

Occupational Health Guideline for sec-Butyl Acetate

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: $\text{CH}_3\text{COOCH}(\text{CH}_2)_2\text{C}_2\text{H}_5$
- Synonyms: 1-Methylpropyl acetate
- Appearance and odor: Colorless liquid with a pleasant odor.

PERMISSIBLE EXPOSURE LIMIT (PEL)

The current OSHA standard for sec-butyl acetate is 200 parts of sec-butyl acetate per million parts of air (ppm) averaged over an eight-hour work shift. This may also be expressed as 950 milligrams of sec-butyl acetate per cubic meter of air (mg/m^3).

HEALTH HAZARD INFORMATION

• Routes of exposure

sec-Butyl acetate can affect the body if it is inhaled, comes in contact with the eyes or skin, or is swallowed.

• Effects of overexposure

1. *Short-term Exposure:* Overexposure to sec-butyl acetate may cause irritation of the eyes, nose, and throat. Severe overexposure may cause weakness, drowsiness, and unconsciousness.

2. *Long-term Exposure:* Prolonged overexposure may produce irritation of the skin.

3. *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 sec-butyl acetate.

• Recommended medical surveillance

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

1. *Initial Medical Screening:* Employees should be screened for history of certain medical conditions (listed below) which might place the employee at increased risk from sec-butyl acetate exposure.

—Skin disease: sec-Butyl acetate is a mild defatting agent and can cause dermatitis on prolonged exposure. Persons with pre-existing skin disorders may be more susceptible to the effects of this agent.

—Kidney disease: Although sec-butyl acetate is not known as a kidney toxin in humans, the importance of this organ in the elimination of toxic substances justifies special consideration in those with impaired renal function.

—Chronic respiratory disease: In persons with impaired pulmonary function, especially those with obstructive airway diseases, the breathing of sec-butyl acetate might cause exacerbation of symptoms due to its irritant properties.

—Liver disease: Although sec-butyl acetate is not known as a liver toxin in humans, the importance of this organ in the biotransformation and detoxification of foreign substances should be considered before exposing persons with impaired liver function.

2. *Periodic Medical Examination:* Any employee developing the above-listed conditions should be referred for further medical examination.

• Summary of toxicology

The principal effects of overexposure to sec-butyl acetate are irritation of the eyes and nose and narcosis at high concentrations. No chronic systemic effects have been reported in humans. Anesthetic effects were not observed in man at levels of 400 to 600 ppm in exposures of 2 to 3 hours.

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.

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Public Health Service Centers for Disease Control
National Institute for Occupational Safety and Health

U.S. DEPARTMENT OF LABOR
Occupational Safety and Health Administration

CHEMICAL AND PHYSICAL PROPERTIES

• Physical data

1. Molecular weight: 116
2. Boiling point (760 mm Hg): 112 C (234 F)
3. Specific gravity (water = 1): 0.86
4. Vapor density (air = 1 at boiling point of sec-butyl acetate): 4.0
5. Melting point: -99 C (-146 F)
6. Vapor pressure at 20 C (68 F): 10 mm Hg
7. Solubility in water, g/100 g water at 20 C (68 F): 0.8
8. Evaporation rate (butyl acetate = 1): 2.0

• Reactivity

1. Conditions contributing to instability: Heat
2. Incompatibilities: Contact with nitrates, strong oxidizers, strong alkalis, and strong acids may cause fires and explosions.
3. Hazardous decomposition products: Toxic gases and vapors (such as carbon monoxide) may be released in a fire involving sec-butyl acetate.
4. Special precautions: sec-Butyl acetate will soften and dissolve many plastics.

• Flammability

1. Flash point: 16.7 C (62 F) (closed cup)
2. Autoignition temperature: Data not available
3. Flammable limits in air, % by volume: Lower: 1.7; Upper: 9.8
4. Extinguishant: Dry chemical, carbon dioxide, foam

• Warning properties

1. Odor Threshold: Both May and Summer report odor thresholds for isobutyl acetate and for butyl acetate of 4 ppm and 7 ppm, respectively. Although no quantitative information is available concerning the odor threshold of sec-butyl acetate, by analogy to isobutyl acetate and to butyl acetate, the odor of sec-butyl acetate is assumed to be detectable below the TLV (200 ppm). According to the *Documentation of TLV's*, however, "the odor of sec-butyl acetate is reportedly milder than that of the primary isomers."

2. Eye Irritation Level: The TLV was recommended to prevent eye and respiratory tract irritation. No quantitative information is available, however, concerning the air concentrations of sec-butyl acetate which produce this irritation.

3. Evaluation of Warning Properties: Since by analogy with isobutyl acetate and butyl acetate, the odor threshold of sec-butyl acetate is assumed to be below the TLV (200 ppm), sec-butyl acetate is treated as a material with good warning properties.

MONITORING AND MEASUREMENT PROCEDURES

• General

Measurements to determine employee exposure are best taken so that the average eight-hour exposure is based on a single eight-hour sample or on two four-hour

samples. Several short-time interval samples (up to 30 minutes) may also be used to determine the average exposure level. Air samples should be taken in the employee's breathing zone (air that would most nearly represent that inhaled by the employee).

• Method

Sampling and analyses may be performed by collection of sec-butyl acetate vapors using an adsorption tube with subsequent desorption with carbon disulfide and gas chromatographic analysis. Also, detector tubes certified by NIOSH under 42 CFR Part 84 or other direct-reading devices calibrated to measure sec-butyl acetate may be used. An analytical method for sec-butyl acetate is in the *NIOSH Manual of Analytical Methods*, 2nd Ed., Vol. 2, 1977, available from the Government Printing Office, Washington, D.C. 20402 (GPO No. 017-033-00260-6).

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 repeated or prolonged skin contact with liquid sec-butyl acetate.

• Clothing wet with liquid sec-butyl acetate should be placed in closed containers for storage until it can be discarded or until provision is made for the removal of sec-butyl acetate from the clothing. If the clothing is to be laundered or otherwise cleaned to remove the sec-butyl acetate, the person performing the operation should be informed of sec-butyl acetate's hazardous properties.

• Any clothing which becomes wet with liquid sec-butyl acetate should be removed immediately and not

reworn until the sec-butyl acetate is removed from the clothing.

- Employees should be provided with and required to use splash-proof safety goggles where liquid sec-butyl acetate may contact the eyes.

SANITATION

- Skin that becomes wet with liquid sec-butyl acetate should be promptly washed or showered with soap or mild detergent and water to remove any sec-butyl acetate.

COMMON OPERATIONS AND CONTROLS

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

Operation	Controls
Liberation during use as a solvent for coating paper or leather	Local exhaust ventilation; general dilution ventilation
Use as a solvent for artificial leather material	Local exhaust ventilation; general dilution ventilation; personal protective equipment
Liberation during spray applications of lacquers	Local exhaust ventilation; general dilution ventilation
Liberation during dip and brush applications of lacquers; during preparation of celluloid products; during preparation of lacquers	Process enclosure; general dilution ventilation
Liberation during application of adhesives	Local exhaust ventilation; general dilution ventilation
Liberation during manufacture of adhesives	Process enclosure; local exhaust ventilation; general dilution ventilation
Liberation during application of textile sizing	Local exhaust ventilation; general dilution ventilation
Liberation during manufacture of photographic film	General dilution ventilation

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 sec-butyl acetate gets into the eyes, wash eyes immediately with large amounts of water, lifting the lower and upper lids occasionally. Get medical attention as soon as possible. Contact lenses should not be worn when working with this chemical.

• Skin Exposure

If sec-butyl acetate gets on the skin, promptly flush the contaminated skin with water. If sec-butyl acetate soaks through the clothing, remove the clothing immediately and flush the skin with water. If there is skin irritation, get medical attention.

• Breathing

If a person breathes in large amounts of sec-butyl acetate, 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 sec-butyl acetate has been swallowed, get medical attention immediately. If medical attention is not immediately available, get the afflicted person to vomit by having him touch the back of his throat with his finger or by giving him syrup of ipecac as directed on the package. This non-prescription drug is available at most drug stores and drug counters and should be kept with emergency medical supplies in the workplace. Do not make an unconscious person vomit.

• 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 sec-butyl acetate is spilled or leaked, the following steps should be taken:

1. Remove all ignition sources.
2. Ventilate area of spill or leak.
3. For small quantities, absorb on paper towels. Evaporate in a safe place (such as a fume hood). Allow sufficient time for evaporating vapors to completely clear the hood ductwork. Burn the paper in a suitable location away from combustible materials. Large quantities can be collected and atomized in a suitable combustion chamber. sec-Butyl acetate should not be allowed to enter a confined space, such as a sewer, because of the possibility of an explosion.

- Waste disposal methods:

sec-Butyl acetate may be disposed of:

1. By absorbing it in vermiculite, dry sand, earth or a similar material and disposing in a secured sanitary landfill.
2. By atomizing in a suitable combustion chamber.

ADDITIONAL INFORMATION

To find additional information on sec-butyl acetate, look up sec-butyl acetate in the following documents:

- Medical Surveillance for Chemical Hazards
- Respiratory Protection for Chemical Hazards
- Personal Protection and Sanitation for Chemical Hazards

These documents are available through the NIOSH Division of Technical Services, 4676 Columbia Parkway, Cincinnati, Ohio 45226.

REFERENCES

- American Conference of Governmental Industrial Hygienists: "sec-Butyl Acetate," *Documentation of the Threshold Limit Values for Substances in Workroom Air* (3rd ed., 2nd printing), Cincinnati, 1974.
- Grant, W. M.: *Toxicology of the Eye* (2nd ed.), C. C. Thomas, Springfield, Illinois, 1974.
- May, J.: "Solvent Odor Thresholds for the Evaluation of Solvent Odors in the Atmosphere," *Staub-Reinhalt*, 26:9, 385-389, 1966.

- Patty, F. A. (ed.): *Toxicology*, Vol. II of *Industrial Hygiene and Toxicology* (2nd ed. rev.), Interscience, New York, 1963.
- Sax, N. I.: *Dangerous Properties of Industrial Materials* (3rd ed.), Van Nostrand Reinhold, New York, 1968.
- Spector, W. S. (Vols. I, II), Negherbon, W. O. (Vol. III), Grebe, R. M. (Vol. IV), and Dittmer, D. S. (Vol. V) (eds.): *Handbook of Toxicology*, Saunders, Philadelphia, 1956-1959.
- Summer, W.: *Odor Pollution of Air: Causes and Control*, L. Hill, London, 1975.
- Union Carbide Corporation, Industrial Medicine and Toxicology Department: *Toxicology Studies - sec-Butyl Acetate*, New York, 1969.

RESPIRATORY PROTECTION FOR SEC-BUTYL ACETATE

Condition	Minimum Respiratory Protection* Required Above 200 ppm
Vapor Concentration	
1000 ppm or less	A chemical cartridge respirator with a full facepiece and an organic vapor cartridge(s).
5000 ppm or less	A gas mask with a chin-style organic vapor canister.
10,000 ppm or less	A gas mask with a chin-style or a front- or back-mounted organic vapor canister. Any supplied-air respirator with a full facepiece, helmet, or hood. Any self-contained breathing apparatus with a full facepiece.
Greater than 10,000 ppm 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. Any escape self-contained breathing apparatus.

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

11/11/2023 10:11 AM