuously with running water.
- Ensure complete irrigation of the eye by keeping eyelids apart and away from eye and moving the eyelids by occasionally lifting the upper and lower lids.
- Continue flushing until advised to stop by the Poisons Information Centre or a doctor, or for at least 15 minutes.
- Transport to hospital or doctor without delay.

**SKIN**

If skin or hair contact occurs

- Immediately flush body and clothes with large amounts of water, using safety shower if available.
- Quickly remove all contaminated clothing, including footwear.
- Wash skin and hair with running water. Continue flushing with water until advised to stop by the Poisons Information Centre.
- Transport to hospital, or doctor.

**INHALED**
If fumes or combustion products are inhaled remove from contaminated area.
Lay patient down. Keep warm and rested.
Prostheses such as false teeth, which may block airway, should be removed, where possible, prior to initiating first aid procedures.
Apply artificial respiration if not breathing, preferably with a demand valve resuscitator, bag-valve mask device, or pocket mask as trained. Perform CPR if necessary.
Inhalation of vapors or aerosols (mists, fumes) may cause lung oedema.
Corrosive substances may cause lung damage (e.g. lung oedema, fluid in the lungs).
As this reaction may be delayed up to 24 hours after exposure, affected individuals need complete rest (preferably in semi-recumbent posture) and must be kept under medical observation even if no symptoms are (yet) manifested.
Before any such manifestation, the administration of a spray containing a dexamethasone derivative or beclomethasone derivative may be considered.

NOTES TO PHYSICIAN
For chloroformates
• Patients exposed only to chloroformates gas do not pose a significant risk of secondary contamination. Patients whose clothing or skin is contaminated with liquid or solvents containing chloroformates can secondarily contaminate rescue and medical personnel by direct contact or through off-gassing chloroformates.
• Chloroformates irritate lungs severely. Because of its slow hydrolysis in the alveoli, serious lung effects and, therefore, symptoms of toxicity may be delayed up to 24 hours. Signs of accumulation of fluid in the lungs (shortness of breath, cyanosis, expectoration, cough) do not usually appear for hours after even severely toxic exposures.
• There is no antidote to be administered to counteract the effects of chloroformates. Treatment consists of supportive measures.
For acute or short term repeated exposures to strong acids
• Airway problems may arise from laryngeal edema and inhalation exposure. Treat with 100% oxygen initially.
• Respiratory distress may require cricothyroidotomy if endotracheal intubation is contraindicated by excessive swelling
• Intravenous lines should be established immediately in all cases where there is evidence of circulatory compromise.
• Strong acids produce a coagulation necrosis characterised by formation of a coagulum (eschar) as a result of the dessicating action of the acid on proteins in specific tissues.
Depending on the degree of exposure, periodic medical examination is indicated. The symptoms of lung oedema often do not manifest until a few hours have passed and they are aggravated by physical effort.

<table>
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<th>Section 5 - FIRE FIGHTING MEASURES</th>
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<tr>
<td>Vapor Pressure (mmHg)</td>
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<td>Upper Explosive Limit (%)</td>
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<td>Specific Gravity (water=1)</td>
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<td>Lower Explosive Limit (%)</td>
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EXTINGUISHING MEDIA
Small Fire
• CO2, dry chemical, dry sand, alcohol-resistant foam (AFFF).
• NOTE Most foams will react with the material and release corrosive/toxic gases
Large Fire
• Water spray, fog or alcohol-resistant foam.
• Move containers from fire area if you can do it without risk.

FIRE FIGHTING
• Alert Fire Brigade and tell them location and nature of hazard.
• May be violently or explosively reactive.
• Wear full body protective clothing with breathing apparatus.
• Prevent, by any means available, spillage from entering drains or water course.
When any large container (including road and rail tankers) is involved in a fire, consider evacuation by 800 metres in all directions.

GENERAL FIRE HAZARDS/HAZARDOUS COMBUSTIBLE PRODUCTS
• Liquid and vapor are flammable.
• Moderate fire hazard when exposed to heat or flame.
• Vapor forms an explosive mixture with air.
• Moderate explosion hazard when exposed to heat or flame.
Combustion products include carbon dioxide (CO2), carbon monoxide (CO), hydrogen chloride, phosgene, other pyrolysis products typical of burning organic material.
May emit poisonous fumes.

FIRE INCOMPATIBILITY
• Avoid contamination with oxidising agents i.e. nitrates, oxidising acids, chlorine bleaches, pool chlorine etc. as ignition may result.

Section 6 - ACCIDENTAL RELEASE MEASURES

MINOR SPILLS
• Cover spill with DRY earth, DRY sand or other non-combustible material followed with plastic sheet to minimise spreading or contact with rain.
• Use clean non-sparking tools to collect material and place it into loosely covered plastic containers for later disposal.
• Drains for storage or use areas should have retention basins for pH adjustments and dilution of spills before discharge or disposal of material.
• Check regularly for spills and leaks.

MAJOR SPILLS
• All equipment used when handling the product must be grounded.
• Do not touch damaged containers or spilled material unless wearing appropriate protective clothing.
• A vapor suppressing foam may be used to reduce vapors.
• DO NOT GET WATER on spilled substance or inside containers.
• DO NOT touch the spill material.
• Clear area of personnel and move upwind.
• Alert Fire Brigade and tell them location and nature of hazard.
• May be violently or explosively reactive.
• Wear full body protective clothing with breathing apparatus.

Section 7 - HANDLING AND STORAGE

PROCEDURE FOR HANDLING
• DO NOT allow clothing wet with material to stay in contact with skin.
• Avoid all personal contact, including inhalation.
• Wear protective clothing when risk of exposure occurs.
• Use in a well-ventilated area.
• Prevent concentration in hollows and sumps.
• Containers, even those that have been emptied, may contain explosive vapors.
• Do NOT cut, drill, grind, weld or perform similar operations on or near containers.

RECOMMENDED STORAGE METHODS
• Glass container is suitable for laboratory quantities.
• Lined metal can, lined metal pail/ can.
• Plastic pail.
• Polyliner drum.
• Packing as recommended by manufacturer.
For low viscosity materials
- Drums and jerricans must be of the non-removable head type.
- Where a can is to be used as an inner package, the can must have a screwed enclosure.

< All inner and sole packagings for substances that have been assigned to Packaging Groups I or II on the basis of inhalation toxicity criteria, must be hermetically sealed.

**STORAGE REQUIREMENTS**
- Store in original containers.
- Keep containers securely sealed.
- Store in a cool, dry, well-ventilated area.
- Store away from incompatible materials and foodstuff containers.

### Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

**EXPOSURE CONTROLS**

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<tr>
<th>Source</th>
<th>Material</th>
<th>TWA ppm</th>
<th>TWA mg/m³</th>
<th>STEL ppm</th>
<th>STEL mg/m³</th>
<th>Peak ppm</th>
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<th>TWA F/CC</th>
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<tr>
<td>US - Michigan Exposure Limits for Air Contaminants</td>
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<td>5</td>
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<td>US - Wyoming Toxic and Hazardous Substances Table Z1 Limits for Air Contaminants</td>
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<td>Canada - Quebec Permissible Exposure Values for Airborne Contaminants (English)</td>
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</table>

**PERSONAL PROTECTION**
RESPIRATOR
- Type ABE-P Filter of sufficient capacity. (AS/NZS 1716 & 1715, EN 1432000 & 1492001, ANSI Z88 or national equivalent)

EYE
- Chemical goggles.
- Full face shield may be required for supplementary but never for primary protection of eyes.
- Contact lenses may pose a special hazard; soft contact lenses may absorb and concentrate irritants. A written policy document, describing the wearing of lens or restrictions on use, should be created for each workplace or task. This should include a review of lens absorption and adsorption for the class of chemicals in use and an account of injury experience. Medical and first-aid personnel should be trained in their removal and suitable equipment should be readily available. In the event of chemical exposure, begin eye irrigation immediately and remove contact lens as soon as practicable. Lens should be removed at the first signs of eye redness or irritation - lens should be removed in a clean environment only after workers have washed hands thoroughly. [CDC NIOSH Current Intelligence Bulletin 59], [AS/NZS 1336 or national equivalent]

HANDS/FEET
- Wear chemical protective gloves, eg. PVC.
- Wear safety footwear or safety gumboots, eg. Rubber
- When handling corrosive liquids, wear trousers or overalls outside of boots, to avoid spills entering boots.
Suitability and durability of glove type is dependent on usage. Important factors in the selection of gloves include:
  - frequency and duration of contact,
  - chemical resistance of glove material,
  - glove thickness and
dexterity

OTHER
- Overalls.
- Eyewash unit.
- Barrier cream.
- Skin cleansing cream.
- Some plastic personal protective equipment (PPE) (e.g. gloves, aprons, overshoes) are not recommended as they may produce static electricity.
- For large scale or continuous use wear tight-weave non-static clothing (no metallic fasteners, cuffs or pockets), non sparking safety footwear.

ENGINEERING CONTROLS
- Engineering controls are used to remove a hazard or place a barrier between the worker and the hazard. Well-designed engineering controls can be highly effective in protecting workers and will typically be independent of worker interactions to provide this high level of protection.
The basic types of engineering controls are:
Process controls which involve changing the way a job activity or process is done to reduce the risk.
Enclosure and/or isolation of emission source which keeps a selected hazard "physically" away from the worker and ventilation that strategically "adds" and "removes" air in the work environment.

Section 9 - PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL PROPERTIES
- Liquid.
- Corrosive.
- Acid.
Toxic or noxious vapors/gas. Reacts violently with water.

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
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</thead>
<tbody>
<tr>
<td>State</td>
<td>Liquid</td>
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<tr>
<td>Molecular Weight</td>
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</tr>
<tr>
<td>Melting Range (°F)</td>
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</tr>
<tr>
<td>Boiling Range (°F)</td>
<td>228- 230</td>
</tr>
<tr>
<td>Flash Point (°F)</td>
<td>88</td>
</tr>
<tr>
<td>Decomposition Temp (°F)</td>
<td>Not available</td>
</tr>
<tr>
<td>Autoignition Temp (°F)</td>
<td>Not available</td>
</tr>
<tr>
<td>Upper Explosive Limit (%)</td>
<td>Not available</td>
</tr>
<tr>
<td>Lower Explosive Limit (%)</td>
<td>Not available</td>
</tr>
<tr>
<td>Volatile Component (%vol)</td>
<td>100</td>
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<tr>
<td>Solubility in water (g/L)</td>
<td>Reacts</td>
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<tr>
<td>Viscosity</td>
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</tr>
<tr>
<td>Not applicable</td>
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<tr>
<td>pH (1% solution)</td>
<td>Not available</td>
</tr>
<tr>
<td>pH (as supplied)</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Vapor Pressure (mmHg)</td>
<td>189.766 @ 20 C</td>
</tr>
<tr>
<td>Specific Gravity (water=1)</td>
<td>1.136</td>
</tr>
<tr>
<td>Relative Vapor Density (air=1)</td>
<td>&gt;1</td>
</tr>
<tr>
<td>Evaporation Rate</td>
<td>Fast</td>
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</tbody>
</table>

APPEARANCE
Liquid; decomposes in water.

Section 10 - CHEMICAL STABILITY

CONDITIONS CONTRIBUTING TO INSTABILITY
- Presence of incompatible materials.
- Product is considered stable.
- Hazardous polymerisation will not occur.

STORAGE INCOMPATIBILITY
- Chloroformates
  - reaction with sulfoxides may be violent or explosive in the absence of diluent or other effective control of reaction rate; violent reactions may be explained in terms of exothermic polymerisation of formaldehyde which is formed under a variety of conditions by interaction of the sulfoxide with reactive halides.
  - may react with rust on corroded materials
  - avoid contact with metallic compounds which may act as decomposition catalysts

Hydrogen chloride
- reacts strongly with strong oxidisers (releasing chlorine gas), acetic anhydride, caesium cyanotridecayhydrodecaborate(2-), ethylidene difluoride, hexalithium disilicide, metal acetylide, sodium, silicon dioxide, tetrascium tetranitride, and many organic materials
- is incompatible with alkaline materials, acetic anhydride, acetylenes, aliphatic amines, alkanolamines, alkylene oxides, aluminium, aluminium-titanium alloys, aromatic amines, amines, amides, 2-aminoethanol, ammonia, ammonium hydroxide, borides, calcium phosphate, carbides, carbonates, cyanides, chlorosulfonic acid, ethylenediamine, ethyleneimine, epichlorohydrin, formaldehyde, isocyanates, metals, metal oxides, metal hydrides, metal acetylenes, metal carbides, oleum, organic anhydrides, potassium permanganate, perchloric acid, phosphides, 3-propiolactone, silicides, sulfides, sulfites, sulfuric acid, uranium phosphate, vinyl acetate, vinylidene fluoride
- attacks most metals forming flammable hydrogen gas, and some plastics, rubbers and coatings
- reacts with zinc, brass, galvanised iron, aluminium, copper and copper alloys
- Contact with moisture or water may generate heat

Acyl halides
- tend to react violently with protic organic solvents, water, and the aprotic solvents, dimethylformamide and dimethyl sulfoxide.
- may react dangerously with ethers.
- may react violently or explosively with sulfoxides in the absence of diluent or other effective control of reaction rate; violent reactions may be explained in terms of exothermic polymerisation of formaldehyde which is formed under a variety of conditions by interaction of the sulfoxide with reactive halides.
- Reacts with mild steel, galvanised steel / zinc producing hydrogen gas which may form an explosive mixture with air.
Formic acid
- reacts explosively or violently strong oxidisers, with hydrogen peroxide, furfuryl alcohol, hypochlorites, isocyanides, nitromethane, chromic acid, nitric acid, phosphorus pentoxide, strong bases, thallium nitrate, nitromethane.
- reacts with concentrated sulfuric acid to produce carbon dioxide
- is incompatible with alkalis, ammonia, aliphatic amines, alkanolamines, furfuryl alcohol, isocyanates, alkylene oxides, epichlorohydrin, palladium
- is a strong reducing agent
- Segregate from alcohol, water.
- Avoid strong acids, bases.
- Avoid reaction with oxidising agents
- NOTE May develop pressure in containers; open carefully. Vent periodically.

For incompatible materials - refer to Section 7 - Handling and Storage.

### Section 11 - TOXICOLOGICAL INFORMATION

**allyl chloroformate**

**TOXICITY AND IRRITATION**
- unless otherwise specified data extracted from RTECS - Register of Toxic Effects of Chemical Substances.
- Asthma-like symptoms may continue for months or even years after exposure to the material ceases. This may be due to a non-allergic condition known as reactive airways dysfunction syndrome (RADS) which can occur following exposure to high levels of highly irritating compound.
- The material may be irritating to the eye, with prolonged contact causing inflammation. Repeated or prolonged exposure to irritants may produce conjunctivitis.
- The material may produce severe irritation to the eye causing pronounced inflammation. Repeated or prolonged exposure to irritants may produce conjunctivitis.
- The material may cause skin irritation after prolonged or repeated exposure and may produce on contact skin redness, swelling, the production of vesicles, scaling and thickening of the skin.

**CARCINOGEN**

<table>
<thead>
<tr>
<th>Chemical</th>
<th>Source</th>
<th>IARC</th>
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<tbody>
<tr>
<td>allyl chloroformate</td>
<td>US - Rhode Island Hazardous Substance List</td>
<td>IARC</td>
</tr>
<tr>
<td>Hydrochloric acid</td>
<td>International Agency for Research on Cancer (IARC) - Agents Reviewed by the IARC Monographs</td>
<td>Group 3</td>
</tr>
<tr>
<td>Acid mists, strong inorganic</td>
<td>International Agency for Research on Cancer (IARC) - Agents Reviewed by the IARC Monographs</td>
<td>Group 1</td>
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<td>Hydrogen chloride</td>
<td>US ACGIH Threshold Limit Values (TLV) - Carcinogens</td>
<td>Carcinogen Category A4</td>
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<td>US - Rhode Island Hazardous Substance List</td>
<td>IARC</td>
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<td>hydrogen chloride</td>
<td>US - Maine Chemicals of High Concern List</td>
<td>Carcinogen A4</td>
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<td>hydrogen chloride</td>
<td>Canada - Prince Edward Island Occupational Exposure Limits - Carcinogens</td>
<td>Notes TLV® Basis URT irrit</td>
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<td>hydrogen chloride</td>
<td>Canada - Prince Edward Island Occupational Exposure Limits - Carcinogens</td>
<td>Notes TLV Basis upper respiratory tract irritation</td>
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<tr>
<td>formic acid</td>
<td>US - Rhode Island Hazardous Substance List</td>
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</table>

### Section 12 - ECOLOGICAL INFORMATION

This material and its container must be disposed of as hazardous waste.
Section 13 - DISPOSAL CONSIDERATIONS

US EPA Waste Number & Descriptions
A. General Product Information
Ignitability characteristic: use EPA hazardous waste number D001 (waste code I)
Corrosivity characteristic: use EPA hazardous waste number D002 (waste code C)
B. Component Waste Numbers
When formic acid is present as a solid waste as a discarded commercial chemical product, off-specification species, as a container residue, or a spill residue, use EPA waste number U123 (waste code C,T).

Disposal Instructions
All waste must be handled in accordance with local, state and federal regulations.
• Containers may still present a chemical hazard/danger when empty.
• Return to supplier for reuse/recycling if possible.
Otherwise:
• If container can not be cleaned sufficiently well to ensure that residuals do not remain or if the container cannot be used to store the same product, then puncture containers, to prevent re-use, and bury at an authorised landfill.
• Where possible retain label warnings and MSDS and observe all notices pertaining to the product.
Legislation addressing waste disposal requirements may differ by country, state and/or territory. Each user must refer to laws operating in their area. In some areas, certain wastes must be tracked. 
A Hierarchy of Controls seems to be common - the user should investigate:
• Reduction
• Reuse
• Recycling
• Disposal (if all else fails)
This material may be recycled if unused, or if it has not been contaminated so as to make it unsuitable for its intended use. If it has been contaminated, it may be possible to reclaim the product by filtration, distillation or some other means. Shelf life considerations should also be applied in making decisions of this type. Note that properties of a material may change in use, and recycling or reuse may not always be appropriate.
• DO NOT allow wash water from cleaning or process equipment to enter drains.
• It may be necessary to collect all wash water for treatment before disposal.
• In all cases disposal to sewer may be subject to local laws and regulations and these should be considered first.
• Where in doubt contact the responsible authority.
• Recycle wherever possible.
• Consult manufacturer for recycling options or consult local or regional waste management authority for disposal if no suitable treatment or disposal facility can be identified.
• Treat and neutralise at an approved treatment plant. Treatment should involve: Neutralisation with soda-ash or soda-lime followed by: burial in a land-fill specifically licenced to accept chemical and/or pharmaceutical wastes or Incineration in a licenced apparatus
• Decontaminate empty containers with 5% aqueous sodium hydroxide or soda ash, followed by water. Observe all label safeguards until containers are cleaned and destroyed.

Section 14 - TRANSPORTATION INFORMATION

DOT:
Symbols: None Hazard class or Division: 6.1
Identification Numbers: UN1722 PG: I
Label Codes: 6.1, 3, 8 Special provisions: 2, B9, B14, B32, N41, T20, TP2, TP13, TP38, TP45
Packaging: Exceptions: None Packaging: Non-bulk: 227
Packaging: Exceptions: None  Quantity limitations:  
Passenger aircraft/rail: Forbidden

Quantity Limitations: Cargo only: Forbidden  Vessel stowage: Location: D

Vessel stowage: Other: 40

Hazardous materials descriptions and proper shipping names:
Allyl chloroformate

**Air Transport IATA:**

<table>
<thead>
<tr>
<th>ICAO/IATA Class:</th>
<th>6.1</th>
<th>ICAO/IATA Subrisk:</th>
<th>3, 8</th>
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<tr>
<td>UN/ID Number:</td>
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<td>Packing Group:</td>
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Special provisions: None  

Cargo Only

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Shipping name: ALLYL CHLOROFORMATE

**Maritime Transport IMDG:**

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<th>IMDG Subrisk:</th>
<th>3, 8</th>
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<table>
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<tr>
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<th>F-E,S-C</th>
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</table>

Shipping name: ALLYL CHLOROFORMATE

**Section 15 - REGULATORY INFORMATION**

Allyl chloroformate (CAS: 2937-50-0) is found on the following regulatory lists:


Regulations for ingredients

Hydrogen chloride (CAS: 7647-01-0) is found on the following regulatory lists:

formic acid (CAS: 64-18-6) is found on the following regulatory lists;

- US EPA Master Testing List - Index I Chemicals Listed
- US EPCRA Section 313 Chemical List
- US FDA CFSA GRAS Substances evaluated by the Select Committee on GRAS Substances (SCOGS)
- US Food Additive Database
- US List of Lists - Consolidated List of Chemicals Subject to EPCRA, CERCLA and Section 112(r) of the Clean Air Act
- "US NIOSH Recommended Exposure Limits (RELS)
- "US OSHA Permissible Exposure Levels (PELS) - Table Z-1"
- "US Postal Service (USPS) Hazardous Materials Table: Postal Service Mailability Guide"
- "US SARA Section 302 Extremely Hazardous Substances"
- "US Spacecraft Maximum Allowable Concentrations (SMACs) for Airborne Contaminants"
- "US Toxic Substances Control Act (TSCA) - Chemical Substance Inventory"
- "US USDA National Organic Program - Synthetic substances allowed for use in organic crop production"
Section 16 - OTHER INFORMATION

LIMITED EVIDENCE

- Skin contact may produce health damage*.  
- Cumulative effects may result following exposure*.  
  * (limited evidence).

Denmark Advisory list for selfclassification of dangerous substances

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<thead>
<tr>
<th>Substance</th>
<th>CAS</th>
<th>Suggested codes</th>
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<td>Xn; R22 Xi; R38</td>
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<tr>
<td>hydrogen chloride</td>
<td>7647-01-0</td>
<td>Xn; R22 Xi; R38</td>
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<tr>
<td>formic acid</td>
<td>64-18-6</td>
<td>Xn; R22 Xi; R38</td>
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</table>

Reasonable care has been taken in the preparation of this information, but the author makes no warranty of merchantability or any other warranty, expressed or implied, with respect to this information. The author makes no representations and assumes no liability for any direct, incidental or consequential damages resulting from its use. For additional technical information please call our toxicology department on +800 CHEMCALL.

- Classification of the preparation and its individual components has drawn on official and authoritative sources as well as independent review by the Chemwatch Classification committee using available literature references.  
- A list of reference resources used to assist the committee may be found at: www.chemwatch.net/references.

- The (M)SDS is a Hazard Communication tool and should be used to assist in the Risk Assessment. Many factors determine whether the reported Hazards are Risks in the workplace or other settings.