# Material Safety Data Sheet
## Polycrystalline Silicon

### 1. Product and company identification

<table>
<thead>
<tr>
<th><strong>Product name</strong></th>
<th>Polycrystalline Silicon</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Synonym</strong></td>
<td>MC Chunk, Rod, Rod Pieces, Granular, Fines, Tear Drops and Chips</td>
</tr>
<tr>
<td><strong>Material uses</strong></td>
<td>Industrial use</td>
</tr>
<tr>
<td><strong>CAS number</strong></td>
<td>7440-21-3</td>
</tr>
<tr>
<td><strong>Manufacturer</strong></td>
<td>REC Silicon Inc.</td>
</tr>
<tr>
<td></td>
<td>119140 Rick Jones Way</td>
</tr>
<tr>
<td></td>
<td>Silver Bow, Montana 59750</td>
</tr>
<tr>
<td></td>
<td>United State of America</td>
</tr>
<tr>
<td></td>
<td>406-496-9877</td>
</tr>
<tr>
<td></td>
<td>Email: <a href="mailto:RECSiliconMSDS@recgroup.com">RECSiliconMSDS@recgroup.com</a></td>
</tr>
<tr>
<td><strong>Validation date</strong></td>
<td>04/21/2011</td>
</tr>
<tr>
<td><strong>Prepared by</strong></td>
<td>Atrion Regulatory Services, Inc.</td>
</tr>
<tr>
<td><strong>In case of emergency</strong></td>
<td>CHEMTREC, U.S. : 1-800-424-9300     International: +1-703-527-3887</td>
</tr>
</tbody>
</table>

### 2. Hazards identification

<table>
<thead>
<tr>
<th><strong>Physical state</strong></th>
<th>Solid. [Powder.]</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Color</strong></td>
<td>Gray</td>
</tr>
<tr>
<td><strong>Odor</strong></td>
<td>Odorless</td>
</tr>
</tbody>
</table>

**Emergency overview**

- **Hazard statements**: MAY CAUSE EYE IRRITATION.
- **Precautions**: Avoid breathing dust. Avoid contact with eyes. Wash thoroughly after handling.
- **OSHA/HCS status**: While this material is not considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200), this MSDS contains valuable information critical to the safe handling and proper use of the product. This MSDS should be retained and available for employees and other users of this product.

**Routes of entry**

- Dermal contact. Eye contact. Inhalation. Ingestion.

**Potential acute health effects**

- **Inhalation**: Exposure to airborne concentrations above statutory or recommended exposure limits may cause irritation of the nose, throat and lungs.
- **Ingestion**: No known significant effects or critical hazards.
- **Skin**: No known significant effects or critical hazards.
- **Eyes**: Slightly irritating to the eyes.

**Potential chronic health effects**

- **Chronic effects**: Repeated or prolonged inhalation of dust may lead to chronic respiratory irritation.
- **Carcinogenicity**: No known significant effects or critical hazards.
- **Mutagenicity**: No known significant effects or critical hazards.
- **Teratogenicity**: No known significant effects or critical hazards.
- **Developmental effects**: No known significant effects or critical hazards.
- **Fertility effects**: No known significant effects or critical hazards.
2. Hazards identification

Target organs: Does not cause damage to the following organs: upper respiratory tract, skin, eyes.

Over-exposure signs/symptoms

Inhalation: Adverse symptoms may include the following:
respiratory tract irritation
coughing

Ingestion: No specific data.

Skin: No specific data.

Eyes: Adverse symptoms may include the following:
irritation
watering
redness

Medical conditions aggravated by over-exposure: None known.

3. Composition/information on ingredients

<table>
<thead>
<tr>
<th>Name</th>
<th>CAS number</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Silicon</td>
<td>7440-21-3</td>
<td>99.9999</td>
</tr>
</tbody>
</table>

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment and hence require reporting in this section.

4. First aid measures

Eye contact: Check for and remove any contact lenses. Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical attention immediately.

Skin contact: In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Clean shoes thoroughly before reuse. Get medical attention immediately.

Inhalation: Move exposed person to fresh air. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention immediately.

Ingestion: Wash out mouth with water. Do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Get medical attention immediately.

Protection of first-aiders: No action shall be taken involving any personal risk or without suitable training. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation.

Notes to physician: No specific treatment. Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled.

5. Fire-fighting measures

Flammability of the product: No specific fire or explosion hazard.

Extinguishing media

Suitable: Use an extinguishing agent suitable for the surrounding fire.

Not suitable: None known.

Special exposure hazards: Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training.
5. Fire-fighting measures

Hazardous thermal decomposition products: Decomposition products may include the following materials:
metal oxide/oxides
hydrogen.

Special protective equipment for fire-fighters: Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

6. Accidental release measures

Personal precautions: No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilled material. Avoid breathing dust. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment (see Section 8).

Environmental precautions: Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).

Methods for cleaning up

Small spill: Move containers from spill area. Vacuum or sweep up material and place in a designated, labeled waste container. Dispose of via a licensed waste disposal contractor.

Large spill: Move containers from spill area. Approach release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Vacuum or sweep up material and place in a designated, labeled waste container. Avoid creating dusty conditions and prevent wind dispersal. Dispose of via a licensed waste disposal contractor. Note: see section 1 for emergency contact information and section 13 for waste disposal.

7. Handling and storage

Handling: Put on appropriate personal protective equipment (see Section 8). Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. Do not ingest. Avoid contact with eyes, skin and clothing. Avoid breathing dust. Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use. Empty containers retain product residue and can be hazardous. Do not reuse container.

Storage: Store in accordance with local regulations. Store in original container protected from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see section 10) and food and drink. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabeled containers. Use appropriate containment to avoid environmental contamination.

8. Exposure controls/personal protection

United States

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Exposure limits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Silicon</td>
<td>OSHA PEL 1989 (United States, 3/1989). TWA: 5 mg/m³ 8 hour(s). Form: Respirable fraction TWA: 10 mg/m³ 8 hour(s). Form: Total dust</td>
</tr>
<tr>
<td></td>
<td>OSHA PEL (United States, 6/2010). TWA: 5 mg/m³ 8 hour(s). Form: Respirable fraction TWA: 10 mg/m³ 8 hour(s). Form: Total dust</td>
</tr>
<tr>
<td></td>
<td>NIOSH REL (United States, 6/2009). TWA: 10 mg/m³ 10 hour(s). Form: Total</td>
</tr>
</tbody>
</table>

04/21/2011.
8. Exposure controls/personal protection

Recommended monitoring procedures: If this product contains ingredients with exposure limits, personal, workplace atmosphere or biological monitoring may be required to determine the effectiveness of the ventilation or other control measures and/or the necessity to use respiratory protective equipment.

Engineering measures: Use only with adequate ventilation. If user operations generate dust, fumes, gas, vapor or mist, use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits.

Hygiene measures: Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

Personal protection

Respiratory: Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

Hands: Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. >8 hours (breakthrough time): Leather/ Vinyl gloves

Eyes: Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists or dusts. If operating conditions cause high dust concentrations to be produced, use dust goggles. Recommended: safety glasses with side-shields

Skin: Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Environmental exposure controls: Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

9. Physical and chemical properties

Physical state: Solid. [Powder.]
Color: Gray.
Odor: Odorless.
Molecular weight: 28.09 g/mole
Molecular formula: Si
Boiling/condensation point: 2355°C (4271°F)
Melting/freezing point: 1410°C (2570°F)
Relative density: 2.33
Density: 2.33 g/cm³
Viscosity: Not available.
Solubility: Insoluble in the following materials: cold water and hot water.
Polycrystalline Silicon

10. Stability and reactivity

Chemical stability
The product is stable.

Conditions to avoid
No specific data.

Incompatible materials
Reactive or incompatible with the following materials: oxidizing materials, acids, alkanes, moisture, water.

Hazardous decomposition products
Under normal conditions of storage and use, hazardous decomposition products should not be produced.

Possibility of hazardous reactions
Under normal conditions of storage and use, hazardous reactions will not occur.

11. Toxicological information

Acute toxicity

<table>
<thead>
<tr>
<th>Product/ingredient name</th>
<th>Result</th>
<th>Species</th>
<th>Dose</th>
<th>Exposure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Silicon</td>
<td>LD50 Oral</td>
<td>Rat</td>
<td>3160 mg/kg</td>
<td>-</td>
</tr>
</tbody>
</table>

Chronic toxicity
Not available.

Irritation/Corrosion

<table>
<thead>
<tr>
<th>Product/ingredient name</th>
<th>Result</th>
<th>Species</th>
<th>Score</th>
<th>Exposure</th>
<th>Observation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Silicon</td>
<td>Eyes - Mild irritant</td>
<td>Rabbit</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Sensitizer
Not available.

Carcinogenicity
Classification
Not available.

Mutagenicity
Not available.

Teratogenicity
Not available.

Reproductive toxicity
Not available.

12. Ecological information

Ecotoxicity
No known significant effects or critical hazards.

Aquatic ecotoxicity
Not available.

Persistence/degradability
Not available.

Other adverse effects
No known significant effects or critical hazards.
13. Disposal considerations

Waste disposal: The generation of waste should be avoided or minimized wherever possible. Significant quantities of waste product residues should not be disposed of via the foul sewer but processed in a suitable effluent treatment plant. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Care should be taken when handling emptied containers that have not been cleaned or rinsed out. Empty containers or liners may retain some product residues. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

Disposal should be in accordance with applicable regional, national and local laws and regulations. Refer to Section 7: HANDLING AND STORAGE and Section 8: EXPOSURE CONTROLS/PERSONAL PROTECTION for additional handling information and protection of employees.

14. Transport information

DOT/IMDG/IATA: Not regulated.

15. Regulatory information

HCS Classification: Not regulated.

U.S. Federal regulations:
- TSCA 8(a) IUR: Partial exemption
- United States inventory (TSCA 8b): This material is listed or exempted.
- SARA 302/304/311/312 extremely hazardous substances: No products were found.
- SARA 302/304 emergency planning and notification: No products were found.
- SARA 302/304/311/312 hazardous chemicals: Silicon
- SARA 311/312 MSDS distribution - chemical inventory - hazard identification: Silicon: Fire hazard, Immediate (acute) health hazard
- Clean Air Act (CAA) 112 accidental release prevention: No products were found.

Clean Air Act Section 112(b) Hazardous Air Pollutants (HAPs): Not listed

Clean Air Act Section 602 Class I Substances: Not listed

Clean Air Act Section 602 Class II Substances: Not listed

DEA List I Chemicals (Precursor Chemicals): Not listed

DEA List II Chemicals (Essential Chemicals): Not listed

SARA 313 Form R - Reporting requirements: Not applicable.

Supplier notification: Not applicable.

State regulations:
- Massachusetts: This material is listed.
- New York: This material is not listed.
15. Regulatory information

New Jersey: This material is listed.
Pennsylvania: This material is listed.
Not available.

United States inventory (TSCA 8b): This material is listed or exempted.

Canada inventory: This material is listed or exempted.

International inventory:
- Australia inventory (AICS): This material is listed or exempted.
- China inventory (IECSC): This material is listed or exempted.
- Japan inventory: This material is listed or exempted.
- Korea inventory: This material is listed or exempted.
- New Zealand Inventory of Chemicals (NZIoC): This material is listed or exempted.
- Philippines inventory (PICCS): This material is listed or exempted.

Chemical Weapons Convention List Schedule I Chemicals: Not listed
Chemical Weapons Convention List Schedule II Chemicals: Not listed
Chemical Weapons Convention List Schedule III Chemicals: Not listed

16. Other information

Label requirements: MAY CAUSE EYE IRRITATION.

Hazardous Material Information System (U.S.A.)

Caution: HMIS® ratings are based on a 0-4 rating scale, with 0 representing minimal hazards or risks, and 4 representing significant hazards or risks. Although HMIS® ratings are not required on MSDSs under 29 CFR 1910.1200, the preparer may choose to provide them. HMIS® ratings are to be used with a fully implemented HMIS® program. HMIS® is a registered mark of the National Paint & Coatings Association (NPCA). HMIS® materials may be purchased exclusively from J. J. Keller (800) 327-6868.

The customer is responsible for determining the PPE code for this material.

National Fire Protection Association (U.S.A.)

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16. Other information

Copyright ©2001, National Fire Protection Association, Quincy, MA 02269. This warning system is intended to be interpreted and applied only by properly trained individuals to identify fire, health and reactivity hazards of chemicals. The user is referred to certain limited number of chemicals with recommended classifications in NFPA 49 and NFPA 325, which would be used as a guideline only. Whether the chemicals are classified by NFPA or not, anyone using the 704 systems to classify chemicals does so at their own risk.

Notice to reader

To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein.

Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.

Date of issue : 04/21/2011.
Date of previous issue : No previous validation.
Version : 1

Indicates information that has changed from previously issued version.

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