

# N-BUTYL CHLOROFORMATE

BFO

## CAUTIONARY RESPONSE INFORMATION

|   |  |
|---|--|
| <b>Common Synonyms</b><br>n-Butyl chloroformate<br>Carbonochloridic acid, butyl ester<br>Chloroformic acid, n-butyl ester<br>Chloroformic acid, n-butyl ester   | Liquid<br><br>Colorless to light yellow<br><br>Unpleasant odor<br><br>Sinks and reacts in water. Flammable, irritating vapor is produced.  |
| <p>Shut off ignition sources. Call fire department.<br/>Avoid contact with liquid and vapor. Keep people away.<br/>Stay upwind. Use water spray to "knock down" vapor.<br/>Notify local health and pollution control agencies.<br/>Protect water intakes.</p> |  |
| <b>Fire</b>   | <p>FLAMMABLE<br/>POISONOUS GASES MAY BE PRODUCED IN FIRE.<br/>Containers may explode in fire.<br/>Flashback along vapor trail may occur.<br/>Vapor may explode if ignited in an enclosed area.<br/>Extinguish with water, dry chemical, alcohol foam, carbon dioxide.<br/>Cool exposed containers with water.</p>  |
| <b>Exposure</b>   | <p>CALL FOR MEDICAL AID.</p> <p>VAPOR<br/>Irritating to eyes, nose and throat.<br/>If inhaled will cause difficult breathing.<br/>Move victim to fresh air.<br/>If breathing has stopped, give artificial respiration.<br/>If breathing is difficult, give oxygen.</p> <p>LIQUID<br/>POISONOUS IF SWALLOWED.<br/>Will burn skin and eyes.<br/>Remove contaminated clothing and shoes.<br/>Flush affected areas with plenty of water.<br/>IF IN EYES, hold eyelids open and flush with plenty of water.<br/>DO NOT INDUCE VOMITING.</p> |
| <b>Water Pollution</b>  | <p>Effect of low concentrations on aquatic life is unknown.<br/>May be dangerous if it enters water intakes.<br/>Notify local health and wildlife officials.<br/>Notify operators of nearby water intakes.</p>   |

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Dilute and disperse  
Do not burn

### 2. CHEMICAL DESIGNATIONS

2.1 **CG Compatibility Group:** Not listed.  
2.2 **Formula:** C<sub>4</sub>H<sub>7</sub>ClO<sub>2</sub>  
2.3 **IMO/UN Designation:** 6.1/2743  
2.4 **DOT ID No.:** 2743  
2.5 **CAS Registry No.:** 592-34-7  
2.6 **NAERG Guide No.:** 155  
2.7 **Standard Industrial Trade Classification:** 51374

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** NIOSH approved airline respirator with full face piece; chemical protective gloves and clothing.
- 3.2 **Symptoms Following Exposure:** Inhalation of vapor irritates nose and throat and can cause delayed pulmonary edema. Liquid irritates eyes and causes severe skin burns and irreversible skin damage if allowed to remain. Can cause blindness. Ingestion causes burns of mouth and stomach.
- 3.3 **Treatment of Exposure:** INHALATION: Remove victim from exposure; if breathing stops, administer artificial respiration; if breathing is difficult, give oxygen; call physician. EYES: Irrigate with copious amounts of water for at least 15 min.; call physician if needed. SKIN: Flush with water for 15 min.; get medical attention for burns. INGESTION: Give large amounts of water; do NOT induce vomiting; get medical attention.
- 3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Currently not available.  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 77°F C.C.  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Water, dry chemical, alcohol foam, carbon dioxide.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Irritating and toxic hydrogen chloride and phosgene may be formed.  
4.6 **Behavior in Fire:** Vapor is heavier than air and may travel a considerable distance to a source of ignition and flashback.  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 28.6 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 10.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Reacts slowly, evolving hydrogen chloride (hydrochloric acid). Reaction can be hazardous if water is hot.  
5.2 **Reactivity with Common Materials:** Currently not available  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Flood with water, rinse with sodium bicarbonate or lime solution.  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 97 + %  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Pressure-vacuum  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Poison  
8.2 **49 CFR Class:** 6.1  
8.3 **49 CFR Package Group:** I  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 136.58  
9.3 **Boiling Point at 1 atm:** 280.4°F = 138°C = 411.2°K  
9.4 **Freezing Point:** Currently not available  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 1.0513 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** 4.72  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available  
9.12 **Latent Heat of Vaporization:** Currently not available  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

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| 9.20<br>SATURATED LIQUID DENSITY |                       | 9.21<br>LIQUID HEAT CAPACITY |   | 9.22<br>LIQUID THERMAL CONDUCTIVITY |   | 9.23<br>LIQUID VISCOSITY   |   |
|----------------------------------|-----------------------|------------------------------|---|-------------------------------------|---|----------------------------|---|
| Temperature<br>(degrees F)       | Pounds per cubic foot | Temperature<br>(degrees F)   | British thermal unit per<br>pound-F   | Temperature<br>(degrees F)          | British thermal unit inch<br>per hour-square foot-F   | Temperature<br>(degrees F) | Centipoise  |
| 68                               | 65.630                |                              | C<br>U<br>R<br>R<br>E<br>N<br>T<br>L<br>Y<br><br>N<br>O<br>T<br><br>A<br>V<br>A<br>I<br>L<br>A<br>B<br>L<br>E |                                     | C<br>U<br>R<br>R<br>E<br>N<br>T<br>L<br>Y<br><br>N<br>O<br>T<br><br>A<br>V<br>A<br>I<br>L<br>A<br>B<br>L<br>E |                            | C<br>U<br>R<br>R<br>E<br>N<br>T<br>L<br>Y<br><br>N<br>O<br>T<br><br>A<br>V<br>A<br>I<br>L<br>A<br>B<br>L<br>E |

| 9.24<br>SOLUBILITY IN WATER |   | 9.25<br>SATURATED VAPOR PRESSURE |   | 9.26<br>SATURATED VAPOR DENSITY |   | 9.27<br>IDEAL GAS HEAT CAPACITY  |   |
|-----------------------------|---|----------------------------------|---|---------------------------------|---|--|---|
| Temperature<br>(degrees F)  | Pounds per 100 pounds<br>of water   | Temperature<br>(degrees F)       | Pounds per square inch  | Temperature<br>(degrees F)      | Pounds per cubic foot   | Temperature<br>(degrees F)   | British thermal unit per<br>pound-F   |
|                             | C<br>U<br>R<br>R<br>E<br>N<br>T<br>L<br>Y<br><br>N<br>O<br>T<br><br>A<br>V<br>A<br>I<br>L<br>A<br>B<br>L<br>E |                                  | C<br>U<br>R<br>R<br>E<br>N<br>T<br>L<br>Y<br><br>N<br>O<br>T<br><br>A<br>V<br>A<br>I<br>L<br>A<br>B<br>L<br>E |                                 | C<br>U<br>R<br>R<br>E<br>N<br>T<br>L<br>Y<br><br>N<br>O<br>T<br><br>A<br>V<br>A<br>I<br>L<br>A<br>B<br>L<br>E | 0<br>25<br>50<br>75<br>100<br>125<br>150<br>175<br>200<br>225<br>250<br>275<br>300<br>325<br>350<br>375<br>400<br>425<br>450<br>475<br>500<br>525<br>550<br>575<br>600 | 0.226<br>0.233<br>0.239<br>0.246<br>0.253<br>0.259<br>0.266<br>0.273<br>0.279<br>0.286<br>0.293<br>0.299<br>0.306<br>0.312<br>0.319<br>0.326<br>0.332<br>0.339<br>0.346<br>0.352<br>0.359<br>0.366<br>0.372<br>0.379<br>0.386 |