

# Occupational Health Guideline for Anisidine (o,p-Isomers)

## 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:  $\text{NH}_2\text{C}_6\text{H}_4\text{OCH}_3$
- Synonyms: o-Methoxyaniline; p-methoxyaniline
- Appearance and odor: Ortho: Colorless to pink liquid with a characteristic amine odor; Para: Light red-brown solid with a characteristic amine odor.

## PERMISSIBLE EXPOSURE LIMIT (PEL)

The current OSHA standard for anisidine is 0.5 milligram of anisidine per cubic meter of air ( $\text{mg}/\text{m}^3$ ) averaged over an eight-hour work shift.

## HEALTH HAZARD INFORMATION

- Routes of exposure  
Anisidine 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  
Exposure to anisidine may affect the ability of the blood to carry oxygen. The earliest effect may be a bluish color of the skin, especially the lips. If the lack of oxygen becomes severe, a person may have drowsiness, headache, nausea, and vomiting. If oxygen lack is very severe, it may cause unconsciousness and even death.
- 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 anisidine.

### • Recommended medical surveillance

The following medical procedures should be made available to each employee who is exposed to anisidine 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 blood, kidneys, liver, and cardiovascular system should be stressed.

—A complete blood count: Anisidine has been shown to cause methemoglobinemia and the formation of erythrocytic inclusion bodies. A complete blood count should be performed including a red cell count, a white cell count, a differential count of a stained smear, as well as hemoglobin and hematocrit.

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

### • Summary of toxicology

The absorption of the ortho or para isomer of anisidine, whether from inhalation of the vapor or dust or from skin absorption, causes anoxia due to the formation of methemoglobin. The peroral LD50 in rats was 1.4 g/kg. Mice repeatedly exposed to concentrations of 10 to 30  $\text{mg}/\text{m}^3$  for 2 hours daily showed a decrease in the excitability of nerves at the end of 1 month of exposure; after 12 months of exposure there was anemia and reticulocytosis. Workers exposed to a concentration of 1.9  $\text{mg}/\text{m}^3$  for 3-½ hours per day for 6 months did not develop anemia or specific signs of intoxication; there were some cases of headache and vertigo, which may have been related to the observation of increased methemoglobin and sulfhemoglobin; the presence of erythrocytic inclusions, or Heinz bodies, was observed.

## CHEMICAL AND PHYSICAL PROPERTIES

### • Physical data

1. Molecular weight: 123

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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

2. Boiling point (760 mm Hg): Ortho: 225 C (436 F); Para: 243 C (470 F)

3. Specific gravity (water = 1): 1.1 (both isomers)

4. Vapor density (air = 1 at boiling point of anisidine, ortho and para isomers): 4.25

5. Melting point: Ortho: 6.2 C (43 F); Para: 58.5 C (137 F)

6. Vapor pressure at 20 C (68 F): Less than 0.1 mm Hg (both isomers)

7. Solubility in water, g/100 g water at 20 C (68 F): Ortho: 1.3; Para: moderate

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

#### • Reactivity

1. Conditions contributing to instability: Heat

2. Incompatibilities: Contact with strong oxidizers may cause fires and explosions.

3. Hazardous decomposition products: Toxic gases and vapors (such as oxides of nitrogen and carbon monoxide) may be released when anisidine decomposes.

4. Special precautions: Liquid anisidine will attack some forms of plastics, rubber, and coatings.

#### • Flammability

1. Flash point: Para: 30 C (86 F) (closed cup)

2. Autoignition temperature: Data not available

3. Flammable limits in air, % by volume: Data not available

4. Extinguishant: Foam, carbon dioxide, dry chemical

#### • Warning properties

Anisidine (o,p-isomers) is not known to be an eye irritant.

## 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 anisidine 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.

## 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 skin contact with solid or liquid anisidine or liquids containing anisidine, where skin contact may occur.

• If employees' clothing may have become contaminated with solid or liquid anisidine or liquids containing anisidine, employees should change into uncontaminated clothing before leaving the work premises.

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

• Where exposure of an employee's body to solid or liquid anisidine or liquids containing anisidine may occur, 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 anisidine should be removed immediately and not reworn until the anisidine is removed from the clothing.

• Employees should be provided with and required to use dust- and splash-proof safety goggles where solid or liquid anisidine or liquids containing anisidine may contact the eyes.

## SANITATION

• Skin that becomes contaminated with anisidine should be immediately washed or showered with soap or mild detergent and water to remove any anisidine.

• Eating and smoking should not be permitted in areas where solid or liquid anisidine or liquids containing anisidine are handled, processed, or stored.

• Employees who handle solid or liquid anisidine or liquids containing anisidine 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 anisidine may occur and control methods which may be effective in each case:

Operation	Controls
Use in manufacture of azo or triphenylmethane dyes and intermediates; use in preparation of organic compounds; in synthesis of guaicol	General dilution ventilation; personal protective equipment
Use in synthesis of hair dyes; as corrosion inhibitors for steel storage; as an antioxidant for some polymercaptan resins; and as a dyeing assist	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 anisidine 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 solid or liquid anisidine or liquids containing anisidine get on the skin, immediately wash the contaminated skin using soap or mild detergent and water. If solid or liquid anisidine or liquids containing anisidine penetrate through the clothing, remove the clothing immediately and wash the skin using soap or mild detergent and water. Get medical attention immediately.

### • Breathing

If a person breathes in large amounts of anisidine, 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 anisidine or liquids containing anisidine 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. Under-

stand 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 anisidine is spilled or leaked, the following steps should be taken:

1. Ventilate area of spill or leak.

2. Collect spilled material in the most convenient and safe manner for reclamation or for disposal in a secured sanitary landfill. Liquids containing anisidine should be absorbed in vermiculite, dry sand, earth, or a similar material. Large quantities may be reclaimed; however, if this is not practical, dissolve in a flammable solvent (such as alcohol) and atomize in a suitable combustion chamber equipped with an appropriate effluent gas cleaning device.

- Waste disposal method:

Anisidine may be disposed of in a secured sanitary landfill.

## REFERENCES

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## RESPIRATORY PROTECTION FOR ANISIDINE (o,p-ISOMERS)

Condition	Minimum Respiratory Protection* Required Above 0.5 mg/m <sup>3</sup>
Particulate or Vapor Concentration	
2.5 mg/m <sup>3</sup> or less	Any dust and mist respirator, except single-use.
5 mg/m <sup>3</sup> or less	Any dust and mist respirator, except single-use or quarter-mask respirator. Any supplied-air respirator. Any self-contained breathing apparatus.
25 mg/m <sup>3</sup> or less	Any 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.
50 mg/m <sup>3</sup> 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 50 mg/m <sup>3</sup> 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.

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