

Occupational Health Guideline for tert-Butyl Chromate

INTRODUCTION

This guideline is intended as a source of information for employees, employers, physicians, industrial hygienists, and other occupational health professionals who may have a need for such information. It does not attempt to present all data; rather, it presents pertinent information and data in summary form.

SUBSTANCE IDENTIFICATION

- Formula: $((\text{CH}_3)_3\text{CO})_2\text{CrO}_2$
- Synonyms: Chromic acid, di-tert-butyl ester; bis(tert-butyl) chromate
- Appearance: Liquid.

PERMISSIBLE EXPOSURE LIMIT (PEL)

The current OSHA standard for tert-butyl chromate is a ceiling level of 0.1 milligram of tert-butyl chromate per cubic meter of air (mg/m^3).

HEALTH HAZARD INFORMATION

• Routes of exposure

tert-Butyl chromate can affect the body if it is inhaled, comes in contact with the eyes or skin, or is swallowed. It may enter the body through the skin.

• Effects of overexposure

Animal experiments suggest that tert-butyl chromate may cause lung changes, drowsiness, staggering gait, muscular weakness, and burns of the skin and eyes. Inorganic hexavalent chromium compounds may cause cancer of the lungs and sinuses. Delayed breathing difficulties may occur.

• Reporting signs and symptoms

A physician should be contacted if anyone develops any signs or symptoms and suspects that they are caused by exposure to tert-butyl chromate.

• Recommended medical surveillance

The following medical procedures should be made available to each employee who is exposed to tert-butyl chromate at potentially hazardous levels:

1. Initial Medical Examination:

—A complete history and physical examination: The purpose is to detect pre-existing conditions that might place the exposed employee at increased risk, and to establish a baseline for future health monitoring. Examination of the respiratory tract, liver, central nervous system, and eyes should be stressed. The skin should be examined for evidence of chronic disorders.

—14" x 17" chest roentgenogram: Because inorganic hexavalent chromium salts cause lung cancer in humans, surveillance of the lungs is indicated.

2. Periodic Medical Examination: The aforementioned medical examinations should be repeated on an annual basis.

• Summary of toxicology

tert-Butyl chromate has been reported to be an irritant of the eyes, lungs, and skin and a mild narcotic in animals. Rats repeatedly exposed daily for 30-60 minutes to an unspecified but lethal concentration of vapor of a mixture of tert-butyl chromate and butyl alcohol displayed lacrimation, drowsiness, ataxia, prostration, muscular weakness and twitching, weight loss, rapid superficial respiration, and necrosis of skin and subcutaneous tissues. Autopsy revealed extensive epithelial exudation in the lung alveoli, and hemorrhage and fat deposition in the liver. In separate inhalation experiments, tert-butyl chromate caused mild narcosis and rapid respiration, while butyl alcohol caused rapid narcosis and slow respiration with no lacrimation or pulmonary irritation. A laboratory assistant engaged in packing metal articles in paraffin-impregnated paper containing 5% tertiary butyl chromate complained of giddiness and abdominal discomfort. The significance of this is unknown. Since tert-butyl chromate contains hexavalent chromium, it may be a human carcinogen by analogy to other hexavalent chromium compounds.

These recommendations reflect good industrial hygiene and medical surveillance practices and their implementation will assist in achieving an effective occupational health program. However, they may not be sufficient to achieve compliance with all requirements of OSHA regulations.

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which have been shown to cause lung and sinus cancer in man.

CHEMICAL AND PHYSICAL PROPERTIES

• Physical data

1. Molecular weight: 230.3
2. Boiling point (760 mm Hg): Data not available
3. Specific gravity (water = 1): Data not available
4. Vapor density (air = 1 at boiling point of tert-butyl chromate): 7.9
5. Melting point: -5 to 0 C (23 to 32 F)
6. Vapor pressure at 20 C (68 F): Data not available
7. Solubility in water, g/100 g water at 20 C (68 F): Data not available

8. Evaporation rate (butyl acetate = 1): Data not available

• Reactivity

1. Conditions contributing to instability: None
2. Incompatibilities: Reducing agents, moisture
3. Hazardous decomposition products: Toxic gases and vapors (such as chromium compounds and carbon monoxide) may be released when tert-butyl chromate decomposes.

4. Special precautions: None

• Flammability

1. Flash point: Data not available
2. Autoignition temperature: Data not available
3. Flammable limits in air, % by volume: Data not available
4. Extinguishant: Data not available

• Warning properties

1. Odor Threshold: No quantitative information is available concerning the odor threshold.
2. Eye Irritation Level: Since Grant reports that "chromium compounds (e.g., chromic acid, chromium chloride, potassium chromate, and potassium dichromate) are known to cause . . . ulcers of the skin and mucous membranes," tert-butyl chromate, for the purposes of this guideline, is treated as an eye irritant.
3. Evaluation of Warning Properties: Since there is no quantitative information relating warning properties to air concentrations of tert-butyl chromate, it is treated as a material with poor warning properties.

MONITORING AND MEASUREMENT PROCEDURES

• Ceiling Evaluation

Measurements to determine employee ceiling exposure are best taken during periods of maximum expected airborne concentrations of tert-butyl chromate. Each measurement should consist of a fifteen (15) minute sample or series of consecutive samples totalling fifteen (15) minutes in the employee's breathing zone (air that would most nearly represent that inhaled by the employee). A minimum of three (3) measurements should be taken on one work shift and the highest of all measurements taken is an estimate of the employee's exposure.

• Method

At the time of publication of this guideline, no measurement method for tert-butyl chromate had been published by NIOSH.

RESPIRATORS

- Good industrial hygiene practices recommend that engineering controls be used to reduce environmental concentrations to the permissible exposure level. However, there are some exceptions where respirators may be used to control exposure. Respirators may be used when engineering and work practice controls are not technically feasible, when such controls are in the process of being installed, or when they fail and need to be supplemented. Respirators may also be used for operations which require entry into tanks or closed vessels, and in emergency situations. If the use of respirators is necessary, the only respirators permitted are those that have been approved by the Mine Safety and Health Administration (formerly Mining Enforcement and Safety Administration) or by the National Institute for Occupational Safety and Health.
- In addition to respirator selection, a complete respiratory protection program should be instituted which includes regular training, maintenance, inspection, cleaning, and evaluation.

PERSONAL PROTECTIVE EQUIPMENT

- Employees should be provided with and required to use impervious clothing, gloves, face shields (eight-inch minimum), and other appropriate protective clothing necessary to prevent any possibility of skin contact with solid or liquid tert-butyl chromate or liquids containing tert-butyl chromate.
- Clothing contaminated with tert-butyl chromate should be placed in closed containers for storage until it can be discarded or until provision is made for the removal of tert-butyl chromate from the clothing. If the clothing is to be laundered or otherwise cleaned to remove the tert-butyl chromate, the person performing the operation should be informed of tert-butyl chromate's hazardous properties.
- Where there is any possibility of exposure of an employee's body to solid or liquid tert-butyl chromate or liquids containing tert-butyl chromate, facilities for quick drenching of the body should be provided within the immediate work area for emergency use.
- Non-impervious clothing which becomes contaminated with tert-butyl chromate should be removed immediately and not reworn until the tert-butyl chromate is removed from the clothing.
- Employees should be provided with and required to use dust- and splash-proof safety goggles where there is any possibility of solid or liquid tert-butyl chromate or liquids containing tert-butyl chromate contacting the eyes.

- Where there is any possibility that employees' eyes may be exposed to solid or liquid tert-butyl chromate or liquids containing tert-butyl chromate, an eye-wash fountain should be provided within the immediate work area for emergency use.

SANITATION

- Skin that becomes contaminated with tert-butyl chromate should be immediately washed or showered with soap or mild detergent and water to remove any tert-butyl chromate.
- Workers subject to skin contact with solid or liquid tert-butyl chromate or liquids containing tert-butyl chromate should wash with soap or mild detergent and water any areas of the body which may have contacted tert-butyl chromate at the end of each work day.
- Eating and smoking should not be permitted in areas where solid or liquid tert-butyl chromate or liquids containing tert-butyl chromate are handled, processed, or stored.
- Employees who handle solid or liquid tert-butyl chromate or liquids containing tert-butyl chromate should wash their hands thoroughly with soap or mild detergent and water before eating, smoking, or using toilet facilities.

COMMON OPERATIONS AND CONTROLS

The following list includes some common operations in which exposure to tert-butyl chromate may occur and control methods which may be effective in each case:

Operation	Controls
Use in oxidation of steroids as a means of identification on paper chromatography	Process enclosure; local exhaust ventilation; general dilution ventilation; personal protective equipment
Use in manufacture of catalysts used for the polymerization of olefins (possible commercial use)	Process enclosure; local exhaust ventilation; general dilution ventilation; personal protective equipment

EMERGENCY FIRST AID PROCEDURES

In the event of an emergency, institute first aid procedures and send for first aid or medical assistance.

• Eye Exposure

If solid or liquid tert-butyl chromate or liquids containing tert-butyl chromate get into the eyes, wash eyes immediately with large amounts of water, lifting the lower and upper lids occasionally. If irritation is present after washing, get medical attention. Contact lenses should not be worn when working with this chemical.

• Skin Exposure

If solid or liquid tert-butyl chromate or liquids containing tert-butyl chromate get on the skin, promptly wash the contaminated skin using soap or mild detergent and water. If solid or liquid tert-butyl chromate or liquids containing tert-butyl chromate penetrate through the clothing, remove the clothing immediately and wash the skin using soap or mild detergent and water. If irritation persists after washing, get medical attention.

• Breathing

If a person breathes in large amounts of tert-butyl chromate, move the exposed person to fresh air at once. If breathing has stopped, perform artificial respiration. Keep the affected person warm and at rest. Get medical attention as soon as possible.

• Swallowing

When solid or liquid tert-butyl chromate or liquids containing tert-butyl chromate have been swallowed and the person is conscious, give the person large quantities of water immediately. After the water has been swallowed, try to get the person to vomit by having him touch the back of his throat with his finger. Do not make an unconscious person vomit. Get medical attention immediately.

• Rescue

Move the affected person from the hazardous exposure. If the exposed person has been overcome, notify someone else and put into effect the established emergency rescue procedures. Do not become a casualty. Understand the facility's emergency rescue procedures and know the locations of rescue equipment before the need arises.

SPILL, LEAK, AND DISPOSAL PROCEDURES

- Persons not wearing protective equipment and clothing should be restricted from areas of spills or leaks until cleanup has been completed.

- If tert-butyl chromate is spilled or leaked, the following steps should be taken:

1. Ventilate area of spill or leak.
2. Collect for reclamation or absorb in vermiculite, dry sand, earth, or a similar material.

- Waste disposal method:

tert-Butyl chromate may be disposed by absorbing in vermiculite, dry sand, earth, or a similar material and disposing in a secured sanitary landfill.

REFERENCES

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RESPIRATORY PROTECTION FOR tert-BUTYL CHROMATE

Condition	Minimum Respiratory Protection* Required Above 0.1 mg/m ³
Particulate Concentration	
5 mg/m ³ or less	Any supplied-air respirator with a full facepiece, helmet, or hood. Any self-contained breathing apparatus with a full facepiece.
200 mg/m ³ or less	A Type C supplied-air respirator with a full facepiece operated in pressure-demand or other positive pressure mode or with a full facepiece, helmet, or hood operated in continuous-flow mode.
Greater than 200 mg/m ³ or entry and escape from unknown concentrations	Self-contained breathing apparatus with a full facepiece operated in pressure-demand or other positive pressure mode. A combination respirator which includes a Type C supplied-air respirator with a full facepiece operated in pressure-demand or other positive pressure or continuous-flow mode and an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive pressure mode.
Fire Fighting	Self-contained breathing apparatus with a full facepiece operated in pressure-demand or other positive pressure mode.
Escape	Any gas mask providing protection against organic vapors and particulates. Any escape self-contained breathing apparatus.

*Only NIOSH-approved or MSHA-approved equipment should be used.