

Occupational Health Guideline for Ammonium Sulfamate (Ammate)

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: $\text{NH}_4\text{SO}_3\text{NH}_4$
- Synonyms: Ammate herbicide
- Appearance and odor: Colorless, odorless solid.

PERMISSIBLE EXPOSURE LIMIT (PEL)

The current OSHA standard for ammonium sulfamate is 15 milligrams of ammonium sulfamate per cubic meter of air (mg/m^3) averaged over an eight-hour work shift. The American Conference of Governmental Industrial Hygienists has recommended for ammonium sulfamate a Threshold Limit Value of $10 \text{ mg}/\text{m}^3$.

HEALTH HAZARD INFORMATION

• Routes of exposure

Ammonium sulfamate can affect the body if it is inhaled or if it comes in contact with the eyes or skin. It can also affect the body if it is swallowed.

• Effects of overexposure

There are no known effects.

• 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 ammonium sulfamate.

• Recommended medical surveillance

Routine medical examinations should be made available to each employee who is exposed to ammonium sulfamate at potentially hazardous levels.

• Summary of toxicology

Ammonium sulfamate is of low toxicity. In rats, the intraperitoneal injection of $0.8 \text{ g}/\text{kg}$ caused the death of 6 of 10 animals; effects were stimulation of respiration and prostration. Repeated application of a 4% solution to the anterior surface of one arm of each of five human subjects for 5 days caused no skin irritation.

CHEMICAL AND PHYSICAL PROPERTIES

• Physical data

1. Molecular weight: 114.1
2. Boiling point (760 mm Hg): Decomposes at 200 C (392 F)
3. Specific gravity (water = 1): Greater than 1
4. Vapor density (air = 1 at boiling point of ammonium sulfamate): Not applicable
5. Melting point: 131 C (268 F)
6. Vapor pressure at 20 C (68 F): Essentially zero
7. Solubility in water, $\text{g}/100 \text{ g}$ water at 20 C (68 F): 200
8. Evaporation rate (butyl acetate = 1): Not applicable

• Reactivity

1. Conditions contributing to instability: Elevated temperatures cause highly exothermic reaction with water; steam may cause container to burst.
2. Incompatibilities: Contact with strong oxidizers may cause fires and explosions. Contact with hot water may cause formation of large amounts of steam.
3. Hazardous decomposition products: Toxic gases and vapors (such as oxides of nitrogen and sulfur and carbon monoxide) may be released when ammonium sulfamate decomposes.
4. Special precautions: None

• Flammability

1. Not combustible

• Warning properties

Ammonium sulfamate is not known to be an eye irritant. Grant states that "ammonium sulfamate (Ammate) is a bright yellow-orange crystalline solid employed princi-

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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pally as a weed killer. Tested by instillation of 0.5 ml of a 4% solution in water in the conjunctival sac of rabbits, it produced no irritation."

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

An analytical method for ammonium sulfamate is in the *NIOSH Manual of Analytical Methods*, 2nd Ed., Vol. 5, 1979, available from the Government Printing Office, Washington, D.C. 20402 (GPO No. 017-033-00349-1).

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.

COMMON OPERATIONS AND CONTROLS

The following list includes some common operations in which exposure to ammonium sulfamate may occur and control methods which may be effective in each case:

Operation

Controls

Application as a herbicide for control of woody plants

Personal protective equipment

Use in manufacture of fire-retardant compositions for flame-proofing textiles and paper products

Process enclosure/segregation; general dilution ventilation; local exhaust ventilation; personal protective equipment

Use in generation of nitrous oxide gas; use in manufacture of electroplating solutions

Process enclosure/segregation; general dilution ventilation; local exhaust ventilation; personal protective equipment

Liberation during formulation for use as an herbicide

Process enclosure; exhaust ventilation; personal protective equipment

Liberation during manufacture for use in herbicide compositions

Process enclosure/segregation; general dilution ventilation; local exhaust ventilation; personal protective equipment

Use in manufacture of electroplating solutions

Process enclosure/segregation; general dilution ventilation; local exhaust 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 ammonium sulfamate gets 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 ammonium sulfamate or liquids containing ammonium sulfamate get on the skin, promptly wash the contaminated skin using soap or mild detergent and water.

• Breathing

If a person breathes in large amounts of ammonium sulfamate, 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 ammonium sulfamate or liquids containing ammonium sulfamate 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 PROCEDURES

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

• If ammonium sulfamate is spilled, the following steps should be taken:

1. Ventilate area of spill.
2. Collect spilled material in the most convenient and safe manner and deposit in sealed containers for reclamation or for disposal in a secured sanitary landfill. Liquid containing ammonium sulfamate should be absorbed in vermiculite, dry sand, earth, or a similar material.

ADDITIONAL INFORMATION

To find additional information on ammonium sulfamate, look up ammonium sulfamate 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

- Ambrose, A. M.: "Studies on the Physiological Effects of Sulfamic Acid and Ammonium Sulfamate," *Journal of Industrial Hygiene and Toxicology*, 25:26-28, 1943.
- American Conference of Governmental Industrial Hygienists: "Ammonium Sulfamate," *Documentation of the Threshold Limit Values for Substances in Workroom Air* (3rd ed., 2nd printing), Cincinnati, 1974.
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- Gleason, M. N., Gosselin, R. E., Hodge, H. C., and Smith, R. P.: *Clinical Toxicology of Commercial Products* (3rd ed.), Williams and Wilkins, Baltimore, 1969.
- Grant, W. M.: *Toxicology of the Eye* (2nd ed.), C. C. Thomas, Springfield, Illinois, 1974.

RESPIRATORY PROTECTION FOR AMMONIUM SULFAMATE (AMMATE)

Condition	Minimum Respiratory Protection* Required Above 15 mg/m³
Particulate Concentration	
75 mg/m ³ or less	Any dust and mist respirator.
150 mg/m ³ or less	Any dust and mist respirator, except single-use or quarter-mask respirator. Any high efficiency particulate filter respirator. Any supplied-air respirator. Any self-contained breathing apparatus.
750 mg/m ³ or less	A high efficiency particulate filter respirator with a full facepiece. Any supplied-air respirator with a full facepiece, helmet, or hood. Any self-contained breathing apparatus with a full facepiece.
5000 mg/m ³ or less	A powered air-purifying respirator with a high efficiency particulate filter. A Type C supplied-air respirator operated in pressure-demand or other positive pressure or continuous-flow mode.
Greater than 5000 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 dust and mist respirator, except single-use. Any escape self-contained breathing apparatus.

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