



CFF Carbon Fiber Filament

Safety Data Sheet

According to Regulation (EC) No. 1907/2006 (REACH) with its amendment Regulation (EU) 2015/830

Revision Date: 24/08/2018 Date of Issue: 24/05/2017 Supersedes Date: 22/02/2018 Version: 1.1

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1. Product identifier

Product Form : Mixture
Product Name : CFF Carbon Fiber Filament
Synonyms : Carbon

1.2. Relevant identified uses of the substance or mixture and uses advised against

1.2.1. Relevant identified uses

Use of the substance/mixture : MarkForged 3D printing material.

1.2.2. Uses advised against

No additional information available

1.3. Details of the supplier of the safety data sheet

Company

MarkForged, Inc
85 School St
Watertown MA 02472
T: 844-700-1035 (9:00 A.M to 6:00 P.M. EST)
support@markforged.com
www.markforged.com

1.4. Emergency telephone number

Emergency number : (CHEMTREC) +1-703-527-3887; +(44)-870-8200418 (UK)

SECTION 2: Hazards identification

2.1. Classification of the substance or mixture

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

Not classified

Adverse physicochemical, human health and environmental effects

No additional information available

2.2. Label elements

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

No labelling applicable

2.3. Other hazards

Other hazards not contributing to the classification : Exposure may aggravate pre-existing eye, skin, or respiratory conditions. There is the risk of thermal burns on contact with hot or molten material. Irritating fumes may be given off during processing or normal conditions of use, ensure adequate ventilation. Contains substances that are combustible dusts. If the product is processed and dusts are generated and become dispersed with an ignition source, this may cause a combustible dust explosion. Keep dust levels to a minimum and follow applicable regulations. This product and any fibers or dust are electrically conductive and may interfere with electrical systems and processes, use proper precautions.

SECTION 3: Composition/information on ingredients

3.1. Substances

Not applicable

3.2. Mixture

Name	Product identifier	%	Classification According to Regulation (EC) No. 1272/2008 [CLP]
Carbon	(CAS-No.) 7440-44-0 (EC-No.) 231-153-3	40 - 60	Not classified

SECTION 4: First aid measures

4.1. Description of first aid measures

First-aid measures general : Never give anything by mouth to an unconscious person. If you feel unwell, seek medical advice (show the label where possible).

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First-aid measures after inhalation	: When symptoms occur: go into open air and ventilate suspected area. Obtain medical attention if breathing difficulty persists.
First-aid measures after skin contact	: Remove contaminated clothing. Drench affected area with water for at least 15 minutes. Obtain medical attention if irritation develops or persists. Cool skin rapidly with cold water after contact with molten product. Removal of solidified molten material from skin requires medical assistance.
First-aid measures after eye contact	: Rinse cautiously with water for at least 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Obtain medical attention. Removal of solidified molten material from the eyes requires medical assistance.
First-aid measures after ingestion	: Rinse mouth. Do NOT induce vomiting. Obtain medical attention.

4.2. Most important symptoms and effects, both acute and delayed

Symptoms/effects	: Not expected to present a significant hazard under anticipated conditions of normal use. Prolonged contact with large amounts of dust may cause mechanical irritation. Risk of thermal burns on contact with molten product.
Symptoms/effects after inhalation	: Not expected to present a significant inhalation hazard under anticipated conditions of normal use. Repeated or prolonged exposure to dust particles may result in fibrosis.
Symptoms/effects after skin contact	: Prolonged exposure may cause skin irritation. Risk of thermal burns on contact with molten product.
Symptoms/effects after eye contact	: May cause mechanical eye irritation.
Symptoms/effects after ingestion	: Ingestion may cause adverse effects. Gastrointestinal discomfort and irritation.
Chronic symptoms	: None known.

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

If exposed or concerned, get medical advice and attention. If medical advice is needed, have product container or label at hand.

SECTION 5: Firefighting measures

5.1. Extinguishing media

Suitable extinguishing media	: Water spray, dry chemical, foam, carbon dioxide.
Unsuitable extinguishing media	: Do not use a heavy water stream. Use of heavy stream of water may spread fire. Application of water stream to hot product may cause frothing and increase fire intensity.

5.2. Special hazards arising from the substance or mixture

Fire hazard	: Not considered flammable but may burn at high temperatures.
Explosion hazard	: Product is not explosive. Contains substances that are combustible dusts. If dust or fibers are allowed to accumulate, may form combustible dust concentrations in air that could ignite and cause an explosion. Take appropriate precautions.
Reactivity	: Hazardous reactions will not occur under normal conditions.
Hazardous decomposition products in case of fire	: Thermal decomposition generates: Carbon oxides (CO, CO ₂). Nitrogen oxides. Hydrogen cyanide. Irritating fumes.

5.3. Advice for firefighters

Precautionary measures fire	: Exercise caution when fighting any chemical fire.
Firefighting instructions	: Use water spray or fog for cooling exposed containers. Do not breathe fumes from fires or vapours from decomposition.
Protection during firefighting	: Do not enter fire area without proper protective equipment, including respiratory protection.
Other information	: Do not allow run-off from fire fighting to enter drains or water courses.

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

General measures	: Avoid prolonged contact with eyes, skin and clothing. Avoid breathing dust.
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6.1.1. For non-emergency personnel

Protective equipment	: Use appropriate personal protective equipment (PPE).
Emergency procedures	: Evacuate unnecessary personnel.

6.1.2. For emergency responders

Protective equipment	: Equip cleanup crew with proper protection.
Emergency procedures	: Upon arrival at the scene, a first responder is expected to recognize the presence of dangerous goods, protect oneself and the public, secure the area, and call for the assistance of trained personnel as soon as conditions permit.

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6.2. Environmental precautions

Prevent entry to sewers and public waters.

6.3. Methods and material for containment and cleaning up

For containment : Contain solid spills with appropriate barriers and prevent migration and entry into sewers or streams.

Methods for cleaning up : Clean up spills immediately and dispose of waste safely. Recover the product by vacuuming, shoveling or sweeping. Avoid generation of dust during clean-up of spills. For particulates and dust: Vacuum clean-up is preferred. If sweeping is required use a dust suppressant. Transfer spilled material to a suitable container for disposal. Contact competent authorities after a spill.

6.4. Reference to other sections

See Section 8 for exposure controls and personal protection and Section 13 for disposal considerations.

SECTION 7: Handling and storage

7.1. Precautions for safe handling

Additional hazards when processed : Carbon fiber is electrically conductive. It may cause short circuits of electrical apparatus, especially when airborne fibers are drifting in the area. Accumulation and dispersion of dust with an ignition source can cause a combustible dust explosion. Keep dust levels to a minimum and follow applicable regulations.

Precautions for safe handling : Wash hands and other exposed areas with mild soap and water before eating, drinking or smoking and when leaving work. Avoid creating or spreading dust. Avoid breathing dust. Avoid prolonged contact with eyes, skin and clothing. Use appropriate personal protective equipment (PPE).

Hygiene measures : Handle in accordance with good industrial hygiene and safety procedures.

7.2. Conditions for safe storage, including any incompatibilities

Technical measures : Comply with applicable regulations.

Storage conditions : Keep container closed when not in use. Store in a dry, cool and well-ventilated place. Keep/Store away from direct sunlight, extremely high or low temperatures and incompatible materials.

Incompatible materials : Strong acids, strong bases, strong oxidizers, water, humidity.

Storage temperature : Room temperature

7.3. Specific end use(s)

MarkForged 3D printing material.

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

Carbon (7440-44-0)		
Austria	MAK (mg/m ³)	5 mg/m ³ (alveolar dust with <1% Quartz, respirable fraction)
Austria	MAK Short time value (mg/m ³)	10 mg/m ³ (alveolar dust with <1% Quartz, respirable fraction)
Poland	NDS (mg/m ³)	4 mg/m ³ (natural-inhalable fraction) 1 mg/m ³ (natural-respirable fraction) 6 mg/m ³ (synthetic-inhalable fraction)

8.2. Exposure controls

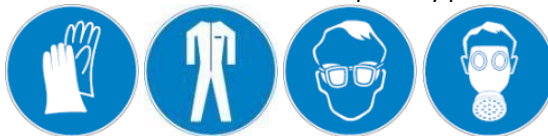
Appropriate engineering controls : Emergency eye wash fountains and safety showers should be available in the immediate vicinity of any potential exposure. Ensure adequate ventilation, especially in confined areas. Avoid creating or spreading dust. Maintain sufficient mechanical or natural ventilation to assure fiber concentrations remain below PEL/TLV. Use local exhaust if necessary. Power equipment should be equipped with properly designed dust collection devices. It is recommended that all dust control equipment such as local exhaust ventilation and material transport systems involved in handling of this product contain explosion relief vents or an explosion suppression system or an oxygen-deficient environment. Ensure all national/local regulations are observed.

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Personal protective equipment : Not generally required. The use of personal protective equipment may be necessary as conditions warrant. Gloves. Protective clothing. Protective goggles. Insufficient ventilation: wear respiratory protection.



Materials for protective clothing : Chemically resistant materials and fabrics.
Hand protection : Wear protective gloves.
Eye and Face Protection : Chemical goggles or safety glasses.
Skin and body protection : Wear suitable protective clothing.
Respiratory protection : If exposure limits are exceeded or irritation is experienced, approved respiratory protection should be worn.
Thermal hazard protection : When working with hot material, use suitable thermally protective clothing.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

Physical state : Solid
Colour : Black
Odour : No data available
Odour threshold : No data available
pH : No data available
Evaporation rate : No data available
Melting point : No data available
Freezing point : No data available
Boiling point : No data available
Flash point : No data available
Auto-ignition temperature : No data available
Decomposition temperature : No data available
Flammability (solid, gas) : No data available
Vapour pressure : No data available
Relative vapour density at 20 °C : No data available
Solubility : No data available
Partition coefficient: n-octanol/water : No data available
Viscosity : No data available
Explosive properties : No data available
Oxidising properties : No data available
Explosive limits : No data available

9.2. Other information

VOC content : Not applicable

SECTION 10: Stability and reactivity

10.1. Reactivity

Hazardous reactions will not occur under normal conditions.

10.2. Chemical stability

Stable under recommended handling and storage conditions (see section 7).

10.3. Possibility of hazardous reactions

Hazardous polymerization will not occur.

10.4. Conditions to avoid

Direct sunlight, extremely high or low temperatures, and incompatible materials. Generation of dust or fibers.

10.5. Incompatible materials

Strong acids, strong bases, strong oxidizers, water, humidity.

10.6. Hazardous decomposition products

Thermal decomposition generates: Carbon oxides (CO, CO₂). Nitrogen oxides. Hydrogen cyanide.

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SECTION 11: Toxicological information

11.1. Information on toxicological effects

Acute toxicity : Not classified (Based on available data, the classification criteria are not met)

Carbon (7440-44-0)

LD50 oral rat	> 10000 mg/kg
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Skin corrosion/irritation	: Not classified (Based on available data, the classification criteria are not met)
Serious eye damage/irritation	: Not classified (Based on available data, the classification criteria are not met)
Respiratory or skin sensitisation	: Not classified (Based on available data, the classification criteria are not met)
Germ cell mutagenicity	: Not classified (Based on available data, the classification criteria are not met)
Carcinogenicity	: Not classified (Based on available data, the classification criteria are not met)
Reproductive toxicity	: Not classified (Based on available data, the classification criteria are not met)
STOT-single exposure	: Not classified (Based on available data, the classification criteria are not met)
STOT-repeated exposure	: Not classified (Based on available data, the classification criteria are not met)
Aspiration hazard	: Not classified (Based on available data, the classification criteria are not met)
Symptoms/Injuries After Inhalation	: Not expected to present a significant inhalation hazard under anticipated conditions of normal use. Repeated or prolonged exposure to dust particles may result in fibrosis.
Symptoms/Injuries After Skin Contact	: Prolonged exposure may cause skin irritation. Risk of thermal burns on contact with molten product.
Symptoms/Injuries After Eye Contact	: May cause mechanical eye irritation.
Symptoms/Injuries After Ingestion	: Ingestion may cause adverse effects. Gastrointestinal discomfort and irritation.
Chronic Symptoms	: None known.

SECTION 12: Ecological information

12.1. Toxicity

Ecology - general : Not classified.

12.2. Persistence and degradability

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Persistence and degradability	Not established.
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12.3. Bioaccumulative potential

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Bioaccumulative potential	Not established.
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12.4. Mobility in soil

No additional information available

12.5. Results of PBT and vPvB assessment

No additional information available

12.6. Other adverse effects

Other information : Avoid release to the environment.

SECTION 13: Disposal considerations

13.1. Waste treatment methods

Product/Packaging disposal recommendations	: Dispose of contents/container in accordance with local, regional, national, and international regulations. Material should be recycled if possible.
Ecology - waste materials	: Avoid unnecessary release into environment.

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SECTION 14: Transport information

The shipping description(s) stated herein were prepared in accordance with certain assumptions at the time the SDS was authored, and can vary based on a number of variables that may or may not have been known at the time the SDS was issued. In accordance with ADR / RID / IMDG / IATA / ADN

ADR	IMDG	IATA	ADN	RID
14.1. UN number				
Not regulated for transport				
14.2. UN proper shipping name				
Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
14.3. Transport hazard class(es)				
Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
14.4. Packing group				
Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
14.5. Environmental hazards				
Dangerous for the environment : No	Dangerous for the environment : No Marine pollutant : No	Dangerous for the environment : No	Dangerous for the environment : No	Dangerous for the environment : No

14.6. Special precautions for user

No additional information available

14.7. Transport in bulk according to Annex II of MARPOL and the IBC Code

Not applicable

SECTION 15: Regulatory information

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

15.1.1. EU-Regulations

Contains no REACH substances with Annex XVII restrictions

Contains no substance on the REACH candidate list

Contains no REACH Annex XIV substances

Carbon (7440-44-0)

Listed on the EEC inventory EINECS (European Inventory of Existing Commercial Chemical Substances)

VOC content : Not applicable

15.1.2. National regulations

No additional information available

15.2. Chemical safety assessment

No chemical safety assessment has been carried out

SECTION 16: Other information

Date of Preparation or Latest Revision : 24/08/2018

Data sources : Information and data obtained and used in the authoring of this safety data sheet could come from database subscriptions, official government regulatory body websites, product/ingredient manufacturer or supplier specific information, and/or resources that include substance specific data and classifications according to GHS or their subsequent adoption of GHS.

Other information : According to Regulation (EC) No. 1907/2006 (REACH) with its amendment Regulation (EU) 2015/830

Indication of Changes

Section	Change	Date Changed	Version
Header	Modified	24/08/2018	1.1

Abbreviations and Acronyms

ACGIH – American Conference of Governmental Industrial Hygienists
ADN – European Agreement Concerning the International Carriage of Dangerous Goods by Inland Waterways
ADR - European Agreement Concerning the International Carriage of Dangerous Goods by Road
ATE - Acute Toxicity Estimate
BCF - Bioconcentration Factor

MARPOL - International Convention for the Prevention of Pollution
NDS - Najwyższe Dopuszczalne Steżenie
NDSCh - Najwyższe Dopuszczalne Steżenie Chwilowe
NDSP - Najwyższe Dopuszczalne Steżenie Pulapowe
NOAEL - No-Observed Adverse Effect Level
NOEC - No-Observed Effect Concentration
NRD - Nevirsytinas Ribinis Dydis

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BEI - Biological Exposure Indices (BEI)	NTP – National Toxicology Program
BOD – Biochemical Oxygen Demand	OEL - Occupational Exposure Limits
CAS No. - Chemical Abstracts Service Number	PBT - Persistent, Bioaccumulative and Toxic
CLP – Classification, Labeling and Packaging Regulation (EC) No 1272/2008	PEL - Permissible Exposure Limit
COD – Chemical Oxygen Demand	pH – Potential Hydrogen
EC – European Community	REACH – Registration, Evaluation, Authorisation, and Restriction of Chemicals
EC50 - Median Effective Concentration	RID – Regulations Concerning the International Carriage of Dangerous Goods by Rail
EEC – European Economic Community	SADT - Self Accelerating Decomposition Temperature
EINECS – European Inventory of Existing Commercial Chemical Substances	SDS - Safety Data Sheet
EmS-No. (Fire) - IMDG Emergency Schedule Fire	STEL - Short Term Exposure Limit
EmS-No. (Spillage) - IMDG Emergency Schedule Spillage	TA-Luft - Technische Anleitung zur Reinhaltung der Luft
EU – European Union	TEL TRK – Technical Guidance Concentrations
ErC50 - EC50 in Terms of Reduction Growth Rate	ThOD – Theoretical Oxygen Demand
GHS – Globally Harmonized System of Classification and Labeling of Chemicals	TLM - Median Tolerance Limit
IARC - International Agency for Research on Cancer	TLV - Threshold Limit Value
IATA - International Air Transport Association	TPRD - Trumpalaikio Poveikio Ribinis Dydis
IBC Code - International Bulk Chemical Code	TRGS 510 - Technische Regel für Gefahrstoffe 510 - Lagerung von Gefahrstoffen in ortsbeweglichen Behältern
IMDG - International Maritime Dangerous Goods	TRGS 552 – Technische Regeln für Gefahrstoffe - N-Nitrosamine
IPRV - Ilgalaikio Poveikio Ribinis Dydis	TRGS 900 - Technische Regel für Gefahrstoffe 900 – Arbeitsplatzgrenzwerte
IOELV – Indicative Occupational Exposure Limit Value	TRGS 903 - Technische Regel für Gefahrstoffe 903 - Biologische Grenzwerte
LC50 - Median Lethal Concentration	TSCA - Toxic Substances Control Act
LD50 - Median Lethal Dose	TWA - Time Weighted Average
LOAEL - Lowest Observed Adverse Effect Level	VOC – Volatile Organic Compounds
LOEC - Lowest-Observed-Effect Concentration	VLA-EC - Valor Límite Ambiental Exposición de Corta Duración
Log Koc - Soil Organic Carbon-water Partitioning Coefficient	VLA-ED - Valor Límite Ambiental Exposición Diaria
Log Kow - Octanol/water Partition Coefficient	VLE – Valeur Limite D'exposition
Log Pow - Ratio of the equilibrium concentration (C) of a dissolved substance in a two-phase system consisting of two largely immiscible solvents, in this case octanol and water	VME – Valeur Limite De Moyenne Exposition
MAK – Maximum Workplace Concentration/Maximum Permissible Concentration	vPvB - Very Persistent and Very Bioaccumulative
	WEL – Workplace Exposure Limit
	WGK - Wassergefährdungsklasse

EU GHS SDS

This information is based on our current knowledge and is intended to describe the product for the purposes of health, safety and environmental requirements only. It should not therefore be construed as guaranteeing any specific property of the product.