

U.S. SILICA COMPANY

SAFETY DATA SHEET

1. IDENTIFICATION

Product identifier: InnoProp™ PR/CR; resin-coated frac sand

Chemical Name or Synonym:

Resin-coated fracturing sand; silica sand substrate coated with phenolic resin

Recommended use of the chemical and restrictions on use: hydraulic fracturing proppant, proppant

Manufacturer:

U.S. Silica Company
8490 Progress Drive, Suite 300
Frederick, MD 21701
U.S.A.

Phone: 800-243-7500

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2. HAZARD(S) IDENTIFICATION

Classification:

Physical	Health
Combustible Dust	Skin Sensitizer Category 1 Carcinogen Category 1A Specific Target Organ Toxicity – Repeated Exposure Category 1



DANGER

May cause an allergic skin reaction.
May cause cancer by inhalation.
Causes damage to lungs through prolonged or repeated exposure by inhalation.
May form combustible dust concentrations in air.

Response:

If on skin: Wash with plenty of soap and water. If skin irritation or rash occurs: Get medical advice.
Wash contaminated clothing before reuse.
If exposed or concerned: Get medical advice.

Storage:

Store locked up.

Disposal:

Dispose of contents/containers in accordance with local regulation

Prevention

Obtain special instructions before use.
Do not handle until all safety precautions have been read and understood.
Do not breathe dust.
Wash exposed skin thoroughly after handling.
Contaminated work clothing must not be allowed out of the workplace.
Do not eat, drink or smoke when using this product.
Wear protective gloves and safety glasses or goggles.
In case of inadequate ventilation wear respiratory protection.

3. COMPOSITION / INFORMATION ON INGREDIENTS

Component	CAS No.	Percent
Crystalline Silica (quartz)	14808-60-7	95-98
Phenol-formaldehyde copolymer	9003-35-4	2-5

Hexamine (hexamethylenetetramine)	100-97-0	<0.4
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The specific identity and/or exact percentage (concentration) of composition has been withheld as a trade secret.

4. FIRST-AID MEASURES

Inhalation: If irritation develops from breathing dust or decomposition products, remove the person immediately from the overexposure and seek medical attention as needed.

Skin contact: Wash thoroughly with soap and water after handling. Seek medical attention if irritation develops.

Eye contact: Wash immediately with plenty of water. Do not rub eyes. If irritation persists, seek medical attention.

Ingestion: If product is swallowed, rinse mouth with water and seek medical attention.

Most important symptoms/effects, acute and delayed: May cause eye irritation. May cause an allergic skin reaction. Particulates may cause abrasive injury. Inhalation of dust may cause respiratory tract irritation. Inhalation of respirable crystalline silica may cause lung disease, silicosis and lung cancer. Symptoms of exposure may include cough, sore throat, nasal congestion, sneezing, wheezing and shortness of breath.

Indication of immediate medical attention and special treatment, if necessary: Immediate medical attention is not normally required.

5. FIRE-FIGHTING MEASURES

Suitable (and unsuitable) extinguishing media: Use water spray, carbon dioxide or dry chemical for fires involving resin coated sand.

Specific hazards arising from the chemical: While crystalline silica is not flammable or combustible, the phenol-formaldehyde resin will burn under fire conditions. Dust from the resin may form explosive mixtures when suspended in the air in the form of a dust cloud. Settled dust presents a fire hazard. Resuspension of the dust into the air by vibration, traffic, material handling, etc. in high concentrations in the presence of an ignition source could result in a dust explosion. Minimize the generation and accumulation of dust. Combustion of resin may release formaldehyde, ammonia and oxides of carbon.

Special protective equipment and precautions for fire-fighters: Firefighters should wear protective clothing and positive pressure SCBA. Avoid use of solid water stream as this may create a dust cloud.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment, and emergency procedures: Wear appropriate protective clothing and respiratory protection (see Section 8). Eliminate all sources of ignition. Avoid generating airborne dust during clean-up.

Environmental precautions: Avoid direct release to waterways. Report releases to regulatory authorities as required by local, state and federal regulations.

Methods and materials for containment and cleaning up: Avoid dry sweeping. Use wet methods to avoid the generation of airborne dust. If resin dust is present, use only explosion-proof vacuum equipment. Resin dust deposits should not be allowed to accumulate on surfaces, as these may form an explosive mixture if they are

released into the atmosphere in sufficient concentrations. Avoid dispersal of dust in the air (i.e., clearing dust surfaces with compressed air.). Collect into closed containers.

7. HANDLING AND STORAGE

Precautions for safe handling:

Avoid generating dust. Do not breathe dust. Do not rely on your sight to determine if dust is in the air. Respirable crystalline silica dust may be in the air without a visible dust cloud. Use adequate exhaust ventilation and dust collection. Maintain and test ventilation and dust collection equipment. Use all available work practices to control dust exposures, such as water sprays. Practice good housekeeping. Do not permit dust to collect on walls, floors, sills, ledges, machinery, or equipment. Keep airborne dust concentrations below permissible exposure limits.

Where necessary to reduce exposures below the PEL or other applicable limit (if lower than the PEL), wear a respirator approved for silica containing dust when using, handling, storing or disposing of this product or bag. See Section 8, for further information on respirators. Do not alter the respirator. Do not wear a tight-fitting respirator with facial hair such as a beard or mustache that prevents a good face to face piece seal between the respirator and face. Maintain, clean, and fit test respirators in accordance with applicable standards. Wash or vacuum clothing that has become dusty.

Avoid mishandling or abuse in handling. The product's coated surface may abrade during abusive handling or mechanical conveyance. Such abrasion may allow dispersion of organic dust. Capture dust at generation points and control sources of ignition, including static electricity, and ground equipment to minimize dust accumulation, airborne dust, and static discharges during handling and/or conveyance. Ignition sources combined with dust accumulation during abusive handling could possibly result in organic dust fires or explosions. Keep resin dust away from open flames, hot surfaces and sources of ignition.

Participate in training, exposure monitoring, and health surveillance programs to monitor any potential adverse health effects that may be caused by breathing respirable crystalline silica. The OSHA Respirable Crystalline Silica Standards; 29CFR1910.1053, 1915.1053 and 1926.1053, 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.

NFPA 654, *Prevention of Fire and Dust Explosions From the Manufacturing, Processing, and Handling of Combustible Particulate Solids* provides information relevant to the prevention of possible explosion hazard associated with phenolic resin dusts that may be created.

Conditions for safe storage, including any incompatibilities: Use dust collection to trap dust produced during loading and unloading. Keep containers closed and store bags to avoid accidental tearing, breaking, or bursting.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Exposure guidelines:

Component	OSHA PEL	ACGIH TLV	NIOSH REL
Phenol-formaldehyde copolymer (as particulates not otherwise classified)	5 mg/m ³ (respirable dust), 15 mg/m ³ (total dust) TWA	None Established	None Established

Hexamine	None Established	None Established	None Established
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Until Effective Date of New OSHA PEL below:

Component	OSHA PEL	ACGIH TLV	NIOSH REL
Crystalline Silica (quartz)	<u>10 mg/m3</u> %SiO ₂ + 2 TWA (respirable dust)	0.025 mg/m3 TWA (respirable dust)	0.05 mg/m3 TWA (respirable dust)
	<u>30 mg/m3</u> %SiO ₂ + 2 TWA (total dust)		

If crystalline silica (quartz) is heated to more than 870°C, quartz can change to a form of crystalline silica known as tridymite; if crystalline silica (quartz) is heated to more than 1470°C, quartz can change to a form of crystalline silica known as cristobalite. It OSHA PEL for crystalline silica as tridymite or cristobalite is one-half of the OSHA PEL for crystalline silica (quartz).

New OSHA PEL from 2016 Respirable Crystalline Silica Standard – see Effective Dates below.

Component	OSHA PEL	ACGIH TLV	NIOSH REL
Crystalline Silica (quartz, cristobalite and tridymite)	0.05 mg/m3 TWA (respirable dust)	0.025 mg/m3 TWA (respirable dust)	0.05 mg/m3 TWA (respirable dust)

Effective Dates: Construction 29CFR 1926.1153 Effective June 23, 2017
 General Industry and Maritime 29CFR 1910.1053 / 1915.1053 Effective June 23, 2018
 Oil and Gas including Hydraulic Fracturing 29CFR 1910.1053 Effective June 23, 2018

Appropriate engineering controls: Use adequate general or local exhaust ventilation to maintain concentrations in the workplace below the applicable exposure limits listed above.

Respiratory protection: If it is not possible to reduce airborne exposure levels to below the OSHA PEL or other applicable limit with ventilation, use the table below to assist you in selecting respirators that will reduce personal exposures to below the OSHA PEL. This table is part of the OSHA Respirator Standard 29CFR1910.134(d). **Assigned protection factor (APF)** means the workplace level of respiratory protection that a respirator or class of respirators is expected to provide to employees when the employer implements a continuing, effective respiratory protection program as specified by the Standard. For example, an APF of 10 means that the respirator should reduce the airborne concentration of a particulate by a factor of 10, so that if the workplace concentration of a particulate was 150 ug/m3, then a respirator with an APF of 10 should reduce the concentration of particulate to 15 ug/m3. In additional a cartridge change-out schedule must be developed based on the concentrations in the workplace.

1. -- Assigned Protection Factors⁵

Type of respirator ^{1, 2}	Quarter mask	Half mask	Full facepiece	Helmet/ hood	Loose-fitting facepiece
1. Air-Purifying Respirator	5	³ 10	50	.....	.....
2. Powered Air-Purifying Respirator (PAPR)	.....	50	1,000	⁴ 25/1,000	25
3. Supplied-Air Respirator (SAR) or Airline Respirator					

• Demand mode	.....	10	50	.....	.....
• Continuous flow mode	.....	50	1,000	⁴ 25/1,000	25
• Pressure-demand or other positive-pressure mode	.....	50	1,000	.....	.....
4. Self-Contained Breathing Apparatus (SCBA)					
• Demand mode	.....	10	50	50	.....
• Pressure-demand or other positive-pressure mode (e.g., open/closed circuit)	.....	.....	10,000	10,000	.....

Notes:

¹Employers may select respirators assigned for use in higher workplace concentrations of a hazardous substance for use at lower concentrations of that substance, or when required respirator use is independent of concentration.

²The assigned protection factors in Table 1 are only effective when the employer implements a continuing, effective respirator program as required by this section (29 CFR 1910.134), including training, fit testing, maintenance, and use requirements.

³This APF category includes filtering facepieces, and half masks with elastomeric facepieces.

⁴The employer must have evidence provided by the respirator manufacturer that testing of these respirators demonstrates performance at a level of protection of 1,000 or greater to receive an APF of 1,000. This level of performance can best be demonstrated by performing a WPF or SWPF study or equivalent testing. Absent such testing, all other PAPRs and SARs with helmets/hoods are to be treated as loose-fitting facepiece respirators, and receive an APF of 25.

⁵These APFs do not apply to respirators used solely for escape. For escape respirators used in association with specific substances covered by 29 CFR 1910 subpart Z, employers must refer to the appropriate substance-specific standards in that subpart. Escape respirators for other IDLH atmospheres are specified by 29 CFR 1910.134 (d)(2)(ii).

Skin protection: Wear chemical resistant gloves and protective clothing as needed to avoid prolonged or repeated skin contact.

Eye protection: Safety glasses with side shields or goggles recommended.

Other: None known.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance (physical state, color, etc.): Off-white to light brown granular solid.

Odor: Slight phenolic odor.

Odor threshold: Not determined	pH: Not applicable
Melting point/freezing point: Not determined	Boiling point/range: Not applicable
Flash point: Not applicable	Evaporation rate: Not applicable
Flammable limits: LEL: Not applicable	UEL: Not applicable
Vapor pressure: Not applicable	Vapor density: Not applicable
Relative density: 2.55	Solubility(ies): Insoluble in water
Partition coefficient: n-octanol/water: Not applicable	Auto-ignition temperature: Not determined
Decomposition temperature: Not determined	Viscosity: Not applicable

Flammability (solid, gas): Phenolic resin dust may be explosive when suspended in air at a concentration of 0.025 oz/ft³

10. STABILITY AND REACTIVITY

Reactivity: Not reactive under normal conditions of use.

Chemical stability: Stable

Possibility of hazardous reactions: No hazardous reactions are known.

Conditions to avoid: Avoid excessive heat and open flames. Avoid generation of dust in handling and use.

Incompatible materials: Strong oxidizers.

Hazardous decomposition products: Thermal decomposition of resin will generate ammonia, phenol, formaldehyde and hydrocarbons.

11. TOXICOLOGICAL INFORMATION

Acute effects of exposure:

Inhalation: Inhalation of dust may cause respiratory tract irritation.

Ingestion: Ingestion in an unlikely route of exposure. If resin dust is swallowed, it may irritate the mouth, throat and gastrointestinal tract.

Skin contact: Partially cured product may cause irritation and possible an allergic skin reaction in some individuals. Contains hexamine which is classified as a skin sensitizer.

Eye contact: May cause eye irritation. Particulates may cause abrasive injury.

Chronic effects: Inhalation of respirable crystalline silica may cause lung disease, silicosis, lung cancer and other effects as indicated below. Symptoms of exposure may include cough, sore throat, nasal congestion, sneezing, wheezing and shortness of breath.

The method of exposure that can lead to the adverse health effects described below is inhalation.

A. SILICOSIS

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

Chronic or Ordinary Silicosis is the most common form of silicosis, and can occur after many years (10 to 20 or more) of prolonged repeated inhalation of 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. Complicated silicosis or PMF symptoms, if present, are shortness of breath and cough. 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 prolonged repeated inhalation of high concentrations of respirable crystalline silica over a relatively short period; the lung lesions can appear within five (5) years of initial exposure. Progression can be rapid. Accelerated silicosis is similar to chronic or ordinary silicosis, except that lung lesions appear earlier and progression is more rapid.

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

B. CANCER

IARC - The International Agency for Research on Cancer ("IARC") concluded that "crystalline silica in the form of quartz or cristobalite dust is carcinogenic to humans (Group 1)". For further information on the IARC evaluation, see IARC Monographs on the Evaluation of Carcinogenic Risks to Humans, Volume 100C, "A Review of Human Carcinogens: Arsenic, Metals, Fibres and Dusts " (2011).

NTP classifies Silica, crystalline (respirable size) is classified as Known to be a Human Carcinogen.

C. AUTOIMMUNE DISEASES

Several studies have reported excess cases of several autoimmune disorders, -- scleroderma, systemic lupus erythematosus, rheumatoid arthritis -- among silica-exposed workers.

D. TUBERCULOSIS

Individuals with silicosis are at increased risk to develop pulmonary tuberculosis, if exposed to tuberculosis bacteria. Individuals with chronic silicosis have a three-fold higher risk of contracting tuberculosis than similar individuals without silicosis.

E. KIDNEY DISEASE

Several studies have reported excess cases of kidney diseases, including end stage renal disease, among silica-exposed workers. For additional information on the subject, the following may be consulted: "Kidney Disease and Silicosis", *Nephron*, Volume 85, pp. 14-19 (2000).

F. NON-MALIGNANT RESPIRATORY DISEASES

The reader is referred to Section 3.5 of the NIOSH Special Hazard Review cited below, for information concerning the association between exposure to crystalline silica and chronic bronchitis, emphysema and small airways disease. There are studies that disclose an association between dusts found in various mining occupations and non-malignant respiratory diseases, particularly among smokers. It is unclear whether the observed associations exist only with underlying silicosis, only among smokers, or result from exposure to mineral dusts generally (independent of the presence or absence of crystalline silica, or the level of crystalline silica in the dust).

Sources of information:

The *NIOSH Hazard Review - Occupational Effects of Occupational Exposure to Respirable Crystalline Silica* published in April 2002 summarizes and discusses the medical and epidemiological literature on the health risks and diseases associated with occupational exposures to respirable crystalline silica.. The *NIOSH Hazard Review* is available from NIOSH - Publications Dissemination, 4676 Columbia Parkway, Cincinnati, OH 45226, or through the NIOSH web site, www.cdc.gov/niosh/topics/silica, then click on the link "NIOSH Hazard Review: Health Effects of Occupational Exposure to Respirable Crystalline Silica".

For a more recent review of the health effects of respirable crystalline silica, the reader may consult *Fishman's Pulmonary Diseases and Disorders*, Fourth Edition, Chapter 57. "Coal Workers' Lung Diseases and Silicosis".

The US Occupational Safety and Health Administration (OSHA) published a summary of respirable crystalline silica health effects in connection with OSHA's Proposed Rule regarding occupational exposure to respirable crystalline silica. The summary was published in the September 12, 2013 Federal Register, which can be found at <https://www.federalregister.gov/articles/2013/09/12/2013-20997/occupational-exposure-to-respirable-crystalline-silica#h-65>.

Numerical measures of toxicity:

Crystalline Silica (quartz): LD50 oral rat >22,500 mg/kg

Phenol-formaldehyde copolymer: Oral LD50 Rat >5 g/kg; Dermal LD50 Rat >2 g/kg

Hexamine: Oral LD50 Rat >20,000 mg/kg; Dermal LD50 Rat >2000 mg/kg

12. ECOLOGICAL INFORMATION

Ecotoxicity:

Crystalline silica (quartz) is not known to be ecotoxic; i.e., no data suggests that crystalline silica (quartz) is toxic to birds, fish, invertebrates, microorganisms or plants.

Phenol-formaldehyde copolymer: No data available

Persistence and degradability: No data available

Bioaccumulative potential: No data available

Mobility in soil: No data available

Other adverse effects: No data available

13. DISPOSAL CONSIDERATIONS

Discard any product, residue, disposable container or liner in full compliance with national regulations.

14. TRANSPORT INFORMATION

The following applies to all modes of transport (IATA/ICAO, IMDG, DOT)

UN number: None

UN proper shipping name: Not regulated

Transport hazard classes(es): None

Packing group, if applicable: None

Environmental hazards: None

Transport in bulk (according to Annex II of MARPOL 73/78 and the IBC Code): Not determined

Special precautions: None known.

15. REGULATORY INFORMATION

UNITED STATES (FEDERAL AND STATE)

TSCA Status: All components are listed on the EPA TSCA inventory.

RCRA: This product is not classified as a hazardous waste under the Resource Conservation and Recovery Act, or its regulations, 40 CFR §261 et seq.

CERCLA: This product has an RQ of 1,000,000 lbs based on the RQ for phenol of 1000 lbs present at <0.1%.

Emergency Planning and Community Right to Know Act (SARA Title III): This product contains the following chemicals subject to SARA 302 or SARA 313 reporting: None above the de minimus concentrations.

California Proposition 65: Crystalline silica (airborne particles of respirable size) is classified as a substance known to the State of California to be a carcinogen. This product contains trace amounts of formaldehyde which is classified as a substance known to the State of California to be a carcinogen.

California Inhalation Reference Exposure Level (REL): California established a chronic non-cancer effect REL of 3 µg for silica (crystalline, respirable). A chronic REL is an airborne level of a substance at or below which no non-cancer health effects are anticipated in individuals indefinitely exposed to the substance at that level.

16. OTHER INFORMATION

Date of preparation/revision: September 10, 2016

Hazardous Material Information System (HMIS):

Health *

Flammability 1

Physical Hazard 0

Protective Equipment E

* For further information on health effects, see Sections 2, 8 and 11 of this MSDS.

National Fire Protection Association (NFPA):

Health 0

Flammability 1

Instability 0

Web Sites with Information about Effects of Crystalline Silica Exposure:

The U. S. Silica Company web site will provide updated links to OSHA and NIOSH web sites addressing crystalline silica issues: www.ussilica.com, click on “Info Center”, then click on “Health & Safety”.

The Occupational Safety and Health Administration (OSHA) web site contains information on the OSHA standard related to respirable crystalline silica at <https://www.osha.gov/silica/index.html>.

The U.S. National Institute for Occupational Safety and Health (NIOSH) maintains a site with information about crystalline silica and its potential health effects at <http://www.cdc.gov/niosh/topics/silica>.

The IARC Monograph concerning crystalline silica, Volume 100C, can be accessed in PDF form at the IARC web site, <http://monographs.iarc.fr/ENG/Monographs/PDFs/index.php>.

U. S. Silica Company Disclaimer

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to take adequate risk management measures in accordance with the national implementation legislation of EU Directives 89/391 and 98/24.