

# HEALTH RELATED INFORMATION ON SILICA

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## U. S. SILICA COMPANY

### MSDS - MATERIAL SAFETY DATA SHEET

#### SECTION 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

**Product Names/Trade Names:**

Silica Sand sold under various names: ASTM TESTING SANDS • GLASS SAND • FLINT SILICA • DM-SERIES • F-SERIES • FOUNDRY SANDS • FJ-SERIES • FP-SERIES • H-SERIES • L-SERIES • N-SERIES • NJ-SERIES • OK-SERIES • P-SERIES • T-SERIES • HYDRAULIC FRACING SANDS • MIN-U-SIL® • MYSTIC WHITE® • #1 DRY • #1 SPECIAL • PENN SAND® • Q-ROK® • SIL-CO-SIL® • SUPERSIL®.

**Synonyms/Common Names:** Sand, Silica Sand, Quartz, Crystalline Silica, Flint, Ground Silica.

**Manufacturer's Name:**  
 U. S. Silica Company  
 P. O. Box 187  
 Berkeley Springs, WV 25411

**Emergency Telephone Number:** 304-258-2500  
 304-258-8295 (fax)

**Date Prepared:** September 15, 2000

## SECTION 2 - COMPOSITION / INFORMATION ON INGREDIENTS

### **Ingredients:**

	Chemical Formula	Typical %, By Weight	CAS #
Crystalline Silica (Quartz)	SiO <sub>2</sub>	99.0 - 99.9	14808-60-7
Aluminum Oxide	Al <sub>2</sub> O <sub>3</sub>	< .8	1344-28-1
Iron Oxide	Fe <sub>2</sub> O <sub>3</sub>	< .1	1309-37-1
Titanium Oxide	TiO <sub>2</sub>	< .1	13463-67-7

### **Exposure Limits for Hazardous Ingredients:**

	OSHA PEL	ACGIH TLV	NIOSH REL
Crystalline Silica (Quartz)	$\frac{10 \text{ mg/m}^3}{\% \text{ SiO}_2 + 2}$	.05	.05

The exposure limits are time-weighted average concentrations for an 8-hour workday and a 40-hour workweek.

Crystalline silica exists in several forms, the most common of which is quartz. If crystalline silica (quartz) is heated to more than 870°C, it can change to a form of crystalline silica known as trydimite, and if crystalline silica (quartz) is heated to more than 1470°C, it can change to a form of crystalline silica known as cristobalite. The OSHA PEL for crystalline silica as trydimite and cristobalite is one-half of the OSHA PEL for crystalline silica (quartz)

## SECTION 3 - HAZARD IDENTIFICATION

### **Emergency Overview:**

The U. S. Silica Company material is a white or tan sand, or ground sand. It is not flammable, combustible or explosive. It does not cause burns or severe skin or eye irritation. A single exposure will not result in serious adverse health effects. Crystalline silica (quartz) is not known to be an environmental hazard.

Crystalline silica (quartz) is incompatible with hydrofluoric acid, fluorine, chlorine trifluoride or oxygen difluoride.

**Potential Health Effects:****Inhalation:**

- a. **Silicosis** Respirable crystalline silica (quartz) can cause silicosis, a fibrosis (scarring) of the lungs. Silicosis may be progressive; it may lead to disability and death.
- b. **Cancer** Crystalline silica (quartz) inhaled from occupational sources is classified as carcinogenic to humans.
- c. **Autoimmune Diseases** There are some studies that show excess numbers of cases of scleroderma and other connective tissue disorders in workers exposed to respirable crystalline silica.
- d. **Tuberculosis** Silicosis increases the risk of tuberculosis.
- e. **Nephrotoxicity** There are some studies that show an increased incidence of chronic kidney disease and end-stage renal disease in workers exposed to respirable crystalline silica.

**Eye Contact:** Crystalline silica (quartz) may cause abrasion of the cornea.

**Skin Contact:** Not applicable.

**Ingestion:** Not applicable.

**Chronic Effects:** The adverse health effects -- silicosis, cancer, autoimmune diseases, tuberculosis, and nephrotoxicity -- are chronic effects.

**Signs and Symptoms of Exposure:** Generally, there are no signs or symptoms of exposure to crystalline silica (quartz).

**Medical Conditions Generally Aggravated by Exposure:** The condition of individuals with lung disease (e.g., bronchitis, emphysema, chronic obstructive pulmonary disease) can be aggravated by exposure.

See Section 11, Toxicological Information, for additional detail on potential adverse health effects.

**SECTION 4 - FIRST AID MEASURES**

**Inhalation:** No specific first-aid is necessary since the adverse health effects associated with exposure to crystalline silica (quartz) result from chronic exposures. If there is a gross inhalation of crystalline silica (quartz), remove the person immediately to fresh air, give artificial respiration as needed, seek medical attention as needed.

**Eye Contact:** Wash immediately with water. If irritation persists, seek medical attention.

**Skin Contact:** Not applicable.

**Ingestion:** Not applicable.

## SECTION 5 - FIRE FIGHTING MEASURES

Crystalline silica (quartz) is not flammable, combustible or explosive.

## SECTION 6 - ACCIDENTAL RELEASE MEASURES

**Spills:** Use dustless methods (vacuum) and place into closable container for disposal, or flush with water. Do not dry sweep. Wear protective equipment specified below.

**Waste Disposal Method:** See Section 13.

## SECTION 7 - HANDLING AND STORAGE

**Precautions During Handling and Use:** Do not breath dust. Use adequate ventilation and dust collection. Keep airborne dust concentrations below PEL. Do not rely on your sight to determine if dust is in the air. Silica may be in the air without a visible dust cloud. If dust cannot be kept below permissible limits, wear a respirator approved for silica dust when using, handling, storing or disposing of this product or bag. Practice good housekeeping. Do not permit dust to collect on walls, floors, sills, ledges, machinery, or equipment. Maintain, clean, and fit test respirators in accordance with OSHA regulations. Maintain and test ventilation and dust collection equipment. Wash or vacuum clothing that has become dusty. See also control measures in Section 8.

**Precautions During Storage:** Avoid breakage of bagged material or spills of bulk material. See control measures in Section 8.

**Do not use U. S. Silica Company materials for sandblasting.**

**The OSHA Hazard Communication Standard, 29 CFR Sections 1910.1200, 1915.1200, 1917.28, 1918.90, 1926.59 and 1928.21, and state and local worker or community "right-to-know" laws and regulations should be strictly followed. WARN YOUR EMPLOYEES (AND YOUR CUSTOMERS IN CASE OF RESALE) BY POSTING AND OTHER MEANS OF THE HAZARDS AND THE REQUIRED OSHA PRECAUTIONS. PROVIDE TRAINING FOR YOUR EMPLOYEES ABOUT THE OSHA PRECAUTIONS.**

See also American Society for Testing and Materials (ASTM) standard practice E 1132-99a, "Standard Practice for Health Requirements Relating to Occupational Exposure to Respirable Crystalline Silica."

## SECTION 8 - EXPOSURE CONTROL / PERSONAL PROTECTION

**Local Exhaust:** Use sufficient local exhaust to reduce the level of respirable crystalline silica to below the PEL. See ACGIH "Industrial Ventilation, A Manual of Recommended Practice" (latest edition).

**Respiratory Protection:** The following chart specifies the types of respirators which may provide respiratory protection for crystalline silica.

Particulate Concentration	MINIMUM RESPIRATORY PROTECTION*
10 x PEL or less	Any particulate respirator, except single-use or quarter-mask respirator. Any fume respirator or high efficiency particulate filter respirator. Any supplied-air respirator. Any self-contained breathing apparatus.
50 x PEL 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.
500 x PEL or less	A Type C supplied-air respirator operated in pressure-demand or other positive pressure or continuous-flow mode.
Greater than 500 x PEL or entry and escape from unknown concentrations	Self-contained breathing apparatus with a full facepiece operated in pressure-demand mode. A combination respirator which includes a Type C supplied-air respirator with a full facepiece operated in pressure-demand or other positive pressure continuous-flow mode and an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive pressure mode.
*Use only NIOSH-approved or MSHA-approved equipment. See 29 CFR §1910.134 and 42 CFR §84.	

See also ANSI standard Z88.2 (latest revision) "American National Standard for Respiratory Protection".

**Permissible Exposure Levels:**

			Exposure Guidelines						
Component	CAS No.	Percentage (by wt.)	OSHA		ACGIH		NIOSH		
			TWA	STEL	TWA	STEL	TWA	STEL	Unit
Crystalline Silica (Quartz)	14808-60-7	99.0-99.9	$\frac{10}{\% \text{ SiO}_2 + 2}$	None	.05	None	.05	None	mg/m <sup>3</sup>

**SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES**

**Appearance:** White or tan sand; granular, crushed, or ground.

**Boiling Point:** 4046°F

**Odor:** None

**Vapor Pressure (mm Hg.):** None

**Specific Gravity (Water = 1):** 2.65

**Vapor Density (Air = 1):** None

**Melting Point:** 3110°F

**Solubility in Water:** Insoluble in water

**Evaporation Rate (Butyl Acetate = 1):** None

## SECTION 10 - STABILITY AND REACTIVITY

**Stability:** Crystalline silica (quartz) is stable.

**Incompatibility (Materials to Avoid):** Contact with powerful oxidizing agents, such as fluorine, chlorine trifluoride and oxygen difluoride, may cause fires.

**Hazardous Decomposition or Byproducts:** Silica will dissolve in hydrofluoric acid and produce a corrosive gas - silicon tetrafluoride.

**Hazardous Polymerization:** Will not occur.

## SECTION 11 - TOXICOLOGICAL INFORMATION

### A. **SILICOSIS**

The major concern is silicosis, caused by the inhalation and retention of respirable crystalline silica dust. Silicosis can exist in several forms, chronic (or ordinary), accelerated, or acute.

Chronic or Ordinary Silicosis (often referred to as Simple Silicosis) is the most common form of silicosis, and can occur after many years of exposure to relatively low levels of airborne respirable crystalline silica dust. It is further defined as either simple or complicated silicosis.

Simple silicosis is characterized by lung lesions (shown as radiographic opacities) less than 1 centimeter in diameter, primarily in the upper lung zones. Often, simple silicosis is not associated with symptoms, detectable changes in lung function or disability.

Simple silicosis may be progressive and may develop into complicated silicosis or progressive massive fibrosis (PMF). Complicated silicosis or PMF is characterized by lung lesions (shown as radiographic opacities) greater than 1 centimeter in diameter. Although there may be no symptoms associated with complicated silicosis or PMF, the symptoms, if present, are shortness of breath, wheezing, cough and sputum production. Complicated silicosis or PMF may be associated with decreased lung function

and may be disabling. Advanced complicated silicosis or PMF may lead to death. Advanced complicated silicosis or PMF can result in heart disease secondary to the lung disease (cor pulmonale).

Accelerated Silicosis can occur with exposure to high concentrations of respirable crystalline silica over a relatively short period; the lung lesions can appear within five (5) years of the initial exposure. The progression can be rapid. Accelerated silicosis is similar to chronic or ordinary silicosis, except that the lung lesions appear earlier and the progression is more rapid.

Acute Silicosis can occur with exposures to very high concentrations of respirable crystalline silica over a very short time period, sometimes as short as a few months. The symptoms of acute silicosis include progressive shortness of breath, fever, cough and weight loss. Acute silicosis is fatal.

## **B. CANCER**

IARC - The International Agency for Research on Cancer ("IARC") concluded that there was "*sufficient evidence* in humans for the carcinogenicity of crystalline silica in the forms of quartz or cristobalite from occupational sources", and that there is "*sufficient evidence* in experimental animals for the carcinogenicity of quartz and cristobalite." The overall IARC evaluation was that "crystalline silica inhaled in the form of quartz or cristobalite from occupational sources is *carcinogenic to humans (Group 1)*." The IARC evaluation noted that "carcinogenicity was not detected in all industrial circumstances studies. Carcinogenicity may be dependent on inherent characteristics of the crystalline silica or on external factors affecting its biological activity or distribution of its polymorphs." For further information on the IARC evaluation, see IARC Monographs on the Evaluation of Carcinogenic Risks to Humans, Volume 68, "Silica, Some Silicates..." (1997).

NTP - The National Toxicology Program, in its Ninth Annual Report on Carcinogens, classified "silica, crystalline (respirable)" as a known human carcinogen.

OSHA - Crystalline silica (quartz) is not regulated by the U. S. Occupational Safety and Health Administration as a carcinogen.

There have been many articles published on the carcinogenicity of crystalline silica, which the reader should consult for additional information; the following are examples of recently published articles: (1) "Crystalline Silica and Lung Cancer: The Problem of Conflicting Evidence", Indoor Built Environ., Volume 8, pp. 121-126 (1998); (2) "Crystalline Silica and the risk of lung cancer on the potteries", Occup. Environ. Med., Volume 55, pp. 779-785 (1998); (3) "Is Silicosis Required for Silica-Associated Lung Cancer?", American Journal of Industrial Medicine, Volume 37, pp. 252- 259 (2000); (4) " Silica, Silicosis, and Lung Cancer: A Risk Assessment", American Journal of Industrial Medicine, Volume 38, pp. 8-18 (2000); (5) "Silica, Silicosis, and Lung Cancer: A Response to a Recent Working Group Report", Journal of Occupational and Environmental Medicine, Volume 42, pp. 704-720 (2000).

## **C. AUTOIMMUNE DISEASES**

There is evidence that exposure to respirable crystalline silica (without silicosis) or that the disease silicosis is associated with the increased incidence of several autoimmune disorders, -- scleroderma, systemic lupus erythematosus, rheumatoid arthritis and diseases affecting the kidneys. For a review of the subject, the following may be consulted: "Occupational Exposure to Crystalline Silica and Autoimmune Disease", Environmental Health Perspectives, Volume 107, Supplement 5, pp. 793-802

(1999); "Occupational Scleroderma", Current Opinion in Rheumatology, Volume 11, pp. 490-494 (1999).

#### **D. TUBERCULOSIS**

Individuals with silicosis are at increased risk to develop pulmonary tuberculosis, if exposed to persons with tuberculosis. The following may be consulted for further information: Occupational Lung Disorders, Third Edition, Chapter 12, entitled "Silicosis and Related Diseases", Parkes, W. Raymond (1994); "Risk of pulmonary tuberculosis relative to silicosis and exposure to silica dust in South African gold miners," Occup Environ Med., Volume 55, pp.496-502 (1998).

#### **E. KIDNEY DISEASE**

There is evidence that exposure to respirable crystalline silica (without silicosis) or that the disease silicosis is associated with the increased incidence of kidney diseases, including end stage renal disease. For additional information on the subject, the following may be consulted: "Kidney Disease and Silicosis", Nephron, Volume 85, pp. 14-19 (2000).

### **SECTION 12 - ECOLOGICAL INFORMATION**

Crystalline silica (quartz) is not known to be ecotoxic; i.e., there is no data which suggests that crystalline silica (quartz) is toxic to birds, fish, invertebrates, microorganisms or plants. For additional information on crystalline silica (quartz), see Sections 9 (physical and chemical properties) and 10 (stability and reactivity) of this MSDS.

### **SECTION 13 - DISPOSAL CONSIDERATIONS**

**General:** The packaging and material may be landfilled; however, material should be covered to minimize generation of airborne dust.

**RCRA:** Crystalline silica (quartz) is not classified as a hazardous waste under the Resource Conservation and Recovery Act, or its regulations, 40 CFR §261 et seq.

The above applies to materials as sold by U.S. Silica Company. The material may be contaminated during use, and it is the responsibility of the user to assess the appropriate disposal of the used material.

### **SECTION 14 - TRANSPORT INFORMATION**

Crystalline silica (quartz) is not a hazardous material for purposes of transportation under the U. S. Department of Transportation Table of Hazardous Materials, 49 CFR §172.101.

### **SECTION 15 - REGULATORY INFORMATION**

#### **UNITED STATES (FEDERAL AND STATE)**

**TSCA No.:** Crystalline silica (quartz) appears on the EPA TSCA inventory under the CAS No.



14808-60-7.

**RCRA:** Crystalline silica (quartz) is not classified as a hazardous waste under the Resource Conservation and Recovery Act, or its regulations, 40 CFR §261 et seq.

**CERCLA:** Crystalline silica (quartz) is not classified as a hazardous substance under regulations of the Comprehensive Environmental Response Compensation and Liability Act (CERCLA), 40 CFR §302.

**Emergency Planning and Community Right to Know Act:** Crystalline silica (quartz) is not an extremely hazardous substance under Section 302 and is not a toxic chemical subject to the requirements of Section 313.

**Clean Air Act:** Crystalline silica (quartz) mined and processed by U.S. Silica Company was not processed with or does not contain any Class I or Class II ozone depleting substances.

**FDA:** Silica is included in the list of substances that may be included in coatings used in food contact surfaces, 21 CFR §175.300(b)(3)(xxvi).

**NTP:** Respirable crystalline silica (quartz) is classified as a carcinogen.

**OSHA Carcinogen:** Crystalline silica (quartz) is not listed.

**California Proposition 65:** Crystalline silica (quartz) is classified as a substance known to the State of California to be a carcinogen.

## **CANADA**

**Domestic Substances List:** U. S. Silica Company products, as naturally-occurring substances, are on the Canadian DSL.

**WHMIS Classification:** D2A

## **OTHER**

**EINECS No.:** 238-878-4

**EEC Label (Risk/Safety Phrases):** R 48/20, R 40/20, S22, S38

**IARC:** Crystalline silica (quartz) is classified in IARC Group 1.

National, state, provincial or local emergency planning, community right-to-know or other laws, regulations or ordinances may be applicable--consult applicable national, state, provincial or local laws.

## **SECTION 16 - OTHER INFORMATION**

**Hazardous Material Information System (HMIS):**

**Health** \*

**Flammability** 0

**Reactivity** 0

**Protective Equipment** E

\* For further information on health effects, see Sections 3 and 11 of this MSDS.

**National Fire Protection Association (NFPA):**

**Health** 0

**Flammability** 0

**Reactivity** 0

**Web Sites with Information about Effects of Crystalline Silica Exposure:**



<http://www.osha-slc.gov/SLTC/silica crystalline/index.html> - The Occupational Safety and Health Administration.



<http://www.cdc.gov/niosh/silicpag.html> - NIOSH Hotlinks to Silicosis Prevention.

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