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.

2. HAZARD(S) IDENTIFICATION

Classification:

<table>
<thead>
<tr>
<th>Physical</th>
<th>Health</th>
</tr>
</thead>
<tbody>
<tr>
<td>Combustible Dust</td>
<td>Skin Sensitizer Category 1</td>
</tr>
<tr>
<td></td>
<td>Carcinogen Category 1A</td>
</tr>
<tr>
<td></td>
<td>Specific Target Organ Toxicity – Repeated Exposure Category 1</td>
</tr>
</tbody>
</table>

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.

3. COMPOSITION / INFORMATION ON INGREDIENTS

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS No.</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crystalline Silica (quartz)</td>
<td>14808-60-7</td>
<td>95-98</td>
</tr>
<tr>
<td>Phenol-formaldehyde copolymer</td>
<td>9003-35-4</td>
<td>2-5</td>
</tr>
<tr>
<td>Hexamine (hexamethylenetetramine)</td>
<td>100-97-0</td>
<td>&lt;0.4</td>
</tr>
</tbody>
</table>

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 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

<table>
<thead>
<tr>
<th>Component</th>
<th>OSHA PEL</th>
<th>ACGIH TLV</th>
<th>NIOSH REL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crystalline Silica (quartz)</td>
<td>10 mg/m³ (respirable dust)</td>
<td>0.025 mg/m³ TWA (respirable dust)</td>
<td>0.05 mg/m³ TWA (respirable dust)</td>
</tr>
<tr>
<td></td>
<td>%SiO₂ + 2 TWA (total dust)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Phenol-formaldehyde copolymer</td>
<td>5 mg/m³ (respirable dust), 15 mg/m³ (total dust) TWA</td>
<td>None Established</td>
<td>None Established</td>
</tr>
<tr>
<td>(as particulates not otherwise</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>classified)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hexamine</td>
<td>None Established</td>
<td>None Established</td>
<td>None Established</td>
</tr>
</tbody>
</table>
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).

**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 NIOSH Respirator Selection Logic, 2004, Chapter III, Table 1, “Particulate Respirators”. The full document can be found at [www.cdc.gov/niosh/npptl/topics/respirators](http://www.cdc.gov/niosh/npptl/topics/respirators); the user of this MSDS is directed to that site for information concerning respirator selection and use. The assigned protection factor (APF) is the maximum anticipated level of protection provided by each type of respirator worn in accordance with an adequate respiratory protection program. 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 using chemical cartridges, consideration must be given to selection of the correct cartridge for the chemical exposure and the maximum use concentration for the cartridge. In addition, a cartridge change-out schedule must be developed based on the concentrations in the workplace.

<table>
<thead>
<tr>
<th>Assigned protection factor</th>
<th>Type of Respirator (Use only NIOSH-certified respirators)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>Any air-purifying elastomeric half-mask respirator equipped with appropriate type of particulate filter. ²&lt;br&gt;Appropriate filtering facepiece respirator. ²,³&lt;br&gt;Any air-purifying full facepiece respirator equipped with appropriate type of particulate filter. ²&lt;br&gt;Any negative pressure (demand) supplied-air respirator equipped with a half-mask.</td>
</tr>
<tr>
<td>25</td>
<td>Any powered air-purifying respirator equipped with a hood or helmet and a high efficiency (HEPA) filter.&lt;br&gt;Any continuous flow supplied-air respirator equipped with a hood or helmet.</td>
</tr>
<tr>
<td>50</td>
<td>Any air-purifying full facepiece respirator equipped with N-100, R-100, or P-100 filter(s).&lt;br&gt;Any powered air-purifying respirator equipped with a tight-fitting facepiece (half or full facepiece) and a high-efficiency filter.&lt;br&gt;Any negative pressure (demand) supplied-air respirator equipped with a full facepiece.&lt;br&gt;Any continuous flow supplied-air respirator equipped with a tight-fitting facepiece (half or full facepiece).&lt;br&gt;Any negative pressure (demand) self-contained respirator equipped with a full facepiece.</td>
</tr>
<tr>
<td>1,000</td>
<td>Pressure-demand supplied-air respirator equipped with a half-mask.</td>
</tr>
</tbody>
</table>

1. The protection offered by a given respirator is contingent upon (1) the respirator user adhering to complete program requirements (such as the ones required by OSHA in 29CFR1910.134), (2) the use of NIOSH-certified respirators in their approved configuration, and (3) individual fit testing to rule out those respirators that cannot achieve a good fit on individual workers.
2. Appropriate means that the filter medium will provide protection against the particulate in question.
3. An APF of 10 can only be achieved if the respirator is qualitatively or quantitatively fit tested on individual workers.

**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.

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Odor threshold</td>
<td>Not determined</td>
</tr>
<tr>
<td>pH</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Melting point/freezing point</td>
<td>Not determined</td>
</tr>
<tr>
<td>Boiling point/range</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Flash point</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Evaporation rate</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Flammable limits: LEL</td>
<td>Not applicable</td>
</tr>
<tr>
<td>UEL</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Vapor pressure</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Vapor density</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Relative density</td>
<td>2.55</td>
</tr>
<tr>
<td>Partition coefficient: n-octanol/water</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Solubility(ies)</td>
<td>Insoluble in water</td>
</tr>
<tr>
<td>Auto-ignition temperature</td>
<td>Not determined</td>
</tr>
<tr>
<td>Decomposition temperature</td>
<td>Not determined</td>
</tr>
<tr>
<td>Viscosity</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Flammability (solid, gas)</td>
<td>Phenolic resin dust may be explosive when suspended in air at a concentration of 0.025 oz/ft³</td>
</tr>
</tbody>
</table>

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).

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”.

Finally, 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

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: March 17, 2014

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 U.S. National Institute for Occupational Safety and Health (NIOSH) and Occupational Safety and Health Administration (OSHA) maintain sites with information about crystalline silica and its potential health effects. For NIOSH, http://www.cdc.gov/niosh/topics/silica; for OSHA, http://www.osha.gov/dsg/topics/silicacrystalline/index.


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