

## MATERIAL SAFETY DATA SHEET

Date Printed: 03/03/2004

Date Updated: 09/02/2002

Version 2.2

## Section 1 - Product and Company Information

Product Name STYRENE, 99%  
Product Number S4972  
Brand ALDRICH

Company Sigma-Aldrich  
Street Address 3050 Spruce Street  
City, State, Zip, Country SAINT LOUIS MO 63103 US  
Technical Phone: 314 771 5765  
Emergency Phone: 414 273 3850 Ext. 5996  
Fax: 800 325 5052

## Section 2 - Composition/Information on Ingredient

Substance Name	CAS #	SARA 313
STYRENE	100-42-5	Yes

Formula C8H8  
Synonyms Benzene, vinyl- \* Cinnamene \* Ethenylbenzene \*  
Ethylene, phenyl- \* NCI-C02200 \* Phenethylene \*  
Phenylethene \* Phenylethylene (OSHA) \* Stirolo  
(Italian) \* Styreen (Dutch) \* Styren (Czech) \*  
Styrene (OSHA) \* Styrene, monomer (ACGIH) \*  
Styrol (German) \* Styrole \* Styrolene \*  
Vinylbenzen (Czech) \* Vinylbenzene \* Vinyl  
benzene (OSHA) \* Vinylbenzol

RTECS Number: WL3675000

## Section 3 - Hazards Identification

## EMERGENCY OVERVIEW

Flammable. Harmful.

Harmful by inhalation. Irritating to eyes, respiratory system and skin. Limited evidence of a carcinogenic effect.

Possible Carcinogen (US). Lachrymator. Target organ(s): Central nervous system. Blood.

## HMIS RATING

HEALTH: 2\*

FLAMMABILITY: 3

REACTIVITY: 1

## NFPA RATING

HEALTH: 2

FLAMMABILITY: 3

REACTIVITY: 1

\*additional chronic hazards present.

For additional information on toxicity, please refer to Section 11.

## Section 4 - First Aid Measures

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#### ORAL EXPOSURE

If swallowed, wash out mouth with water provided person is conscious. Call a physician.

#### INHALATION EXPOSURE

If inhaled, remove to fresh air. If not breathing give artificial respiration. If breathing is difficult, give oxygen.

#### DERMAL EXPOSURE

In case of contact, immediately wash skin with soap and copious amounts of water.

#### EYE EXPOSURE

In case of contact, immediately flush eyes with copious amounts of water for at least 15 minutes.

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### Section 5 - Fire Fighting Measures

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#### FLAMMABLE HAZARDS

Flammable Hazards: Yes

#### EXPLOSION HAZARDS

Container explosion may occur under fire conditions. Forms explosive mixtures in air.

#### FLASH POINT

89.6 °F 32 °C Method: closed cup

#### EXPLOSION LIMITS

Lower: 1.1 % Upper: 8.9 %

#### AUTOIGNITION TEMP

480 °C

#### FLAMMABILITY

N/A

#### EXTINGUISHING MEDIA

Suitable: Carbon dioxide, dry chemical powder, or appropriate foam.

Unsuitable: Water may be effective for cooling, but may not effect extinguishment.

#### FIREFIGHTING

Protective Equipment: Wear self-contained breathing apparatus and protective clothing to prevent contact with skin and eyes.

Specific Hazard(s): Vapor may travel considerable distance to source of ignition and flash back. Flammable liquid.

Specific Method(s) of Fire Fighting: Use water spray to cool fire-exposed containers.

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### Section 6 - Accidental Release Measures

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#### PROCEDURE TO BE FOLLOWED IN CASE OF LEAK OR SPILL

Evacuate area. Shut off all sources of ignition.

#### PROCEDURE(S) OF PERSONAL PRECAUTION(S)

Wear respirator, chemical safety goggles, rubber boots, and heavy rubber gloves.

#### METHODS FOR CLEANING UP

Absorb on sand or vermiculite and place in closed containers for disposal. Ventilate area and wash spill site after material pickup is complete.

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## Section 7 - Handling and Storage

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### HANDLING

User Exposure: Do not breathe vapor. Do not get in eyes, on skin, on clothing.

### STORAGE

Suitable: Keep tightly closed. Keep away from heat, sparks, and open flame.  
Store at 2-8°C

### SPECIAL REQUIREMENTS

Light sensitive.

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## Section 8 - Exposure Controls / PPE

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### ENGINEERING CONTROLS

Use only in a chemical fume hood. Safety shower and eye bath. Use nonsparking tools.

### PERSONAL PROTECTIVE EQUIPMENT

Respiratory: Government approved respirator.

Hand: Compatible chemical-resistant gloves.

Eye: Chemical safety goggles.

### GENERAL HYGIENE MEASURES

Wash thoroughly after handling.

### EXPOSURE LIMITS, RTECS

Country	Source	Type	Value
USA	ACGIH	STEL	40 PPM
USA	ACGIH	TWA	20 PPM
USA	MSHA Standard-air	TWA	100 PPM (420 MG/M3)
USA	OSHA.	PEL	8H TWA 100 PPM;CL 200;PK 600/5
New Zealand	OEL		
Remarks: check ACGIH TLV			
USA	NIOSH	TWA	50 PPM
		STEL	100 PPM

### EXPOSURE LIMITS

Country	Source	Type	Value
Poland		NDS	50 MG/M3
Poland		NDSch	200 MG/M3
Poland		NDSP	-

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## Section 9 - Physical/Chemical Properties

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### Appearance

Physical State: Clear liquid  
Color: Colorless

### Property

Value At Temperature or Pressure

Molecular Weight 104.15 AMU

pH N/A

BP/BP Range 145 - 146 °C

760 mmHg

MP/MP Range -31 °C

Freezing Point N/A

Vapor Pressure 4.3 mmHg

15 °C

Vapor Density	3.6 g/l	
Saturated Vapor Conc.	N/A	
SG/Density	0.906 g/cm3	
Bulk Density	N/A	
Odor Threshold	N/A	
Volatile%	N/A	
VOC Content	N/A	
Water Content	N/A	
Solvent Content	N/A	
Evaporation Rate	N/A	
Viscosity	N/A	
Surface Tension	N/A	
Partition Coefficient	N/A	
Decomposition Temp.	N/A	
Flash Point	89.6 °F 32 °C	Method: closed cup
Explosion Limits	Lower: 1.1 % Upper: 8.9 %	
Flammability	N/A	
Autoignition Temp	480 °C	
Refractive Index	1.547	
Optical Rotation	N/A	
Miscellaneous Data	N/A	
Solubility	Solubility in Water: Insoluble.	

N/A = not available

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## Section 10 - Stability and Reactivity

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### STABILITY

Stable: Stable.

Conditions to Avoid: May polymerize on exposure to light.

Materials to Avoid: Oxidizing agents Copper, Copper alloys.

### HAZARDOUS DECOMPOSITION PRODUCTS

Hazardous Decomposition Products: Carbon monoxide, Carbon dioxide.

### STABILIZERS PRESENT

Inhibited with 10-15 ppm 4-tert-butylcatechol.

### HAZARDOUS POLYMERIZATION

Hazardous Polymerization: May occur

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## Section 11 - Toxicological Information

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### ROUTE OF EXPOSURE

Skin Contact: Causes skin irritation.

Skin Absorption: May be harmful if absorbed through the skin.

Eye Contact: Causes eye irritation. Lachrymator.

Inhalation: Material is irritating to mucous membranes and upper respiratory tract. May be harmful if inhaled.

Ingestion: May be harmful if swallowed.

### TARGET ORGAN(S) OR SYSTEM(S)

Central nervous system. Blood. Lymphatic system. Endocrine system.

### SIGNS AND SYMPTOMS OF EXPOSURE

Exposure can cause: Dermatitis. CNS depression. Nausea, dizziness, and headache.

### TOXICITY DATA

Inhalation  
Human  
10,000 ppm  
LCLO

Oral  
Rat  
2650 mg/kg  
LD50

Remarks: Behavioral:Somnolence (general depressed activity).  
Liver:Other changes.

Inhalation  
Rat  
12,000 mg/m3  
LC50

Intraperitoneal  
Rat  
898 MG/KG  
LD50

Oral  
Mouse  
316 mg/kg  
LD50

Inhalation  
Mouse  
9,500 mg/m3  
LC50

Intraperitoneal  
Mouse  
660 MG/KG  
LD50

Intravenous  
Mouse  
90 MG/KG  
LD50

Oral  
Mammal  
> 1500 mg/kg  
LD50

#### IRRITATION DATA

Skin  
Human  
500 mg

Skin  
Rabbit  
500 mg  
Remarks: Open irritation test

Skin  
Rabbit  
100 %  
Remarks: Moderate irritation effect

Eyes  
Rabbit  
100 mg  
Remarks: Severe irritation effect

Eyes  
Rabbit  
100 mg  
24H  
Remarks: Moderate irritation effect

#### CHRONIC EXPOSURE - CARCINOGEN

Result: This product is or contains a component that has been reported to be possibly carcinogenic based on its IARC, ACGIH, NTP, or EPA classification.

Species: Rat  
Route of Application: Oral  
Dose: 1520 MG/KG  
Exposure Time: 43W  
Frequency: I  
Result: Tumorigenic: Equivocal tumorigenic agent by RTECS criteria. Skin and Appendages: Other: Tumors.

Species: Rat  
Route of Application: Inhalation  
Dose: 100 PPM  
Exposure Time: 4H/5D/1Y  
Frequency: I  
Result: Tumorigenic: Carcinogenic by RTECS criteria. Skin and Appendages: Other: Tumors. Blood: Leukemia

Species: Mouse  
Route of Application: Inhalation  
Dose: 160 PPM  
Exposure Time: 6H/2Y  
Frequency: I  
Result: Tumorigenic: Carcinogenic by RTECS criteria. Lungs, Thorax, or Respiration: Tumors.

#### IARC CARCINOGEN LIST

Rating: Group 2B

#### NTP CARCINOGEN LIST

Rating: Inadequate studies  
Species: Mouse/rat  
Route: Gavage

#### ACGIH CARCINOGEN LIST

Rating: A4

#### CHRONIC EXPOSURE - TERATOGEN

Species: Rat  
Dose: 4 GM/KG  
Route of Application: Oral  
Exposure Time: (6-15D PREG)  
Result: Effects on Embryo or Fetus: Fetotoxicity (except death,

e.g., stunted fetus).

Species: Rat  
Dose: 11470 MG/KG  
Route of Application: Oral  
Exposure Time: (6-15D PREG)  
Result: Specific Developmental Abnormalities: Urogenital system.

Species: Rat  
Dose: 1500 UG/M3/24H  
Route of Application: Inhalation  
Exposure Time: (1-22D PREG)  
Result: Effects on Embryo or Fetus: Fetotoxicity (except death, e.g., stunted fetus). Effects on Embryo or Fetus: Fetal death.

#### CHRONIC EXPOSURE - MUTAGEN

Result: Laboratory experiments have shown mutagenic effects.

Species: Human  
Dose: 100 UMOL/L  
Cell Type: lymphocyte  
Mutation test: Unscheduled DNA synthesis

Species: Human  
Dose: 28 MMOL/L  
Cell Type: HeLa cell  
Mutation test: DNA inhibition

Species: Human  
Dose: 300 MG/KG  
Cell Type: lymphocyte  
Mutation test: Body fluid assay

Species: Human  
Route: Inhalation  
Dose: 7500 PPB/8H/5D-I  
Mutation test: Cytogenetic analysis

Species: Human  
Dose: 300 PPM  
Exposure Time: 72H  
Cell Type: lymphocyte  
Mutation test: Cytogenetic analysis

Species: Human  
Route: Inhalation  
Dose: 1204 MG/M3/5Y-I  
Mutation test: Sister chromatid exchange

Species: Human  
Dose: 10 UMOL/L  
Cell Type: lymphocyte  
Mutation test: Sister chromatid exchange

Species: Rat  
Dose: 145 UG/PLATE  
Cell Type: Embryo  
Mutation test: Morphological transformation.

Species: Rat  
Dose: 3 MMOL/L  
Cell Type: liver

Mutation test: DNA damage

Species: Rat

Dose: 3800 UMOL/L

Cell Type: liver

Mutation test: Unscheduled DNA synthesis

Species: Rat

Route: Inhalation

Dose: 300 PPM

Exposure Time: 8W

Mutation test: Cytogenetic analysis

Species: Rat

Route: Intraperitoneal

Dose: 750 MG/KG

Mutation test: Sister chromatid exchange

Species: Rat

Route: Intraperitoneal

Dose: 40 GM/KG

Exposure Time: 8W

Mutation test: sperm

Species: Mouse

Route: Intraperitoneal

Dose: 250 MG/KG

Mutation test: Micronucleus test

Species: Mouse

Route: Intraperitoneal

Dose: 10 MMOL/KG

Mutation test: DNA damage

Species: Mouse

Route: Intraperitoneal

Dose: 450 MG/KG

Mutation test: Sister chromatid exchange

Species: Mouse

Route: Inhalation

Dose: 125 PPM

Exposure Time: 4D

Mutation test: Sister chromatid exchange

Species: Mouse

Dose: 1 GM/KG

Cell Type: S. cerevisiac

Mutation test: Host-mediated assay

Species: Mouse

Dose: 1 GM/KG

Cell Type: S. pombe

Mutation test: Host-mediated assay

Species: Mouse

Route: Intraperitoneal

Dose: 3500 MG/KG

Exposure Time: 7W

Mutation test: sperm

Species: Hamster



Dose: 240 UMOL/PLATE (+S9)  
Cell Type: lung  
Mutation test: Mutation in microorganisms

Species: Hamster  
Dose: 100 MG/L  
Cell Type: lung  
Mutation test: Cytogenetic analysis

#### CHRONIC EXPOSURE - REPRODUCTIVE HAZARD

Species: Rat  
Dose: 8600 MG/KG  
Route of Application: Oral  
Exposure Time: (1-22D PREG/21D POST)  
Result: Effects on Newborn: Behavioral.

Species: Rat  
Dose: 5575 MG/KG  
Route of Application: Oral  
Exposure Time: (MULTIGENERATIONS)  
Result: Effects on Newborn: Viability index (e.g., # alive at day 4 per # born alive). Effects on Newborn: Weaning or lactation index (e.g., # alive at weaning per # alive at day 4).

Species: Rat  
Dose: 293 PPM/6H  
Route of Application: Inhalation  
Exposure Time: (7-21D PREG)  
Result: Effects on Newborn: Behavioral.

Species: Rat  
Dose: 5 MG/M3/24H  
Route of Application: Inhalation  
Exposure Time: (1-22D PREG)  
Result: Effects on Newborn: Stillbirth. Effects on Newborn: Weaning or lactation index (e.g., # alive at weaning per # alive at day 4).

Species: Rat  
Dose: 1500 UG/M3/24H  
Route of Application: Inhalation  
Exposure Time: (1-7D PREG)  
Result: Effects on Fertility: Pre-implantation mortality (e.g., reduction in number of implants per female; total number of implants per corpora lutea). Effects on Fertility: Post-implantation mortality (e.g., dead and/or resorbed implants per total number of implants).

Species: Rat  
Dose: 50 PPM/6H  
Route of Application: Inhalation  
Exposure Time: (7-12D PREG)  
Result: Effects on Newborn: Growth statistics (e.g., reduced weight gain).

Species: Mouse  
Dose: 500 PPM/6H  
Route of Application: Inhalation  
Exposure Time: (6-16D PREG)  
Result: Effects on Fertility: Post-implantation mortality (e.g., dead and/or resorbed implants per total number of implants).

Species: Hamster  
Dose: 1000 PPM/6H  
Route of Application: Inhalation  
Exposure Time: (6-18D PREG)  
Result: Effects on Fertility: Post-implantation mortality (e.g., dead and/or resorbed implants per total number of implants).

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## Section 12 - Ecological Information

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### ACUTE ECOTOXICITY TESTS

Test Type: LC50 Fish  
Species: Leuciscus idus  
Time: 48 h  
Value: 17 - 66 mg/l

Test Type: EC50 Daphnia  
Species: Daphnia magna  
Time: 24 h  
Value: 182 mg/l

### ELIMINATION

Elimination: 60 %

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## Section 13 - Disposal Considerations

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### APPROPRIATE METHOD OF DISPOSAL OF SUBSTANCE OR PREPARATION

Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber. Observe all federal, state, and local environmental regulations.

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## Section 14 - Transport Information

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### DOT

Proper Shipping Name: Styrene monomer, inhibited  
UN#: 2055  
Class: 3  
Packing Group: Packing Group III  
Hazard Label: Flammable liquid  
PIH: Not PIH

### IATA

Proper Shipping Name: Styrene monomer, stabilized  
IATA UN Number: 2055  
Hazard Class: 3  
Packing Group: III

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## Section 15 - Regulatory Information

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### EU DIRECTIVES CLASSIFICATION

Symbol of Danger: Xn  
Indication of Danger: Harmful.  
R: 10 20 36/38  
Risk Statements: Flammable. Harmful by inhalation. Irritating to eyes and skin.  
S: 23  
Safety Statements: Do not breathe vapor.

US CLASSIFICATION AND LABEL TEXT

Indication of Danger: Flammable. Harmful.

Risk Statements: Harmful by inhalation. Irritating to eyes, respiratory system and skin. Limited evidence of a carcinogenic effect.

Safety Statements: Keep away from sources of ignition - no smoking. In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. Wear suitable protective clothing, gloves, and eye/face protection.

US Statements: Possible Carcinogen (US). Lachrymator. Target organ(s): Central nervous system. Blood.

UNITED STATES REGULATORY INFORMATION

SARA LISTED: Yes

DEMINIMIS: 0.1 %

NOTES: This product is subject to SARA section 313 reporting requirements.

TSCA INVENTORY ITEM: Yes

CANADA REGULATORY INFORMATION

WHMIS Classification: This product has been classified in accordance with the hazard criteria of the CPR, and the MSDS contains all the information required by the CPR.

DSL: Yes

NDSL: No

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Section 16 - Other Information

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DISCLAIMER

For R&D use only. Not for drug, household or other uses.

WARRANTY

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Inc., shall not be held liable for any damage resulting from handling or from contact with the above product. See reverse side of invoice or packing slip for additional terms and conditions of sale. Copyright 2004 Sigma-Aldrich Co. License granted to make unlimited paper copies for internal use only.