



Technologies Inc.

SAFETY DATA SHEET

Silicon Carbide (SiC) Whisker/Fiber/Microfiber
Aluminum Oxide Blends containing Silicon Nitride

Revision: 8; Revision Date: October 11, 2017

SECTION 1: IDENTIFICATION OF THE SUBSTANCE /MIXTURE AND OF THE COMPANY

1.1 Product identifiers

Commercial product name(s): C-TUFF™ Ceramic Powder Blends: All Designations
Aluminum Oxide – Silicon Carbide Whisker Blends containing Silicon Nitride

Generic name: Ceramic Composite Powder Blend

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

Used for the manufacture of substances.

1.3 Details of the supplier of the safety data sheet

Company: Haydale 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-technologies.com

SECTION 2: HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

This product is not classified as a hazardous substance or mixture. This product does not need to be labelled as hazardous.

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

Not a hazardous substance or mixture according to Regulation (EC) No. 1272/2008.

Classification according to Directive 67/548/EEC

This substance is not classified as dangerous according to Directive 67/548/EEC.

2.2 Label elements

This substance does not need to be labelled in accordance with EC directives or respective national laws.

SAFETY DATA SHEET

Silicon Carbide (SiC) Whisker/Fiber/Microfiber
Aluminum Oxide Blends containing Silicon Nitride
Revision: 8; Revision Date: October 11, 2017

2.3 Other hazards

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

Raw, dry SiC whiskers/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 whiskers/microfibers are non-respirable and non-hazardous. When SiC whiskers/microfibers are incorporated into a matrix material or composite system (for example a polymer coating), they are non-respirable and non-hazardous. Under such conditions, there is no evidence to suggest that SiC whisker or microfiber ever become respirable, even when these matrix material or composite systems are subjected to mechanical wear.

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

2.3.2 Aluminum Oxide does not cause any health hazard under normal conditions of use and as delivered. High dust concentration in the working environment may cause mechanical irritation of the eyes, skin and respiratory tract. In its crystalline form, the product can have sharp edges that may cause cuts to the hands during handling.

2.3.3 Silicon Nitride: Hazards not otherwise classified (HNOC) or not covered by GHS – none.

SAFETY DATA SHEET

Silicon Carbide (SiC) Whisker/Fiber/Microfiber
Aluminum Oxide Blends containing Silicon Nitride
Revision: 8; Revision Date: October 11, 2017

SECTION 3: COMPOSITION / INFORMATION ON INGREDIENTS

3.1 Substances

Definition according to EC directive:	Silicon Carbide Whiskers (Microfibers)	1-50%
CAS No.:	409-21-2 (silicon carbide)	
EINECS No.:	206-991-8 (silicon carbide)	
	Aluminum Oxide	50-99%
CAS No.:	1344-28-1 (alumina powder)	
EINECS No.:	215-691-6	
	Silicon Nitride	
CAS No.:	12033-89-5	1-50%
EINECS No.:	234-796-8	

SECTION 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 of normal use.

4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in SECTION 2.3 – Other Hazards and also in SECTION 11 – TOXICOLOGICAL INFORMATION.

4.3 Indication of any immediate medical attention and special treatment needed

No data available.

SAFETY DATA SHEET

Silicon Carbide (SiC) Whisker/Fiber/Microfiber
Aluminum Oxide Blends containing Silicon Nitride
Revision: 8; Revision Date: October 11, 2017

SECTION 5: FIREFIGHTING MEASURES

5.1 Extinguishing media

Dry powder is not flammable. Use extinguishing measures appropriate for the source of the fire.

5.2 Special hazards arising from the substance or mixture

Silicon Nitride: nitrogen oxides (NOx), silicon oxides

5.3 Advice for firefighters

Wear pressure-demand, self-contained breathing apparatus and full firefighting protective clothing for firefighting if necessary.

SECTION 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.

For more information, see SECTION 8.2 – Exposure controls.

6.2 Environmental precautions

Silicon Nitride: Do not let product enter drains.

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.

SECTION 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. 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.

SAFETY DATA SHEET

Silicon Carbide (SiC) Whisker/Fiber/Microfiber
Aluminum Oxide Blends containing Silicon Nitride
Revision: 8; Revision Date: October 11, 2017

SECTION 8: EXPOSURE CONTROLS / PERSONAL PROTECTION

8.1 Exposure Limits

Silicon Carbide Whiskers (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 whiskers/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.

Aluminum Oxide

OSHA PEL: 15mg/m³ TWA - respirable: 5mg/m³ TWA

ACGIH® TLV® 10 mg/m³ TWA

Silicon Nitride

OSHA PEL: 10mg/m³ TWA - respirable: 5mg/m³ TWA

ACGIH® TLV® 10 mg/m³ TWA

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).

SAFETY DATA SHEET

Silicon Carbide (SiC) Whisker/Fiber/Microfiber
Aluminum Oxide Blends containing Silicon Nitride
Revision: 8; Revision Date: October 11, 2017

Environmental
exposure controls:

Silicon Nitride: Do not let product enter drains.

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

- (a) Appearance: Variable, typically gray-green powder.
- (b) Odor: Odorless.
- (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: Not flammable by conventional test methods.
- (h) Evaporation rate: Not applicable.
- (i) Flammability (solid, gas): Not flammable.
- (j) Upper/lower flammability or explosive limits: Not applicable.
- (k) Vapor pressure: Not applicable.
- (l) Vapor density: Not applicable.
- (m) Relative density: 3.30-3.97.
- (n) Water solubility: Insoluble in water.
- (o) Partition coefficient: Insoluble in both water and n-octanol.
n-octanol/water:
- (p) Auto-ignition temperature: Not applicable.
- (q) Decomposition temperature: Not applicable.
- (r) Viscosity: No data available.
- (s) Explosive properties: Not applicable.
- (t) Oxidizing properties: Not applicable.

SAFETY DATA SHEET

Silicon Carbide (SiC) Whisker/Fiber/Microfiber
Aluminum Oxide Blends containing Silicon Nitride
Revision: 8; Revision Date: October 11, 2017

SECTION 10: STABILITY AND REACTIVITY

10.1 Reactivity

This material is stable. No hazardous reactions known.

10.2 Chemical stability

This material is stable. No hazardous reactions known.

10.3 Possibility of hazardous reactions

Not applicable.

10.4 Conditions to avoid

Not applicable.

10.5 Incompatible materials

Not applicable.

10.6 Hazardous decomposition products

None known.

SECTION 11: TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

11.1.1 Silicon Carbide

- | | |
|--|--|
| (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: | No data available. |
| (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. |

SAFETY DATA SHEET

Silicon Carbide (SiC) Whisker/Fiber/Microfiber
Aluminum Oxide Blends containing Silicon Nitride
Revision: 8; Revision Date: October 11, 2017

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.

11.1.2 Aluminum Oxide

- (a) Acute toxicity Oral LD50 for dry Aluminum Oxide: >5000 mg/kg bwt (rats)
- (b) Skin corrosion/irritation: None.
- (c) Serious eye damage/irritation: No effects apart from mechanical irritation.
- (d) Respiratory or skin sensitization: None.
- (e) Germ cell mutagenicity: None.
- (f) Carcinogenicity: None.
- (g) Reproductive toxicity: None.
- (h) STOT-single exposure: No data available.
- (i) STOT-repeated exposure: No data available.
- (j) Aspiration hazard: No data available.

Further toxicological information:

11.1.3 Silicon Nitride

- (a) Acute toxicity No data available.
- (b) Skin corrosion/irritation: No data available.
- (c) Serious eye damage/irritation: No data available.
- (d) Respiratory or skin sensitization: No data available.
- (e) Germ cell mutagenicity: No data available.
- (f) Carcinogenicity: IARC: No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.
ACGIH: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH.

SAFETY DATA SHEET

Silicon Carbide (SiC) Whisker/Fiber/Microfiber
Aluminum Oxide Blends containing Silicon Nitride
Revision: 8; Revision Date: October 11, 2017

NTP: No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.
OSHA: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA..

(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:

SECTION 12: ECOLOGICAL INFORMATION

12.1 Toxicity

No data available.

12.2 Persistence and degradability

No data available.

12.3 Bioaccumulative 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.

SECTION 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.

SAFETY DATA SHEET

Silicon Carbide (SiC) Whisker/Fiber/Microfiber
Aluminum Oxide Blends containing Silicon Nitride
Revision: 8; Revision Date: October 11, 2017

SECTION 14: TRANSPORT INFORMATION

14.1 UN Number

ADR/RID: Not dangerous goods.
IMDG: Not dangerous goods.
IATA Not dangerous goods.

14.2 UN proper shipping name

ADR/RID: Not dangerous goods.
IMDG: Not dangerous goods.
IATA Not dangerous goods.

14.3 Transport hazard class(es)

Not dangerous goods.

14.4 Packing group

Not dangerous goods.

14.5 Environmental hazards

None known.

14.6 Special precautions for user

No data available.

SECTION 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.

SECTION 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.