

## 1. Material Identification

**Product Name** : Terbufos  
**Catalog Number** : io-3059  
**CAS Number** : 13071-79-9  
**Identified uses** : Laboratory chemicals, manufacture of chemical compounds  
**Company** : Ionz

>> R&D Use only

## 2. Hazards Identification

### GHS Classification:

Flammable liquid ( category 2 )  
Acute toxicity, oral (Category 3)  
Acute toxicity, dermal (Category 3)  
Acute toxicity, inhalation (Category 3)  
Specific target organ toxicity, single exposure (Category 1)

### Pictogram(s)



### GHS Hazard Statements

- >> H300+H310+H330 (37.3%): Fatal if swallowed, in contact with skin or if inhaled [Danger Acute toxicity, oral; acute toxicity, dermal; acute toxicity, inhalation]
- >> H300 (100%): Fatal if swallowed [Danger Acute toxicity, oral]
- >> H310 (100%): Fatal in contact with skin [Danger Acute toxicity, dermal]
- >> H330 (37.3%): Fatal if inhaled [Danger Acute toxicity, inhalation]
- >> H400 (100%): Very toxic to aquatic life [Warning Hazardous to the aquatic environment, acute hazard]
- >> H410 (100%): Very toxic to aquatic life with long lasting effects [Warning Hazardous to the aquatic environment, long-term hazard]

### Precautionary Statement Codes

- >> P260, P262, P264, P270, P271, P273, P280, P284, P301+P316, P302+P352, P304+P340, P316, P320, P321, P330, P361+P364, P391, P403+P233, P405, and P501

### Health Hazards:

- >> This material may be fatal if swallowed, inhaled, or absorbed through the skin. Repeated inhalation or skin contact may progressively increase susceptibility to poisoning. (EPA, 1998)
- >> This is a liquid organophosphorus pesticide. Fire may produce irritating or poisonous gases. Hydrolyzes under alkaline conditions. (EPA, 1998)
- >> Combustible.

### 3. Composition/Information On Ingredients

**Chemical name** : Terbufos  
**CAS Number** : 13071-79-9  
**Molecular Formula** : C<sub>9</sub>H<sub>21</sub>O<sub>2</sub>PS<sub>3</sub>  
**Molecular Weight** : 288.4000 g/mol

### 4. First Aid Measures

#### First Aid:

- >> Note: Terbufos is a cholinesterase inhibitor.
- >> Signs and Symptoms of Acute Terbufos Exposure: Acute exposure to terbufos may produce the following signs and symptoms: pinpoint pupils, blurred vision, headache, dizziness, muscle spasms, and profound weakness. Vomiting, diarrhea, abdominal pain, seizures, and coma may also occur. The heart rate may decrease following oral exposure or increase following dermal exposure. Chest pain may be noted. Hypotension (low blood pressure) may be noted, although hypertension (high blood pressure) is not uncommon. Respiratory symptoms include dyspnea (shortness of breath), respiratory depression, and respiratory paralysis. Psychosis may occur.
- >> Emergency Life-Support Procedures: Acute exposure to terbufos may require decontamination and life support for the victims. Emergency personnel should wear protective clothing appropriate to the type and degree of contamination. Air-purifying or supplied-air respiratory equipment should also be worn, as necessary. Rescue vehicles should carry supplies such as plastic sheeting and disposable plastic bags to assist in preventing spread of contamination.
- >> Inhalation Exposure:
  - >> 1. Move victims to fresh air. Emergency personnel should avoid self-exposure to terbufos.
  - >> 2. Evaluate vital signs including pulse and respiratory rate, and note any trauma. If no pulse is detected, provide CPR. If not breathing, provide artificial respiration. If breathing is labored, administer oxygen or other respiratory support.
  - >> 3. Obtain authorization and/or further instructions from the local hospital for administration of an antidote or performance of other invasive procedures.
  - >> 4. Transport to a health care facility.
- >> Dermal/Eye Exposure:
  - >> 1. Remove victims from exposure. Emergency personnel should avoid self-exposure to terbufos.
  - >> 3. Remove contaminated clothing as soon as possible.
  - >> 4. If eye exposure has occurred, eyes must be flushed with lukewarm water for at least 15 minutes.
  - >> 5. Wash exposed skin areas three times with soap and water.
  - >> 6. Obtain authorization and/or further instructions from the local hospital for administration of an antidote or performance of other invasive procedures.
  - >> 7. Transport to a health care facility.
- >> Ingestion Exposure:
  - >> 1. Evaluate vital signs including pulse and respiratory rate, and note any trauma. If no pulse is detected, provide CPR. If not breathing, provide artificial respiration. If breathing is labored, administer oxygen or other respiratory support.
  - >> 2. Obtain authorization and/or further instructions from the local hospital for administration of an antidote or performance of other invasive procedures.
  - >> 3. Vomiting may be induced with syrup of Ipecac. If elapsed time since ingestion of terbufos is unknown or suspected to be greater than 30 minutes, do not induce vomiting and proceed to Step
  - >> 4. Ipecac should not be administered to children under 6 months of age. Warning: Ingestion of terbufos may result in sudden onset of seizures or loss of consciousness. Syrup of Ipecac should be administered only if victims are alert, have an active gag-reflex, and show no signs of impending seizure or coma. If ANY uncertainty exists, proceed to Step
  - >> 4. The following dosages of Ipecac are recommended: children up to 1 year old, 10 mL (1/3 oz); children 1 to 12 years old, 15 mL (1/2 oz); adults, 30 mL (1 oz). Ambulate (walk) the victims and give large quantities of water. If vomiting has not occurred after 15 minutes, Ipecac may be readministered. Continue to ambulate and give water to the victims. If vomiting has not occurred within 15 minutes after second administration of Ipecac, administer activated charcoal.
  - >> 4. Activated charcoal may be administered if victims are conscious and alert. Use 15 to 30 g (1/2 to 1 oz) for children, 50 to 100 g (1-3/4 to 3-1/2 oz) for adults, with 125 to 250 mL (1/2 to 1 cup) of water.

- >> 5. Promote excretion by administering a saline cathartic or sorbitol to conscious and alert victims. Children require 15 to 30 g (1/2 to 1 oz) of cathartic; 50 to 100 g (1-3/4 to 3-1/2 oz) is recommended for adults.
- >> 6. Transport to a health care facility. (EPA, 1998)

#### First Aid Measures

##### Inhalation First Aid

- >> Fresh air, rest. Refer immediately for medical attention.

##### Skin First Aid

- >> Remove contaminated clothes. Rinse and then wash skin with water and soap. Refer immediately for medical attention.

##### Eye First Aid

- >> Rinse with plenty of water (remove contact lenses if easily possible). Refer for medical attention.

##### Ingestion First Aid

- >> Rinse mouth. Refer immediately for medical attention. Give a slurry of activated charcoal in water to drink.

## 5. Fire Fighting Measures

- >> This is a liquid organophosphorus pesticide. Wear positive pressure breathing apparatus and special protective clothing. Move container from fire area if you can do so without risk. Fight fire from maximum distance. Dike fire control water for later disposal; do not scatter the material.
- >> For small fires, use dry chemical, carbon dioxide, water spray, or foam. For large fires, use water spray, fog, or foam. (EPA, 1998)
- >> In case of fire in the surroundings: all extinguishing agents allowed.

## 6. Accidental Release Measures

### Isolation and Evacuation:

Isolation and evacuation measures to take when a large amount of this chemical is accidentally released in an emergency.

- >> Excerpt from ERG Guide 152 [Substances - Toxic (Combustible)]:
- >> IMMEDIATE PRECAUTIONARY MEASURE: Isolate spill or leak area in all directions for at least 50 meters (150 feet) for liquids and at least 25 meters (75 feet) for solids.
- >> SPILL: Increase the immediate precautionary measure distance, in the downwind direction, as necessary.
- >> FIRE: If tank, rail tank car or highway tank is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also, consider initial evacuation for 800 meters (1/2 mile) in all directions. (ERG, 2024)

### Spillage Disposal:

Methods for containment and safety measures to protect workers dealing with a spillage of this chemical.

- >> Personal protection: chemical protection suit including self-contained breathing apparatus. Do NOT let this chemical enter the environment. Collect leaking liquid in covered containers. Then store and dispose of according to local regulations.

## 7. Handling And Storage

### Safe Storage:

- >> Separated from food and feedstuffs and oxidizing materials. Store in an area without drain or sewer access. Provision to contain effluent from fire extinguishing.

### Storage Conditions:

>> You should store this chemical in a freezer and away from all mineral acids and bases.

## 8. Exposure Control/ Personal Protection

>> 0.01 [mg/m<sup>3</sup>], inhalable fraction and vapor

>> 0.01 mg/m

### TLV-TWA (Time Weighted Average)

>> 0.01 mg/m<sup>3</sup> (inhalable fraction and vapor) [1999]

### Inhalation Risk:

>> Evaporation at 20 °C is negligible; a harmful concentration of airborne particles can, however, be reached quickly on spraying.

### Effects of Short Term Exposure:

>> Cholinesterase inhibition. The substance may cause effects on nervous system. This may result in central nervous system disorders.

### Effects of Long Term Exposure:

>> The substance may have effects on the nervous system.

### Acceptable Daily Intakes:

An estimate of the amount of a chemical in food or drinking water that can be consumed daily over a lifetime without presenting an appreciable risk to health. It is usually expressed as milligrams of the substance per kilogram of body weight per day and applies to chemicals such as food additives, pesticide residues and veterinary drugs.

>> FAO/WHO ADI: 0.0002 mg/kg

### Fire Prevention

>> NO open flames.

### Exposure Prevention

>> AVOID EXPOSURE OF ADOLESCENTS AND CHILDREN! STRICT HYGIENE! FIRST AID: USE PERSONAL PROTECTION. IN ALL CASES CONSULT A DOCTOR!

### Inhalation Prevention

>> Avoid inhalation of aerosol.

### Skin Prevention

>> Protective clothing. Protective gloves.

### Eye Prevention

>> Wear face shield.

### Ingestion Prevention

>> Do not eat, drink, or smoke during work. Wash hands before eating.

### Exposure Control and Personal Protection

#### Exposure Summary

>> Biological Exposure Indices (BEI) [ACGIH] – Acetylcholinesterase activity in red blood cells = 70% of individual's baseline; Butylcholinesterase activity in serum or plasma = 60% of individual's baseline; Sample at end of shift; [TLVs and BEIs]

## 9. Physical And Chemical Properties

### Molecular Weight:

>> 288.4

**Exact Mass:**

>> 288.04413043

**Physical Description:**

>> Technical product is a clear, colorless to pale yellow liquid. Used as a soil insecticide. (EPA, 1998)  
>> COLOURLESS-TO-PALE-YELLOW LIQUID.

**Color/Form:**

>> Slightly yellowish liquid

**Odor:**

>> Mercaptan-like odor

**Boiling Point:**

>> 156 °F at 0.01 mmHg (EPA, 1998)  
>> 68.9 °C

**Melting Point:**

>> -20.6 °F (EPA, 1998)  
>> -29.2 °C

**Flash Point:**

>> 190 °F (EPA, 1998)  
>> 87.8 °C

**Solubility:**

>> Insoluble (<1 mg/ml) (NTP, 1992)  
>> Solubility in water, mg/l at 25 °C: 5.07 (very poor)

**Density:**

>> 1.105 at 75.2 °F (EPA, 1998) – Denser than water; will sink  
>> Relative density (water = 1): 1.1

**Vapor Pressure:**

>> 0.0003 mmHg at 77 °F (EPA, 1998)  
>> Vapor pressure, Pa at 25 °C: 0.04

**LogP:**

>> log Kow = 4.48  
>> 4.48

**Stability/Shelf Life:**

>> Stable for at least two years at room temperature.

**Decomposition:**

>> This compound decomposes in the presence of acids or bases /and/... at temperatures over 120 °C.

**Corrosivity:**

The ability of a chemical to damage or destroy other substances when it comes into contact.

>> Non-corrosive to metals.

**Refractive Index:**

>> Index of refraction: 1.52 @ 23 °C/D

**Collision Cross Section:**

Collision cross section (CCS) represents the effective area for the interaction between an individual ion and the neutral gas through which it is traveling (e.g., in ion mobility spectrometry (IMS) experiments). It quantifies the probability of a collision taking place between two or more particles.

>> 166.27 Å<sup>2</sup> [M+Na]<sup>+</sup>

## 10. Stability And Reactivity

>> Hydrolyzes under alkaline conditions [EPA, 1998]. Insoluble in water.

## 11. Toxicological Information

### RAIS Toxicity Values:

This section provides the Chemical toxicity information from the Risk Assessment Information System.

### Oral Chronic Reference Dose (RfDoc) (mg/kg-day)

>> 2.5e-05

### Oral Chronic Reference Dose Reference

>> HEAST Current

### Oral Subchronic Chronic Reference Dose (RfDos) (mg/kg-day)

>> 2.5e-05

### Oral Subchronic Chronic Reference Dose Reference

>> HEAST Current

### USGS Health-Based Screening Levels for Evaluating Water-Quality:

This section provides the USGS Health-Based Screening Levels for Evaluating Water-Quality data.

### Chemical

>> Terbufos

### USGS Parameter Code

>> 68699

### Noncancer HBSL (Health-Based Screening Level)[µg/L]

>> 0.06

### Reference

>> Smith, C.D. and Nowell, L.H., 2024. Health-Based Screening Levels for evaluating water-quality data (3rd ed.). DOI:10.5066/F71C1TWP

### Evidence for Carcinogenicity:

Evidence that this chemical does or may cause cancer. The information here is collected from various sources by the Hazardous Substances Data Bank (HSDB).

>> Cancer Classification: Group E Evidence of Non-carcinogenicity for Humans

### Exposure Routes:

>> The substance can be absorbed into the body in hazardous amounts by ingestion, by inhalation and through the skin.

### Inhalation Exposure

>> See Ingestion.

### Skin Exposure

>> EASILY ABSORBED! See Ingestion.

### Ingestion Exposure

>> Blurred vision. Headache. Dizziness. Muscle spasms. Weakness. Vomiting. Diarrhoea. Abdominal pain.

### Adverse Effects:

An adverse effect is an undesired harmful effect resulting from a medical treatment or other intervention.

>> Other Poison - Organophosphate

>> ACGIH Carcinogen - Not Classifiable.

### Interactions:

>> Because different classes of enzymes may be inhibited, the effects of organophosphorus pesticide poisoning may be complex and potentially at least could involve interactions with drugs as well as with other pesticides or chemicals. Potentiation may also involve solvents or other components of formulated pesticides. Certain drugs such as phenothiazines, antihistamines, CNS depressants, barbiturates, xanthines (theophylline), aminoglycosides and parasympathomimetic agents are to be avoided because of increased toxicity. /Organophosphorus pesticides/

#### **Antidote and Emergency Treatment:**

>> Airway protection. Ensure that a clear airway exists. Intubate the patients and aspirate the secretions with a large-bore suction device if necessary. Administer oxygen by mechanically assisted pulmonary ventilation if respiration is depressed. Improve tissue oxygenation as much as possible before administering atropine, so as to minimize the risk of ventricular fibrillation. In severe poisonings, it may be necessary to support pulmonary ventilation mechanically for several days. /Organophosphate pesticides/

#### **Human Toxicity Excerpts:**

>> /HUMAN EXPOSURE STUDIES/ Signs and symptoms of acute intoxication by organophosphorus insecticides include muscarinic, nicotinic, and central nervous system (CNS) manifestations. Symptoms may develop rapidly, or there may be a delay of several hours after exposure before they become evident. The delay tends to be longer in the case of more lipophilic compounds, which also require metabolic activation. Symptoms may increase in severity for more than one day and may last for several days. In severe cases, respiratory failure is a dominant effect. /Organophosphorus Pesticides/

#### **Non-Human Toxicity Excerpts:**

>> /LABORATORY ANIMALS: Acute Exposure/ In primary eye and primary dermal irritation studies in rabbits, all animals died within 24 hours after dosing with 0.5 ml or less of terbufos.

#### **Non-Human Toxicity Values:**

>> LD50 Rat male oral 2 mg/kg /from table/

## **12. Ecological Information**

### **Resident Soil (mg/kg)**

>> 1.90e+01

### **Industrial Soil (mg/kg)**

>> 2.50e+02

### **Tapwater (ug/L)**

>> 5.90e+00

### **MCL (ug/L)**

>> 4.00e+03

### **Risk-based SSL (mg/kg)**

>> 6.50e-02

### **Chronic Oral Reference Dose (mg/kg-day)**

>> 3.00e-04

### **Volatile**

>> Volatile

### **Mutagen**

>> Mutagen

### **Fraction of Contaminant Absorbed in Gastrointestinal Tract**

>> 1

### **Fraction of Contaminant Absorbed Dermally from Soil**

>> 0.1

### **Soil Saturation Concentration (mg/kg)**

>> 3.09e+01

## ICSC Environmental Data:

>> The substance is very toxic to aquatic organisms. The substance may cause long-term effects in the aquatic environment. Bioaccumulation of this chemical may occur in aquatic organisms. This substance does enter the environment under normal use. Great care, however, should be taken to avoid any additional release, for example through inappropriate disposal.

## Sediment/Soil Concentrations:

Concentrations of this compound in sediment/soil.

>> SOIL: Soil samples (n=822) collected from 49 agricultural facilities from Illinois were analyzed for pesticides(1). During the 5 years prior to this study, terbufos had been handled at approximately 35 of the 49 sites(1). Terbufos was detected in 2 samples from 2 sites, and concns were 69 and 70 ug/kg(1).

## 13. Disposal Considerations

### Spillage Disposal

>> Personal protection: chemical protection suit including self-contained breathing apparatus. Do NOT let this chemical enter the environment. Collect leaking liquid in covered containers. Then store and dispose of according to local regulations.

### Disposal Methods

>> SRP: The most favorable course of action is to use an alternative chemical product with less inherent propensity for occupational exposure or environmental contamination. Recycle any unused portion of the material for its approved use or return it to the manufacturer or supplier. Ultimate disposal of the chemical must consider: the material's impact on air quality; potential migration in soil or water; effects on animal, aquatic, and plant life; and conformance with environmental and public health regulations.

## 14. Transport Information

### DOT

Terbufos  
6.1  
UN Pack Group: I

### IATA

Terbufos  
6.1,  
UN Pack Group: I

## 15. Regulatory Information

### Federal Drinking Water Guidelines:

Federal drinking water guidelines (e.g. maximum containment level (MCL)) for this chemical. In general, these guidelines are recommendations and not legally enforceable.

>> EPA 0.4 ug/L

### Regulatory Information

#### California Safe Cosmetics Program (CSCP) Reportable Ingredient

- >> Hazard Traits - Developmental Toxicity; Neurotoxicity
- >> Authoritative List - CECBP - Priority Chemicals
- >> Report - if used as a fragrance or flavor ingredient

### Status Regulation (EC)

>> 2002/2076

#### New Zealand EPA Inventory of Chemical Status

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>> Terbufos: Does not have an individual approval but may be used as a component in a product covered by a group standard. It is not approved for use as a chemical in its own right.

## 16. Other Information

### Other Safety Information

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#### Chemical Assessment

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- >> IMAP assessments - Phosphorodithioic acid, S-[[[(1,1-dimethylethyl)thio]methyl]O,O-diethyl ester: Environment tier I assessment
- >> IMAP assessments - Phosphorodithioic acid, S-[[[(1,1-dimethylethyl)thio]methyl]O,O-diethyl ester: Human health tier I assessment

"The information provided is believed to be accurate but is not comprehensive and should be used as a reference. It reflects our current knowledge and is intended for safety guidance related to the product. This document does not constitute a warranty of the product's properties. Ionz is not responsible for any damages resulting from handling or contact with the product incorrectly."