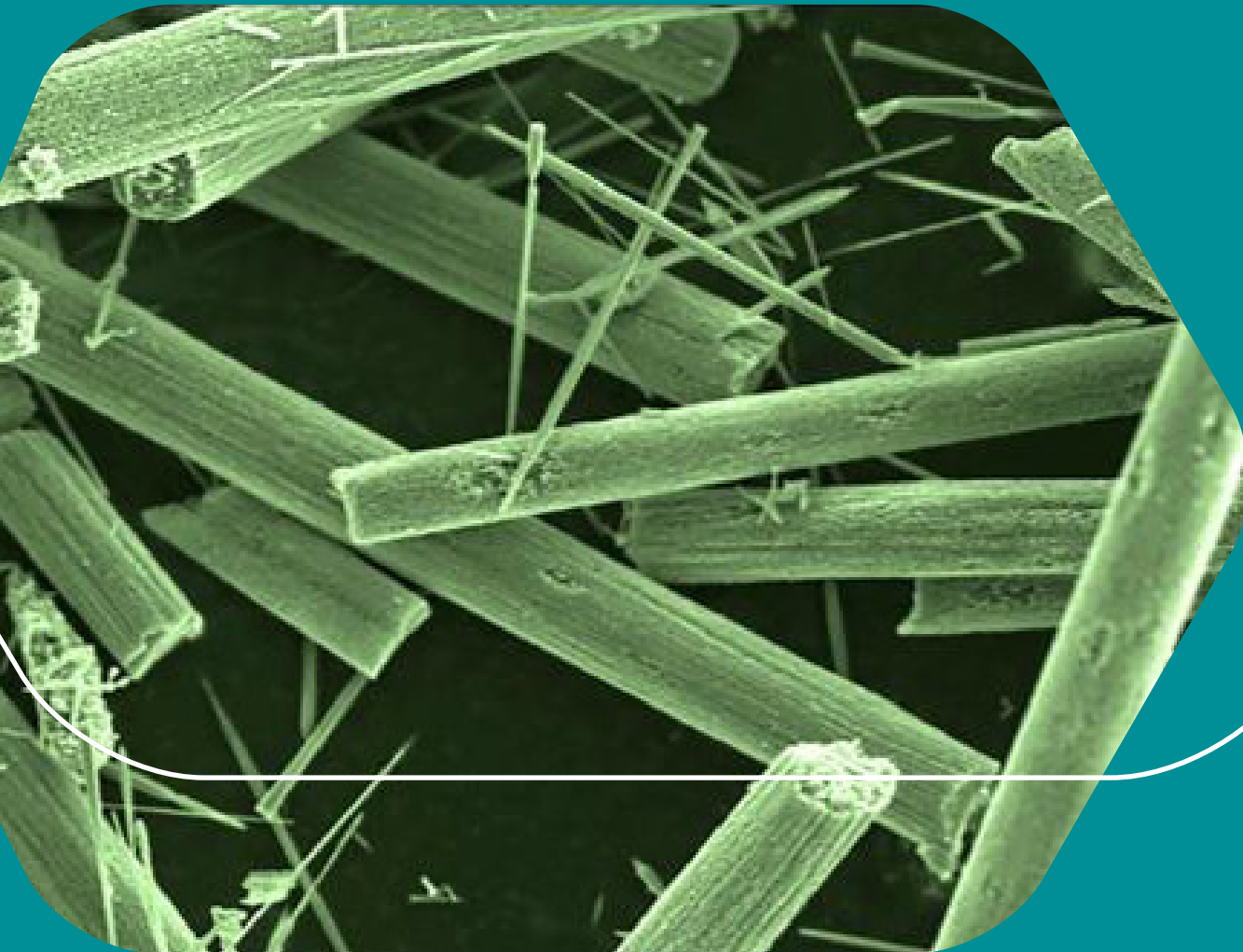


Creating Material Change



Silicon Carbide Fiber/Microfiber By-Product Safety Data Sheet



Innovation underpins everything we do
www.haydale.com  HaydaleGraphene

Silicon Carbide (SiC) Fiber Dry Powder

1. Identification of the Substance/Mixture and of the Company

- 1.1 **Product Identifiers**
- Commercial product name(s):** Silicon Carbide microfiber By-Product
- Generic name:** Silicon Carbide Froth
- REACH No.:** A registration number is not available for this substance as the substance or its uses are exempted from registration, the annual tonnage does not require a registration, or the registration is envisaged for a later registration deadline.
- CAS No.:** See section 3.

- 1.2 **Relevant identified uses of the substance or mixture, and uses advised against:** Silicon Carbide fiber/microfiber By-Product.

- 1.3 **Details of the supplier of the safety data sheet**
- Company:** Haydale Ceramic Technologies Inc.
1446 South Buncombe Road
Greer
SC 29651
USA
- Telephone:** +1 864 877 0123
- Fax:** +1 864 879 6615
- E-mail address:** info@haydale.com

2. Hazards Identification

- 2.1 **Classification of the substance or mixture** Combustible dust.

Classification according to Regulation (EC) No 1272/2008 [CLP]

Specific target organ toxicity - repeated exposure, Inhalation (Category 2)
Flammable liquids, Category 3

Classification according to Directive 67/548/EEC

Harmful: danger of serious damage to health by prolonged exposure through inhalation.
R10: Flammable; Xn: Harmful.; Xi: Irritant.; N: Dangerous for the environment; R10; R38; R65; R51/53

- 2.2 **Label elements**
- Warning:H228: Flammable Solid
H373: May cause damage to organs through prolonged or repeated exposure if inhaled.
- CLP Hazard Statements:
PHYSICAL HAZARDS:
H226: Flammable liquid and vapor
- HEALTH HAZARDS:
H315: Causes skin irritation
H304: May be fatal if swallowed and enters airways
H336: May cause drowsiness or dizziness

CONTROLLED DOCUMENT – UNCONTROLLED WHEN PRINTED

The information contained in this document is proprietary to Haydale and its subsidiaries.
Version number: 7 | Revision date: 2018-04-02

ENVIRONMENTAL HAZARDS:
H411: Toxic to aquatic life with long lasting effects

CLP Precautionary statements:
Prevention: P102: Keep out of reach of children.
P210: Keep away from heat/sparks/open flames/hot surfaces - No smoking
P280: Wear protective gloves/protective clothing/eye protection/face protection
Response: P301+P310: IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician
P331: Do NOT induce vomiting
Disposal: P501: Dispose of contents and container to appropriate waste site or reclaimer in accordance with local and national regulations

2.3 Other hazards

2.3.1

Silicon carbide (SiC) fibers/microfibers are a fibrous form of single-crystal silicon carbide having an aspect ratio of 3:1 or greater. SiC fibers/microfibers are non-toxic by ingestion, have no extractables, and are even approved for food contact in some situations.

Raw, dry SiC fibers/microfibers may become airborne during handling and become respirable in some conditions. When dispersed in water, solvent, polymer, or other carrier material (when wetted), SiC fibers/microfibers are non-respirable and non-hazardous. When SiC fibers/microfibers are incorporated into a matrix material or composite system (for example a polymer coating), they are non-respirable and nonhazardous. Under such conditions, there is no evidence to suggest that SiC fiber or microfiber ever become respirable, even when these matrix material or composite systems are subjected to mechanical wear.

SiC fibers/microfibers are not a hazardous substance according to Regulation (EC) No. 1272/2008. Most agencies list SiC fibers/microfibers as non-hazardous even in dry powder form. However, some agencies list SiC fibers/microfibers as potential carcinogens, based on limited experimental animal data that suggests a carcinogenic effect. Any potential carcinogenicity of SiC fibers/microfibers is limited to chronic overexposure of dry, respirable dust. No data exists for humans.

Haydale Technologies Inc. recommends handling this substance with appropriate caution according to the recommendations of this safety data sheet to ensure workplace safety.

OSHA:	Non-hazardous.
ECHA:	Non-hazardous.
NTP:	Non-hazardous.
IARC:	Class 2B, "possibly carcinogenic to humans" of dry respirable dust, although no data exists for humans. This classification is for the entire family of refractory ceramic fibers, which includes silicon carbide fibers/microfibers.
ACGIH®:	Class A2, "suspected human carcinogen" for dry respirable dust, although no data exists for humans. Recommended exposure limits is 0.1 fibers/cc 8-hour time weighted average (TWA) for fibers greater than 5µm in length with an aspect ratio greater than or equal to 3:1 as determined by the membrane filter method at 400 to 450 times magnification (4-mm objective) using phase-contrast illumination.

CONTROLLED DOCUMENT – UNCONTROLLED WHEN PRINTED

The information contained in this document is proprietary to Haydale and its subsidiaries.
Version number: 1.2 | Revision date: 2019-08-30

2.3.2 Carbon:	Hazards not otherwise classified (HNOC) or not covered by GHS - Combustible dust.
2.3.3 Quartz (Silica):	Hazards not otherwise classified (HNOC) or not covered by GHS – none.
2.3.4 Kerosene:	Hazards not otherwise classified (HNOC) or not covered by GHS – none.

3. Composition / Information on Ingredients

3.1 Substances

Definition according to EC directive:	Silicon carbide fibers (microfibers)	10-25%
CAS No.:	409-21-2 (silicon carbide)	
EINECS No.:	206-991-8(silicon carbide)	
CAS No.:	Carbon	17-25%
EINECS No.:	7440-44-0	
	231-153-3	
CAS No.:	Quartz (Silica)	2-4%
EINECS No.:	14808-60-7	
	238-878-4	
CAS No.:	Kerosene	1-5%
EINECS No.:	8008-20-6	
	232-366-4	
CAS No.:	Water	40-50%
EINECS No.:	7732-18-5	
	231-791-2	

4. First Aid Measures

4.1 Description of first aid measures

Inhalation:	If dust is inhaled, and if symptoms of pulmonary involvement develop (coughing, wheezing, or shortness of breath), remove immediately from the exposure area to fresh air. If symptoms persist, seek medical attention.
Skin contact:	Not expected to present a significant skin hazard under anticipated conditions of normal use, but, if irritation or rash occurs, seek medical attention for symptomatic treatment.
Eye contact:	In case of eye irritation due to contact with material, immediately rinse with copious quantities of clean water, occasionally lifting upper and lower eyelids, until no evidence of material remains (approximately 15-20 minutes). If symptoms persist, such as pain, blinking, tears, or redness, seek medical attention.
Ingestion:	Not expected to present a significant ingestion hazard under anticipated conditions if normal use. Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in SECTIONS 2.2-Label Elements/2.3 – Other Hazards and also in SECTION 11 – TOXICOLOGICAL INFORMATION.

CONTROLLED DOCUMENT – UNCONTROLLED WHEN PRINTED

The information contained in this document is proprietary to Haydale and its subsidiaries.
Version number: 1.2 | Revision date: 2019-08-30

4.3 **Indication of any immediate medical attention and special treatment needed**

No data available.

5. Firefighting Measures

5.1 **Extinguishing media** Water spray or water fog.

5.2 **Special hazards arising from the substance or mixture**

None known.

5.3 **Advice for firefighters** Wear pressure-demand, self-contained breathing apparatus and full firefighting protective clothing for firefighting if necessary. When mixed with air and exposed to an ignition source, sufficient flammable dust may exist to burn in the open or explode if confined. Use good housekeeping practices to avoid rendering dust airborne. Heat from fire can also ignite product. May not be obvious that product is burning unless material is stirred and sparks are apparent. Do not enter area without proper protection. Fight fire from safe, protected location. Apply extinguishing media carefully to prevent frothing/steam explosion. Use water spray or fog for cooling. Avoid creating dust. Notify authorities if liquid enters sewers or public waters.

6. Accidental Release Measures

6.1 **Personal precautions, protective equipment and emergency procedures**

Wear personal protective equipment if warranted, to prevent breathing of respirable dust. It is recommended to work in an engineered closed system where respirable dust may be exhausted. If it is not easy or possible to work in an engineered closed system, a suitable respirator should be worn. Remove all sources of ignition.

For more information, see SECTION 8.2 – Exposure controls.

6.2 **Environmental precautions**

Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

6.3 **Methods and material for containment and cleaning up**

Wet down spillage, pick-up mechanically, and dispose of according to national, regional, and local regulations.

6.4 **Reference to other sections**

For personal protection see section 8. For disposal see section 13.

7. Handling and Storage

7.1 **Precautions for safe handling**

Avoid dust formation. Use an engineered closed system if possible during handling, and appropriate respiratory protection. Keep away from sources of ignition - No smoking. Take measures to prevent the build-up of electrostatic charge. Store in a sealed container.

7.2 **Conditions for safe storage, including any incompatibilities**

Store in tightly sealed containers in a clean, secure area. Identify the contents of all containers. No known incompatibilities.

7.3 **Specific end use(s)**

Apart from the uses mentioned in section 1.2, no other specific uses are stipulated.

CONTROLLED DOCUMENT – UNCONTROLLED WHEN PRINTED

The information contained in this document is proprietary to Haydale and its subsidiaries.

Version number: 1.2 | Revision date: 2019-08-30

8. Exposure Controls / Personal Protection

8.1	Control parameters	Silicon Carbide Fibers (microfibers)
	OSHA:	Non-hazardous.
	ECHA:	Non-hazardous.
	NTP:	Non-hazardous.
	IARC:	Class 2B, "possibly carcinogenic to humans" of dry respirable dust, although no data exists for humans. This classification is for the entire family of refractory ceramic fibers, which includes silicon carbide fibers/microfibers.
	ACGIH®:	Class A2, "suspected human carcinogen" for dry respirable dust, although no data exists for humans. Recommended exposure limits is 0.1 fibers/cc 8-hour time weighted average (TWA) for fibers greater than 5µm in length with an aspect ratio greater than or equal to 3:1 as determined by the membrane filter method at 400 to 450 times magnification (4-mm objective) using phase-contrast illumination.
		Carbon
	OSHA PEL:	15mg/m ³ total, 5mg/m ³ respirable
	ACGIH®TLV®:	10mg/m ³ total, 3mg/m ³ respirable
		Quartz (Silica)
	OSHA PEL:	10mg/m ³ ÷ (%SiO ₂ +2)
	ACGIH®TLV®:	0.1mg/m ³ total, .05mg/m ³ respirable
	Kerosene:	N/P
	Water:	N/P
8.2	Exposure controls	
	General protection and hygiene measures:	Observe general industrial hygiene practice.
	Respiratory protection:	Use an engineered closed system if possible during handling. If it is not easy or possible to work in an engineered closed system, a suitable respirator should be worn, to prevent breathing of respirable dust. A respirator with category N95 filters should be used.
	Hand protection:	Not normally considered a skin hazard. Where use can result in skin contact, practice good personal hygiene, and wash hands and other exposed areas with mild soap and water before eating, drinking, smoking, using toilet facilities, or leaving work.
	Eye/face protection:	Use protective goggles to prevent contact with eyes. Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166 (EU).
	Environmental exposure controls:	No data available.

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

(a) Appearance:	Fiber/microfiber/particle/carbon powder. Variable color, typically gray-green/black.
(b) Odor:	Not applicable.
(c) Odor threshold:	Not applicable.
(d) pH:	Not applicable.
(e) Melting point/ freezing point:	Decomposes above 2500°C
(f) Initial boiling point and boiling range:	Not applicable.
(g) Flash point:	>225°F (closed cup).
(h) Evaporation rate:	(Butyl Acetate = 1): Not applicable.
(i) Flammability (solid, gas):	Flammable.
(j) Upper/lower flammability or explosive limits:	Lower (LEL): Not applicable. Upper(UEL): Not applicable.
(k) Vapor pressure:	(mm Hg): Not applicable
(l) Vapor density:	(Air = 1): Not applicable
(m) Relative density:	Not applicable.
(n) Water solubility:	Insoluble in water.
(o) Partition coefficient: n-octanol/water:	Insoluble in both water and n-octanol.
(p) Auto-ignition temperature:	Not applicable.
(q) Decomposition temperature:	2500°C
(r) Viscosity:	No data available.
(s) Explosive properties:	Not applicable.
(t) Oxidizing properties:	Not applicable.

10. Stability and Reactivity

10.1 Reactivity	No data available.
10.2 Chemical stability	Stable under normal use conditions. Avoid dust creation and excessive heat. Temperatures greater than 700°C may produce carbon monoxide when silicon carbide fibers/microfibers are in contact with oxidizing agents.
10.3 Possibility of hazardous reactions	Not applicable.
10.4 Conditions to avoid	Avoid heat, sparks, open flames and other ignition sources.
10.5 Incompatible materials	Strong oxidizing agents.
10.6 Hazardous decomposition products	Carbon monoxide and carbon dioxide.

11. Toxicological Information

11.1 Information on toxicological effects

(a) Acute toxicity	LD50 for dry silicon carbide powder is > 2.000 mg/kg
(b) Skin corrosion/irritation:	No data available.
(c) Serious eye damage/ irritation:	No data available.
(d) Respiratory or skin sensitization:	Excessive exposure to respirable silicon carbide fibers/microfibers may cause cough, mucus production, shortness of breath, irritation of the breathing passages, and/or may result in lung damage.
(e) Germ cell mutagenicity:	No data available.
(f) Carcinogenicity:	See SECTION 2.3 – Other hazards.

(g) Reproductive toxicity:	No data available.
(h) STOT-single exposure:	No data available.
(i) STOT-repeated exposure:	No data available.
(j) Aspiration hazard:	No data available.

Further toxicological information: Silicon carbide is not bioactive and not known to absorb into living tissues. Silicon carbide is not sensitizing and is non-toxic by oral ingestion.

12. Ecological Information

12.1	Toxicity	No data available.
12.2	Persistence and degradability	No data available.
12.3	Bio accumulative potential	No data available.
12.4	Mobility in soil	No data available.
12.5	Results of PBT and vPvB assessment	PBT/vPvB assessment not available as chemical safety assessment not required/not conducted.
12.6	Other adverse effects	No data available.

13. Disposal Considerations

13.1	Waste treatment methods Product disposal:	Spillage or unused materials should be disposed in accordance with national, regional, and local solid waste regulations.
------	--	---

Contaminated packaging: Containers should be tightly sealed to prevent drying and subsequent airborne emissions during transportation and at the disposal site. It is recommended that containers be externally labeled to indicate that container should remain sealed.

14. Transport Information

14.1	UN Number ADR/RID: IMDG: IATA:	UN Number: 1223 UN Number: 1223 UN Number: 1223
14.2	UN proper shipping name ADR/RID: IMDG: IATA:	Kerosene Kerosene Kerosene
14.3	Transport hazard class(es)	3
14.4	Packing group	III
14.5	Environmental hazards	Yes. Marine Pollutant.
14.6	Special precautions for user	No data available.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

No data available.

15.2 Chemical safety assessment

For this product a chemical safety assessment was not carried out.

16. Other Information

This information covers the safety requirements of the product(s) exclusively and is based on current knowledge and experience. This safety information should be used for information purposes only, and does not represent a guarantee for properties of the described product(s) in terms of any legal warranty. Haydale Technologies Inc. shall not be held liable for any damage resulting from handling or from contact with the above product.

The content supplied in this safety data sheet ("Information") supersedes all previous versions supplied

The Information is designed only as guidance for the safe handling, storage, processing and/or use of the Product. The Information is correct to the best of the Haydale Group's knowledge and belief at the date of publication (Haydale Group means Haydale Limited as a subsidiary of Haydale Graphene Industries plc. and any subsidiary or holding company from time to time and any subsidiary from time to time of any holding company of Haydale Limited), however no express or implied warranty or guarantee or representation is made regarding the fitness for any particular purpose, merchantability, accuracy or completeness of the Information provided. The Information relates solely to the specific Product designated and may not be valid or applicable where the Product is handled, stored, processed or used in combination with any other materials or in any process other than those described in the Information.



Contact us: T: +1 864 877 0123 E: info@haydale.com