

NIOSH/OSHA STANDARDS COMPLETION PROGRAM

DRAFT TECHNICAL STANDARD AND
SUPPORTING DOCUMENTATION FOR

*** ALPHA-METHYL STYRENE ***

NIOSH/OSHA Draft Technical Standard
and Supporting Documentation for ALPHA-METHYL STYRENE

The basic text of this document contains the draft technical standard approved by the Joint Review Committee of the NIOSH/OSHA Standards Completion Program and the supporting documentation for the substance ALPHA-METHYL STYRENE.

The SCP draft technical standards are recommendations to the Department of Labor for its consideration in rulemaking and have no legal status until final rules have been promulgated by that agency. This draft standard is provided for your information only.

The References and Sources, Respirator Table Documentation and Use/Exposure and Control Documentation are the working documents used by the various SCP working groups during the development of the draft technical standard and serve as the technical foundation for the standard. The classification for each substance and the regulatory statements were derived following a decision logic established for the various sections of the standard.

NIOSH/OSHA Draft Technical Standard
and Supporting Documentation for ALPHA-METHYL STYRENE

(a) DEFINITIONS

- (1) PERMISSIBLE EXPOSURE - "Permissible Exposure" means inhalation of alpha-methyl styrene in concentrations not in excess of 100 parts per million (ppm) (480 milligrams per cubic meter, mg/cu.m.) averaged over any 15 minute period during an 8-hour work shift, as stated in section 1910.93 Table G-1.
- (2) ACTION LEVEL - "Action Level" means one half (1/2) of the permissible exposure for alpha-methyl styrene.

(b) EMPLOYEE INFORMATION - Each employer who has a workplace in which alpha-methyl styrene is present shall:

- (1) STANDARD AVAILABILITY - Keep a copy of this section with its appendices at the workplace. This material shall be made readily available to affected employees; and
- (2) PRESENCE OF ALPHA-METHYL STYRENE - Inform affected employees of the quantity, location, and manner of use or storage of alpha-methyl styrene.

(c) EXPOSURE MEASUREMENT

- (1) INITIAL DETERMINATION - Each employer who has a place of employment in which alpha-methyl styrene is released into the workplace air shall determine if any employee may be exposed to airborne concentrations of alpha-methyl styrene at or above the action level. The determination shall be made each time there is a change in production, process, or control measures which could result in an increase in airborne concentrations of alpha-methyl styrene. A written determination shall be made and it shall contain at least the following information:
 - (i) Any information, observations, or calculations which would indicate employee exposure to alpha-methyl styrene;
 - (ii) Any measurements of airborne concentrations of alpha-methyl styrene taken;
 - (iii) Any employee complaints of symptoms which may be attributable to exposure to alpha-methyl styrene; and
 - (iv) Date of determination, work being performed at the time, location within work site, name, and social security number of each employee considered.
- (2) INITIAL EXPOSURE MEASUREMENT - If the employer determines that any employee may be exposed to airborne concentrations of alpha-methyl styrene at or above the action level, the exposure of the employee believed to have the greatest exposure shall be measured. The exposure measurement shall be representative of the maximum exposure of the employee.
- (3) IDENTIFICATION OF EXPOSED EMPLOYEES - If the exposure measurement taken under paragraph (c)(2) of this section reveals employee exposure to airborne concentrations of alpha-methyl styrene at or above the action level, the employer shall:
 - (i) Identify all employees who may be exposed at or above the action level; and
 - (ii) Measure the exposure of the employees so identified.
- (4) EXPOSURE ABOVE THE ACTION LEVEL - If an employee exposure measurement reveals that an employee is exposed to airborne concentrations of alpha-methyl styrene at or above the action level,

NIOSH/OSHA Draft Technical Standard
and Supporting Documentation for ALPHA-METHYL STYRENE

but not above the permissible exposure, the exposure of that employee shall be measured at least every two months.

- (5) EXPOSURE ABOVE THE PERMISSIBLE EXPOSURE - If an employee exposure measurement reveals that an employee is exposed to airborne concentrations of alpha-methyl styrene above the permissible exposure, the employer shall:
- (i) Inform the employee of the exposure as required by paragraph (N)(1) of this section; and
 - (ii) Measure the exposure of the employee at least monthly; and
 - (iii) Institute control measures as required by paragraph (E) of this section.
- (6) TERMINATION OF EXPOSURE MEASUREMENT - If two consecutive employee exposure measurements taken at least one week apart reveal that the employee is exposed to airborne concentrations of alpha-methyl styrene below the action level, the employer may terminate measurement for the employee. For purposes of this subparagraph, use of respirators shall not constitute reduction of employee exposure below the action level.
- (d) METHODS OF MEASUREMENT - An employee's exposure shall be obtained by samples which represent the employee's actual maximum exposure during an 8-hour work shift (Appendix B (IV)). The method of measurement shall have an accuracy, to a confidence level of 95%, of not less than that given in Table 1 below.

Table 1

Concentration	Required Accuracy
Above permissible exposure	Plus or Minus 25%
At or below permissible exposure and above the action level	Plus or Minus 35%
At or below the action level	Plus or Minus 50%

- (e) Methods of compliance
- (1) Engineering controls - No employee shall be exposed to alpha-methyl styrene above the permissible limit as defined in paragraph (a)(1) of this section. Engineering and work practice controls shall be used to reduce exposure to alpha-methyl styrene to at or below the permissible exposure.
- (i) When mechanical ventilation is used to control exposure, measurements which demonstrate system efficiency (for example: air velocity, static pressure, or air volume) shall be made at least every three months. Measurements of system efficiency shall also be made within five work days of any change in production, process, or control which might result in a reduction in control.
 - (ii) Where a fan is located in duct work and where alpha-methyl styrene is present in concentrations greater than 4750 ppm, one fourth of the lower flammable limit, the fan rotating element shall be of nonsparking material or the casing shall consist of, or be lined with, nonsparking material. There shall be sufficient clearance between the fan rotating element and the fan casing so as to prevent contact.
- (2) Respirators
- (i) Compliance with the permissible exposure may not be achieved by the use of respirators except:

NIOSH/OSHA Draft Technical Standard
and Supporting Documentation for ALPHA-METHYL STYRENE

- (a) During the time period necessary to install engineering controls; or
- (b) In work situations in which engineering controls are technically not feasible; or
- (c) In work situations in which feasible engineering and work practice controls are insufficient to reduce employee exposure to at or below the permissible exposure. Where technically feasible engineering and work practice controls are not sufficient to reduce exposure to at or below permissible exposure, they shall be used to reduce exposure to the lowest level feasible; or
- (d) For operations not exceeding 40 hours per year; or
- (e) In emergencies.
- (ii) Respirators shall be jointly approved by the Mining Enforcement and Safety Administration (formerly Bureau of Mines) and by the National Institute for Occupational Safety and Health under the provisions of 30 CFR Part 11.
- (iii) Employers shall select and provide the appropriate respirator from Table 2 and shall ensure that the employee uses the respirator provided.
- (iv) Employers shall institute a respiratory protection program in accordance with sections 1910.134(b),(d),(e),(f) and (g).

TABLE 2. RESPIRATORY PROTECTION FOR ALPHA-METHYL STYRENE

Condition	Permissible Respiratory Protection
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Vapor Concentration

Equal to or Less than 200 ppm	cartridge(s). Any supplied-air respirator.

Equal to or Less than 1000 ppm	full facepiece and organic vapor cartridge(s).

Equal to or Less than 5000 ppm	A gas mask with a front or back-mounted organic vapor canister. Any self-contained breathing apparatus with a full facepiece. Any supplied-air respirator with a full facepiece.

Equal to or Less than 10 000 ppm	with a full facepiece, hood, or helmet operated in cont-
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NIOSH/OSHA Draft Technical Standard
and Supporting Documentation for ALPHA-METHYL STYRENE

inuous flow mode.

Greater than 10 000
ppm or Entry &
Escape from Unknown
Concentrations

supplied-air respirator with a full facepiece
operated in pressure-demand (positive pressure) or
continuous flow mode and an auxiliary self-contained
air supply operated in pressure-demand mode.

Fire Fighting

Self-contained breathing apparatus with a full facepiece
operated in pressure-demand (positive pressure) mode.

Escape

Any gas mask providing protection against organic
vapors.
Any escape self-contained breathing apparatus.

(f) Fire and Safety

Employers shall familiarize themselves with the information contained in the Substance Technical Guidelines for alpha-methyl styrene contained in Appendix B in order to ensure the safe handling and use of alpha-methyl styrene.

- (1) Electrical - For the purposes of compliance with section 1910.309, locations classified as hazardous locations due to the presence of alpha-methyl styrene shall be Class I Group D.
- (2) Portable fire extinguishers - For the purposes of compliance with section 1910.157, alpha-methyl styrene is classified as a Class B fire hazard.
- (3) Powered industrial trucks - For the purposes of compliance with section 1910.178, locations classified as hazardous locations due to the presence of alpha-methyl styrene shall be Class I Group D.
- (4) Combustible liquids - For the purposes of compliance with section 1910.106, liquid alpha-methyl styrene is classified as a Class II combustible liquid.
- (5) Sources of ignition - Sources of ignition such as smoking or open flames are prohibited where alpha-methyl styrene is used, handled or stored in a manner so as to create a potential fire or explosion hazard.
- (6) Storage - alpha-methyl styrene shall be stored so as not to come in contact with strong oxidizing agents and catalysts for polymerization including strong acids and aluminum or iron chlorides.

(g) Personal Protective Equipment

(1) Skin Contact

- (i) Employers shall provide, and require employees to use, impervious clothing, gloves, face shields (8 inch minimum) and other appropriate protective clothing necessary to

NIOSH/OSHA Draft Technical Standard
and Supporting Documentation for ALPHA-METHYL STYRENE

prevent repeated or prolonged skin contact to alpha-methyl styrene. Face shields shall comply with section 1910.133(a)(6).

- (ii) Employers shall ensure that clothing contaminated with alpha-methyl styrene is placed in closed containers. Employers shall provide for the cleaning or disposal of such clothing and if the clothing is to be laundered or otherwise cleaned, shall inform the person performing this operation of the hazardous properties of alpha-methyl styrene.
- (iii) Employers shall ensure that non-impervious clothing which becomes wet with alpha-methyl styrene be removed promptly and not reworn until the alpha-methyl styrene is removed from the clothing.
- (iv) Employers shall ensure that clothing which becomes wet with alpha-methyl styrene be removed immediately and not reworn until the alpha-methyl styrene is removed from the clothing.

(2) Eye Contact

- (i) Employers shall provide, and require employees to use, splash-proof safety goggles (cup-cover type dust and splash safety goggles), which comply with section 1910.133(a)(6), where eye contact to liquid alpha-methyl styrene may occur.

(h) Spills

- (1) Spills of alpha-methyl styrene shall be cleaned up immediately after eliminating potential sources of ignition and utilizing available ventilation.
- (2) Liquid alpha-methyl styrene may not be allowed to enter a confined space, such as a sewer, because of the possibility of an explosion.

(i) Sanitation

- (1) Employers shall ensure that employees whose skin becomes wet with alpha-methyl styrene promptly wash or shower as necessary to remove any alpha-methyl styrene from the skin.
- (2) Where skin contamination may occur and showers are required for adequate cleaning of the body, employers shall provide showers as described in section 1910.141(d)(3).
- (3) Employers shall ensure that employees who handle alpha-methyl styrene wash their hands thoroughly with soap or mild detergent and water before eating, smoking, or using toilet facilities.

(j) Training and Information - Each employer who has employees exposed to alpha-methyl styrene in excess of the action level, or employees who may have skin or eye contact with liquid alpha-methyl styrene, or employees who work where accidental release, spill, fire, or explosion of alpha-methyl styrene may occur, shall annually:

- (1) Substance Safety Data Sheet - Inform each employee of the information contained in the Substance Safety Data Sheet for alpha-methyl styrene, which is contained in Appendix A; and

(2) Medical -

- (I) Advise employees as to the signs and symptoms of exposure to alpha-methyl styrene.
- (II) Instruct the employees to advise the employer of the development of signs and symptoms of exposure to alpha-methyl styrene which are listed in Appendix A.

NIOSH/OSHA Draft Technical Standard
and Supporting Documentation for ALPHA-METHYL STYRENE

- (III) Instruct the employees to inform the employer if they develop any of the medical conditions listed in (k)(2) of this section; and
- (3) Procedures -
 - (I) Provide training to insure that employees understand the precautions of safe use, emergency procedures, and the correct use of protective equipment relative to alpha-methyl styrene.
 - (II) The procedures required by (j)(1), (2), and (3)(I) shall be provided to employees at the expense of the employer during the employee's normal working hours.
- (k) Medical Surveillance
 - (1) The employer shall provide medical procedures as required by paragraph (k). These procedures shall be provided at no cost to the employee.
 - (2) Preplacement Questionnaire - The employer shall obtain from each employee who will be exposed to liquid alpha-methyl styrene, or airborne concentrations of alpha-methyl styrene at or above the action level, a written statement as to whether such employee has a history of any of the following:
 - (i) Kidney disease
 - (ii) Liver disease
 - (iii) Chronic lung disease
 - (iv) Skin disease
 - (3) Preplacement Medical Examination - The employer shall provide a medical examination for an employee if the employee provides a history of any of the conditions named in paragraph (k)(2).
 - (4) Results of Preplacement Examination - The employer shall obtain a physician's written opinion based on the medical examination pursuant to paragraph (k)(3).
 - (5) Periodic Medical Examinations - The employer shall provide a medical examination for an employee if the employee advises the employer of the development of:
 - (i) Any of the medical conditions listed in (k)(2),
 - (ii) Signs and symptoms listed in Appendix A which the employee suspects may be caused by exposure to alpha-methyl styrene.
 - (6) Results of Periodic Examinations - The employer shall obtain a physician's written opinion based on the medical examination pursuant to paragraph (k)(5).
 - (7) Exclusion or Removal from Exposure - No employee shall be exposed to alpha-methyl styrene if such exposure could place the employee at increased risk of material impairment of his health.
 - (8) Emergency Procedures - The employer shall provide emergency and follow-up medical examinations and treatment for any employee injured through exposure to alpha-methyl styrene.
 - (9) Informing the Physician - The employer shall provide to the examining physician the following information:
 - (i) A copy of this regulation for alpha-methyl styrene;
 - (ii) A description of the employee's duties as they relate to his exposure to alpha-methyl styrene;
 - (iii) A description of any personal protective equipment required to be used;

NIOSH/OSHA Draft Technical Standard
and Supporting Documentation for ALPHA-METHYL STYRENE

(iv) The results of any employee's exposure measurement, if available;

(v) The employee's anticipated exposure level; and

(vi) Upon request of the physician, information from previous medical examination of the employee.

(10) Physician's Written Opinion

(i) The physician's written opinion shall be a signed statement by the examining physician specifically stating:

(a) Whether the employee has any detected medical conditions which could be directly or indirectly aggravated by exposure to alpha-methyl styrene or which could significantly interfere with the ability of the employee to follow recommended or required procedures for protecting himself from unusual or emergency exposure.

(b) Any recommended limitations upon the employee's exposure to alpha-methyl styrene.

(c) The employee has been informed by the physician of any detected medical conditions which required further medical examination or treatment.

(ii) The written opinion shall not reveal medical information unrelated to exposure to alpha-methyl styrene.

(11) Refusal to be Medically Examined - If an employee refuses any required medical examination, the employer shall inform the employee of the possible health consequences of such refusal and obtain a signed statement from the employee indicating that the employee understands the risks involved by refusing to be examined.

(1) Recordkeeping.

(1) Initial determination.

(i) The employer shall keep an accurate record of all initial determinations required to be made pursuant to paragraph (c)(1) of this section.

(ii) The record shall include the written determination and any supporting documentation as required in paragraph (c)(1) of this section.

(iii) This record shall be maintained for at least one year.

(2) Exposure measurements.

(i) The employer shall keep an accurate record of all measurements taken to determine employee exposure to alpha-methyl styrene.

(ii) This record shall include:

(a) The date of measurement;

(b) A reference to the subparagraph of this regulation which required the measurement, if any;

(c) Operations involving exposure to alpha-methyl styrene which are being monitored;

(d) Sampling and analytical methods used and evidence of their accuracy;

(e) Number, duration, and results of samples taken;

(f) Name, Social Security number, and exposure of the employee monitored.

(iii) This record shall be maintained for one year.

(3) Mechanical ventilation.

NIOSH/OSHA Draft Technical Standard
and Supporting Documentation for ALPHA-METHYL STYRENE

- (i) When mechanical ventilation is used as an engineering control, the employer shall maintain a record of measurements demonstrating the effectiveness of such ventilation as required by paragraph (e)(1)(i) of this section.
 - (ii) This record shall include:
 - (a) Date of measurement;
 - (b) Type of measurement taken;
 - (c) Result of measurement.
 - (iii) This record shall be maintained for one year.
- (4) Training and information.
- (i) The employer shall keep an accurate record of all employee training and advice required by paragraph (j) of this section.
 - (ii) The record shall include:
 - (a) Date of training;
 - (b) Name and Social Security number of employees trained;
 - (c) Substance of training provided.
 - (iii) This record shall be maintained for at least one year.
- (5) Medical records.
- (i) The employer shall keep an accurate medical record for each employee.
 - (ii) The record shall include:
 - (a) Physician's written opinion;
 - (b) Preplacement questionnaire;
 - (c) Any employee medical complaints relative to exposure to alpha-methyl styrene;
 - (d) A signed statement of any refusal to be examined;
 - (e) A copy of information provided to the physician pursuant to paragraph (k)(9) of this section.
 - (iii) This record shall be maintained for the duration of the employment of the affected employee.
- (6) Access to records.
- (i) All records required to be maintained by this section shall be made available upon request to authorized representatives of the Assistant Secretary and the Director.
 - (ii) Employee exposure measurement records required to be maintained by this section shall be made available to employees and former employees and their designated representatives.
 - (iii) Employee medical records required to be maintained by this section shall be made available upon written request to a physician designated by the employee or former employee.
- (m) Observation of monitoring.
- (1) Duty.

The employer shall give affected employees or their representatives an opportunity to observe any monitoring of employee exposure to alpha-methyl styrene which is conducted pursuant to this section.
 - (2) Exercise of opportunity to observe monitoring.
 - (i) When observation of the monitoring of employee exposure to alpha-methyl styrene requires entry into an area where the use of personal protective devices is required, the observer shall use such equipment and comply with all other applicable safety procedures.

NIOSH/OSHA Draft Technical Standard
and Supporting Documentation for ALPHA-METHYL STYRENE

- (ii) Without interfering with the measurement, observers shall be entitled to:
 - (a) Receive an explanation of the measurement procedures;
 - (b) Visually observe all steps related to the measurement of exposure to alpha-methyl styrene that are being performed at the place of exposure.
 - (c) Record the results obtained.
- (n) Employee notification.
 - (1) The employer shall notify in writing, within five work days, every employee who is found to be exposed to alpha-methyl styrene above the permissible exposure. The employee shall also be notified of the level of his exposure and the corrective action being taken to reduce the exposure to at or below the permissible exposure.
 - (2) Pursuant to paragraph (k) of this Section, when an employee is medically examined the employer shall provide the employee with a copy of the physician's written opinion.

NIOSH/OSHA Draft Technical Standard
and Supporting Documentation for ALPHA-METHYL STYRENE

APPENDIX A

SUBSTANCE SAFETY DATA SHEET

I. SUBSTANCE IDENTIFICATION

SUBSTANCE: alpha-methyl styrene

PERMISSIBLE EXPOSURE: 100 parts of alpha-methyl styrene vapor per million parts of air (ppm) or 480 milligrams of alpha-methyl styrene vapor per cubic meter of air (mg/cu m) must never be exceeded.

APPEARANCE AND ODOR: Colorless liquid with a characteristic odor

II. HEALTH HAZARD DATA

A. Ways in Which the Chemical Affects Your Body: alpha-methyl styrene can affect your body if you inhale it, swallow it, or if it comes in contact with your skin or eyes.

B. Effects of Overexposure:

1. Short term Effects: alpha-methyl styrene may cause irritation of the eyes, nose, and throat. The overexposed person may experience drowsiness,
2. Long Term Effects: Prolonged overexposure may produce irritation skin.
3. Reporting Signs and Symptoms: You should inform your employer if you develop any signs or symptoms associated with alpha-methyl styrene exposure.

III. EMERGENCY FIRST AID PROCEDURES

A. Eye Exposure: If alpha-methyl styrene gets into your eyes, wash your 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.

B. Skin Exposure: If alpha-methyl styrene gets on your non-impervious clothing or skin remove and clean the contaminated clothing and flush the contaminated skin with water promptly. When there is skin irritation, get medical attention.

C. Breathing: If you or any other person breathes in large amounts of alpha-methyl styrene remove the exposed person to fresh air at once. If breathing has stopped, perform artificial respiration. Keep the

NIOSH/OSHA Draft Technical Standard
and Supporting Documentation for ALPHA-METHYL STYRENE

affected person warm and at rest. Get medical attention as soon as possible.

D. Swallowing: If alpha-methyl styrene has been swallowed, do not cause vomiting. Get medical attention immediately.

E. Rescue: Move 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 yourself. Understand your emergency rescue procedures and know the locations of the equipment before the need arises.

IV. RESPIRATORS AND PROTECTIVE CLOTHING

A. RESPIRATORS: Respirators are not the best way to control exposure to alpha-methyl styrene. You can only be required to wear them for routine use if your employer is in the process of installing controls or other control measures prove inadequate. You may be required to wear respirators for non-routine activities or in emergencies. If respirators are worn, they must have a Mining Enforcement and Safety Administration (MESA)/National Institute for Occupational Safety and Health (NIOSH) approval label. (Older respirators may have a Bureau of Mines approval label.)

If you can smell alpha-methyl styrene while wearing a respirator, the respirator is not working correctly; go immediately to fresh air. If you experience difficulty breathing while wearing a respirator, tell your employer.

B. PROTECTIVE CLOTHING: You must wear impervious clothing, gloves, face shield, and other appropriate protective clothing over any parts of your body that could repeatedly be exposed to alpha-methyl styrene liquid.

C. EYE PROTECTION: You must wear splash-proof safety goggles if it is possible that alpha-methyl styrene may get into your eyes.

V. PRECAUTIONS FOR SAFE USE, HANDLING, AND STORAGE

alpha-Methyl styrene is a combustible liquid and must be stored in tightly closed containers, in a cool well-ventilated area, away from ignition sources. You must not smoke in areas where alpha-methyl styrene is stored, handled, or used. Metal alpha-methyl styrene storage containers must be grounded and bonded when transferring liquids and must be opened and closed with non-sparking tools. If your non-impervious clothing becomes wet with alpha-methyl styrene, you must promptly remove the clothing and not wear it again until the alpha-methyl styrene has been removed. If your skin becomes wet with alpha-methyl styrene, you must wash or shower promptly. Fire extinguishers, where provided, must be readily available and you should know where they are and how to operate them. Ask your supervisor where alpha-methyl styrene is used in your work area and for any additional plant safety rules.

NIOSH/OSHA Draft Technical Standard
and Supporting Documentation for ALPHA-METHYL STYRENE

APPENDIX B

SUBSTANCE TECHNICAL GUIDELINES
ALPHA-METHYLSTYRENE

- I. PHYSICAL AND CHEMICAL DATA
 - A. Substance Identification
 - 1. Synonyms: 1-Methyl-1-phenylethylene; AMS
 - 2. Formula: $C_6H_5C(CH_3)=CH_2$ or C_9H_{10}
 - B. Physical Data
 - 1. Boiling point (760 mm Hg): 165 C (329 F)
 - 2. Specific gravity (Water): 0.92
 - 3. Vapor density (air=1): 4.1
 - 4. Melting point: -23 C (-9 F)
 - 5. Vapor pressure at 20 C (68 F): 1.9 mm Hg
 - 6. Solubility in water, % by weight at 20 C (68 F): Insoluble
 - 7. Evaporation rate (butyl acetate=1): less than 1
 - 8. Appearance and odor: Colorless liquid with a characteristic odor
- II. FIRE, EXPLOSION AND REACTIVITY HAZARD DATA
 - A. Fire
 - 1. Flash point: 54 C (129 F) (closed cup)
 - 2. Autoignition temperature: 574 C (1066 F)
 - 3. Flammable limits in air, % by volume: Lower: 1.9; Upper: 6.1
 - 4. Extinguishing media: Carbon dioxide, dry chemical or foam.
 - 5. Special fire-fighting procedures: Do not use solid stream of water, since stream will scatter and spread fire. Use water spray to keep containers cool.
 - 6. Unusual fire and explosion hazards: alpha-methyl styrene is a combustible liquid. Its vapors can form explosive mixtures in air at elevated temperatures. All ignition sources must be controlled when alpha-methyl styrene is used, handled, and stored. alpha-methyl styrene vapors are heavier than air; thus the vapors may travel along the ground and be ignited by open flames or sparks at locations remote from the site at which the alpha-methyl styrene is handled.
 - 7. For the purposes of complying with 29 CFR 1910.106, alpha-methyl styrene is classified as a Class II combustible liquid. At 4750 ppm, one-fourth of the lower flammable limit, alpha-methyl styrene is considered a potential fire and explosion hazard.
 - 8. For the purposes of complying with 29 CFR 1910.309, the classification of hazardous locations as described in Article

NIOSH/OSHA Draft Technical Standard
and Supporting Documentation for ALPHA-METHYL STYRENE

500 of the National Electrical Code for alpha-methyl styrene shall be Class I, Group D.

B. Reactivity

1. Conditions contributing to instability: heat
2. Incompatibilities: Contact with oxidizing agents (including peroxides and halogens) may cause fire and explosions. Also avoid contact with catalysts for vinyl polymerization and catalysts for ionic polymerization such as aluminum or iron chloride.
3. Hazardous Decomposition Products: Toxic gases and vapors (such as carbon monoxide) may be released in a fire involving alpha-methyl styrene.
4. Special Precautions: none

III. SPILL AND LEAK PROCEDURES

A. If alpha-methyl styrene 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) and burn the paper. For large quantities can be collected and atomized in a suitable combustion chamber. Combustion may be improved by mixing with a flammable liquid. Liquid alpha-methylstyrene may not be allowed to enter a confined space, such as a sewer, because of the possibility of an explosion.

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

C. Waste Disposal Methods:

alpha-Methyl styrene may be disposed of:

1. By absorbing it in vermiculite, dry sand, earth or a similar material and disposing in a sanitary land fill.
2. By atomizing in a suitable combustion chamber. Combustion may be improved by mixing with a flammable liquid.

IV. MONITORING AND MEASUREMENT PROCEDURES

a. EXPOSURE ABOVE THE ACTION LEVEL: Measurements taken for the purpose of determining employee exposure under this section must be taken during periods of maximum expected airborne concentrations of alpha-methyl styrene. Each measurement should consist of a 15-minute sample or series of consecutive samples totaling fifteen (15) minutes in the employee's breathing zone (air that would most nearly represent that inhaled by the employee). A minimum of three measurements should be taken on one work shift and the highest of all measurements taken is a good estimate of employee's highest exposure for that shift. Sampling and analyses may be performed by instruments such as; detector tubes certified by NIOSH under 42 CFR Part 84, portable direct-reading instruments, gas and vapor adsorption tubes with subsequent chemical analyses, or dosimeters. The method of measurement must determine the concentration of alpha-methyl styrene to plus or minus 35%.

b. EXPOSURE ABOVE THE PERMISSIBLE EXPOSURE: The monitoring under this section should be essentially the same as described under paragraph IV.A.. More than three (3) measurements should be taken during the

NIOSH/OSHA Draft Technical Standard
and Supporting Documentation for ALPHA-METHYL STYRENE

work shift so that increased confidence may be placed in the judgement that the employee has or has not, in fact, been exposed in excess of the permissible limit. Laboratories performing Samples should be collected as described under paragraph IV.A.. chemical analyses should be accredited in Industrial Hygiene Chemistry by the American Industrial Hygiene Association (AIHA). The method of measurement must determine the concentration of alpha-methyl styrene to plus or minus 25%. Method meeting these accuracy requirements are available in the "NIOSH Monitoring Methods Manual".

V. MISCELLANEOUS PRECAUTIONS

- A. High exposures to alpha-methyl styrene can occur when transferring the liquid from one container to another.
- B. Non-sparking tools must be used to open and close metal alpha-methyl styrene containers which must then be effectively grounded and bonded prior to pouring.
- C. Store alpha-methyl styrene in tightly closed containers in a cool well-ventilated area away from ignition sources.
- D. Runaway polymerization of alpha-methyl styrene is not likely unless the material comes in contact with catalysts for ionic polymerization such as aluminum or iron chlorides and strong acids.
- E. Employers must advise employees of all plant areas and operations where exposure to alpha-methyl styrene could occur.

VI. COMMON OPERATIONS

Some common operations in which exposure to alpha-methyl styrene is likely to occur are when it is produced from cumene, and when it is used in making certain polyesters, alkyd resins, copolymers with methyl methacrylate, and homopolymers.

NIOSH/OSHA Draft Technical Standard
and Supporting Documentation for ALPHA-METHYL STYRENE

APPENDIX C - MEDICAL SURVEILLANCE GUIDELINES

I. Route of Entry

Inhalation

II. Toxicology

Overexposure to alpha-methyl styrene causes slight irritation of the eyes, upper respiratory tract, and skin. With prolonged and repeated contact, there may be depression of the central nervous system.

III. Signs and Symptoms

Irritation of eyes, nose and throat and drowsiness. Prolonged skin contact may produce dermatitis.

IV. Special Tests

None in common usage.

V. Treatment

None specific. Remove from exposure, give artificial resuscitation if indicated, and wash eyes and contaminated skin. Recovery is usually rapid and complete.

VI. Surveillance and Preventive Considerations

A. General

Most reported effects of alpha-methyl styrene are caused by its irritant properties. It is important that the physician become familiar with plant operating conditions in which exposure to alpha-methyl styrene occurs. Those with skin disease may not tolerate the wearing of protective clothing and those with chronic respiratory disease may not tolerate the wearing of negative pressure respirators.

B. Preplacement

Routine medical histories and physical examinations are not required. However the employer must screen employees for history of certain medical conditions (listed below) which might place the employee at increased risk from alpha-methyl styrene exposure. Only those giving a positive history of these conditions must be referred for further medical examinations.

1. Skin disease -- Alpha-Methyl styrene can cause dermatitis on prolonged exposure. Persons with pre-existing skin disorders may be more susceptible to the effects of the agent.

NIOSH/OSHA Draft Technical Standard
and Supporting Documentation for ALPHA-METHYL STYRENE

2. Chronic respiratory disease -- In persons with impaired pulmonary function, especially those with obstructive airway diseases, the breathing of alpha-methyl styrene might cause exacerbation of symptoms due to its irritant properties or psychic reflex bronchospasm.
3. Renal disease -- Although alpha-methyl styrene is not known as a kidney toxin, the importance of the organ in the elimination of toxic substances justifies special consideration in those with possible impairment of renal function.
4. Liver disease -- Although alpha-methyl styrene 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.

C. Periodic Examinations

Routine periodic examinations are not required. However, if the employer becomes aware of an employee with the above listed conditions, he must refer such employee for further medical examination.

References

1. Wolf, M.A., et al.: "Toxicological Studies of Certain Alkylated Benzenes and Benzene". Archives of Industrial Health, 14:387-398, 1956.

NIOSH/OSHA Draft Technical Standard
and Supporting Documentation for ALPHA-METHYL STYRENE

REFERENCES AND SOURCES
ALPHA-METHYL STYRENE

1910.93

- (f) Personal Protective Equipment, and, (h) Sanitation
Eyes: Grant, "Toxicology of the Eyes"
Skin: "Alpha-Methyl Styrene," Allied Chemical Company
Sax, "Dangerous Properties of Industrial Materials"
Wolf et al., "Toxicological Studies of Certain Alkylated
Benzenes and Benzene," AMA Arch. Ind. Hth., 14 (4) 387-98 (1956)
Ingestion: Sax, "Dangerous Properties of Industrial Materials"
Wolf et al., "Toxicological Studies of Certain Alkylated
Benzenes and Benzene," AMA Arch. Ind. Hth., 14 (4) 387-98 (1956)

COMMENTS

Eye - Classification: 2

Output statement numbers: 10

Exceptions: None

Interpreting the data of Smyth and Carpenter, Grant notes that alpha-methyl styrene "has been tested by application of a drop to rabbit eyes and has been found to cause only slight transient corneal irritation and no corneal damage." In the absence of any other information, it is concluded that the substance will only produce mild or moderate eye irritation when in contact with the eye and that a classification of 2 is appropriate.

Skin - Classification: 2

Output statement numbers: 2, 7b, 17g, 17i

Exceptions: 20a

The Allied Chemical Company reports that "prolonged skin contact can cause severe rashes, swelling and blistering." Sax lists alpha-methyl styrene as an acute local irritant of moderate effect. According to Wolf et al., the repeated cutaneous application of alpha-methyl styrene to rabbit skin results in definite erythema to cherry-red erythema similar to that caused by a good sunburn. They note it also causes the development of a thin layer of devitalized tissue which resulted in exfoliation.

Alpha-methyl styrene is insoluble in water, has a flash point of 129.2 degrees F, and a vapor pressure of 1.9 mm Hg at 20 degrees C.

A classification of 2 is concluded to be appropriate to prevent the cited effects. Statement 20a is not used because the amounts of chemical towards which it is directed would have innocuous effects.

Ingestion - Classification: 0

Output statement numbers: None

Exceptions: None

Wolf et al. give an oral rat LD50 of 4.9 g/Kg. Sax lists alpha-methyl styrene as an acute systemic ingesta of moderate hazard. He adds, "from animal studies it appears that immediate deaths occur from primary action on the central nervous system."

NIOSH/OSHA Draft Technical Standard
and Supporting Documentation for ALPHA-METHYL STYRENE

Since alpha-methyl styrene is of low acute oral toxicity and chronic feeding data are unavailable, it is concluded that ingestion of harmful quantities would not, in the context of this standard, present a hazard in the industrial environment.

RESPIRATOR TABLE DOCUMENTATION

SUBSTANCE: Alpha-methyl styrene

D. O. L. STANDARD: 100 ppm shall not be exceeded.

WARNING PROPERTIES:

Odor Threshold: According to the Documentation of TLV's, "four human subjects exposed to a concentration of 200 ppm of alpha-methyl styrene reported definite unpleasant odor . . . after two minutes." This concentration is not necessarily the odor threshold.

Eye Irritation Level: The Documentation of TLV's also notes that at 200 ppm human subjects experienced eye irritation. This concentration is not necessarily the threshold of eye irritation.

Evaluation of Warning Properties: Alpha-methyl styrene can be detected at a concentration less than two times the permissible exposure limit. Even though the permissible exposure limit is a ceiling concentration, alpha-methyl styrene is still treated as a material with adequate warning properties, since the ceiling appears to have been established to avoid irritant effects. Gas sorbent respiratory equipment is permitted. The Documentation of TLV's gives the following quote of Dow Chemical Company: "We suggest, therefore, an Industrial Hygiene Standard of 200 ppm based on toxicity. For engineering purposes, we suggest that the vapor concentration be controlled to 100 ppm alpha-methyl styrene in order to minimize complaints of exposed persons."

IDLH: 5000 ppm

Basis for IDLH Value: Since there are no acute inhalation toxicity data available upon which to base the IDLH concentration for alpha-methyl styrene, the chosen IDLH (5000 ppm) is based upon an analogy with styrene. Animals exposed to 5000 ppm styrene become unconscious within one hour.

Other Toxicological Information: According to Sax, alpha-methyl styrene produces the same toxic effects as those of methyl styrene (vinyl toluene). "From animal studies it appears that immediate deaths occur from primary action on CNS whereas delayed deaths come about from pneumonia."

There is little information on the inhalation toxicity of alpha-methyl styrene.

LFL: 19,000 ppm

VAPOR PRESSURE AT 20 C: 1.9 mm Hg

SATURATED CONCENTRATION AT 20 C: 2500 ppm

NIOSH/OSHA Draft Technical Standard
and Supporting Documentation for ALPHA-METHYL STYRENE

USE/EXPOSURE AND CONTROL DOCUMENT
ALPHA-METHYL STYRENE

	Use/Exposure	Principal Route of Entry	Currently Used Control Methods
1.	Inhalation of vapor during manufacture of styrene-butadiene rubber using alpha-methyl styrene	A	General dilution ventilat
2.	Inhalation of vapor during production of alpha-methyl styrene	A	Local exhaust ventilation general dilution ventilat
3.	Inhalation of vapor during spray application of specialized alpha-methyl styrene-polyester surface coatings	A,B	Local exhaust ventilation general dilution ventilat personal protective equip (gloves, goggles, barrier creams)
4.	Inhalation of vapor during manufacture of high-impact acrylonitrile-butadiene-styrene plastics	A	General dilution ventilat local exhaust ventilation
5.	Inhalation of vapor during manufacture of specialized alpha-methyl styrene-polyester and alkyd surface coating resins	A	Local exhaust ventilation general dilution ventilat
6.	Inhalation of vapor and skin contact with liquid during handling and subdivision of large quantities of alpha-methyl styrene	A,B	Local exhaust ventilation personal protective equip (gloves, aprons, goggles, barrier creams)
7.	Inhalation of vapor during manufacture of certain plasticizers in varnishes, adhesives, and plastics	A	Local exhaust ventilation general dilution ventilat
8.	Inhalation of vapor during manufacture of carbolic acid with cumene peroxidation process	A	Local exhaust ventilation general dilution ventilat
9.	Inhalation of vapor during brush application of specialized alpha-methyl styrene polyester surface coatings	A	General dilution ventilat

NIOSH/OSHA Draft Technical Standard
and Supporting Documentation for ALPHA-METHYL STYRENE

- A -- Inhalation
- B -- Skin contact resulting in
localized irritation
- C -- Ingestion
- D -- Skin contact resulting in
absorption and subsequent
systemic poisoning