High Temperature Carbon Fiber (CF-HT, CF-HT-A) / Carbon Fiber for ULTEM™ Filament

Safety Data Sheet

Acc. to 2019 No. 758 - REACH etc. (Amendment etc.) (EU Exit) Regulations 2019 and subsequent amendments

Revision Date: 04/03/2024 Date of Issue: 16/11/2021 Version: 1.1a

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

1.1. Product Identifier

Product Form : Mixture

Product Name : High Temperature Carbon Fiber (CF-HT, CF-HT-A) / Carbon Fiber for ULTEM™ Filament

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
60 Tower Rd
Waltham, MA 02451
T: 866-496-1805 (9:00 A.M to 6:00 P.M. EST)
support@markforged.com
markforged.com

1.4. Emergency Telephone Number

Emergency Number : +1 703-741-5970 / 1-800-424-9300 (Chemtrec)

SECTION 2: HAZARDS IDENTIFICATION

2.1. Classification of the Substance or Mixture

Classification According to the GB CLP Regulation

Not classified

2.2. Label Elements

Labelling According to the GB CLP Regulation

EUH-statements : EUH210 - Safety data sheet available on request.

2.3. Other Hazards

This substance/mixture does not meet the PBT criteria of REACH regulation, annex XIII

This substance/mixture does not meet the vPvB criteria of REACH regulation, annex XIII

Other Hazards Not Contributing to the Classification : Under normal conditions of use, this product is not expected to generate dust, however, if dust is generated - do not generate dust during clean-up, use non-sparking tools, vacuum cleanup is preferred however utilize dust suppressants if necessary, do not allow dust to accumulate in the workplace, utilize proper ventilation systems with explosion relief valves.

SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS

3.1. Substances

Not applicable

3.2. Mixtures

Name	Product Identifier	%	Classification According to the GB CLP Regulation
Carbon	(CAS-No.) 7440-44-0 (EC-No.) 231-153-3;931-328-0	35 – 45	Not classified

Specific Concentration Limits:

Name	Product Identifier	Specific Concentration Limits

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).

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 : Gently wash with plenty of soap and water. In molten form: . 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 : No health effects expected. If irritation does occur, flush with lukewarm, gently flowing water for 5 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Obtain medical attention if irritation develops or persists. 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. For particulates and dust: Repeated or prolonged exposure to dust particles may result in fibrosis (Pneumoconiosis).

Symptoms/Effects After Skin Contact : Prolonged exposure may cause skin irritation. Fumes may cause irritation of the skin and eyes. Risk of thermal burns on contact with molten product.

Symptoms/Effects After Eye Contact : May cause slight irritation to eyes. Fumes from thermal decomposition may cause eye irritation. Risk of thermal burns on contact with molten product.

Symptoms/Effects After Ingestion : Ingestion may cause adverse effects.

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, fog, carbon dioxide (CO_2), alcohol-resistant foam, or dry chemical.

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. Do not use water when molten material is involved, may react violently or explosively on contact with water.

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 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.

Reactivity : Hazardous reactions will not occur under normal conditions.

Hazardous Decomposition Products in Case of Fire : Carbon oxides (CO, CO_2). Hydrocarbons. Phenol.

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 : This product contains an ingredient that is a potential combustible dust. In sufficient quantities in air with an ignition source this material may present a combustible dust hazard. Take appropriate precautions, avoid sparks and other ignition sources.

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.

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 recognise 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. Ventilate area.

6.2. Environmental Precautions

Prevent entry to sewers and public waters.

6.3. Methods and Materials 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. 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.

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 prolonged contact with eyes, skin and clothing. Avoid breathing dust.

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 : Store in accordance with applicable national storage class systemsKeep container closed when not in use. Store in a dry, cool place. Keep/Store away from direct sunlight, extremely high or low temperatures and incompatible materials.

Incompatible Materials : Strong acids, strong bases, strong oxidisers.

7.3. Specific End Use(S)

MarkForged 3D printing material

SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1. Control Parameters

Please see section 16 for the legal basis of limit value information in section 8.1, including the national legislation or provision which gives rise to a given limit.

8.2. Exposure Controls

Appropriate Engineering Controls : Suitable eye/body wash equipment should be available in the vicinity of any potential exposure. Ensure adequate ventilation, especially in confined areas. Ensure all national/local regulations are observed.

Personal Protective Equipment : Gloves. Protective clothing. Protective goggles.Personal protective equipment should be chosen in accordance with Regulation (EU) 2016/425, CEN standards, and in discussion with the supplier of the protective equipment.

Materials for Protective Clothing : Chemically resistant materials and fabrics.

Hand Protection : Wear protective gloves.

Eye Protection : Chemical safety goggles.

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. In case of inadequate ventilation, oxygen deficient atmosphere, or where exposure levels are not known wear approved respiratory protection.

Other Information : When using, do not eat, drink or smoke.

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

9.1. Information on Basic Physical and Chemical Properties

Physical State	: Solid
Appearance	: No data available
Colour	: No data available
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
Relative Density	: 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

No additional information available

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.

10.5. Incompatible Materials
Strong acids, strong bases, strong oxidisers.

10.6. Hazardous Decomposition Products
Thermal decomposition may produce: Carbon oxides (CO, CO_2). Hydrocarbons. Phenol.

SECTION 11: TOXICOLOGICAL INFORMATION

11.1. Information on Toxicological Effects

Likely Routes of Exposure : Inhalation
Eye contact
Dermal

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

Acute Toxicity (Dermal) : Not classified

Acute Toxicity (Inhalation) : Not classified

Carbon (7440-44-0)	
LD50 Oral Rat	> 10000 mg/kg

Skin Corrosion/Irritation : Not classified (Based on available data, the classification criteria are not met)

Eye Damage/Irritation : Not classified (Based on available data, the classification criteria are not met)

Respiratory or Skin Sensitization : 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)

Specific Target Organ Toxicity (Single Exposure) : Not classified (Based on available data, the classification criteria are not met)

Specific Target Organ Toxicity (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. For particulates and dust: Repeated or prolonged exposure to dust particles may result in fibrosis (Pneumoconiosis).

Symptoms/Injuries After Skin Contact : Prolonged exposure may cause skin irritation. Fumes may cause irritation of the skin and eyes. Risk of thermal burns on contact with molten product.

Symptoms/Injuries After Eye Contact : May cause slight irritation to eyes. Fumes from thermal decomposition may cause eye irritation. Risk of thermal burns on contact with molten product.

Symptoms/Injuries After Ingestion : Ingestion may cause adverse effects.

Chronic Symptoms : None known.

Potential Adverse Human Health Effects And Symptoms : Based on available data, the classification criteria are not met.

SECTION 12: ECOLOGICAL INFORMATION

12.1. Toxicity

Ecology - General : Not classified (Based on available data, the classification criteria are not met)

Hazardous To The Aquatic Environment, Short-Term (Acute) : Not classified (Based on available data, the classification criteria are not met)

Hazardous To The Aquatic Environment, Long-Term (Chronic) : Not classified (Based on available data, the classification criteria are not met)

12.2. Persistence and Degradability

High Temperature Carbon Fiber (CF-HT, CF-HT-A) / Carbon Fiber for ULTEM™ Filament	
Persistence and Degradability	Not established.

12.3. Bioaccumulative potential

High Temperature Carbon Fiber (CF-HT, CF-HT-A) / Carbon Fiber for ULTEM™ Filament	
Bioaccumulative Potential	Not established.

12.4. Mobility in Soil

No additional information available

12.5. Results Of Pbt And Vpvb Assessment

High Temperature Carbon Fiber (CF-HT, CF-HT-A) / Carbon Fiber for ULTEM™ Filament
This substance/mixture does not meet the PBT criteria of REACH regulation, annex XIII
This substance/mixture does not meet the vPvB criteria of REACH regulation, annex XIII

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, territorial, provincial, and international regulations.

Ecology - Waste Materials : Avoid release to the environment.

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

14.1. UN Number

Not regulated for transport

14.2. UN Proper Shipping Name

Not regulated for transport

14.3. Transport Hazard Class(Es)

Not regulated for transport

14.4. Packing Group

Not regulated for transport

14.5. Environmental Hazards

Not regulated for transport

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

15.1.1.1. REACH Annex XVII Information

Contains no REACH substances with Annex XVII restrictions

15.1.1.2. REACH Candidate List Information

Contains no substance on the REACH candidate list ≥ 0,1 % / SCL

15.1.1.3. POP (2019/1021) - Persistent Organic Pollutants Information

Contains no substance subject to Regulation (EU) No 2019/1021 of the European Parliament and of the Council of 20 June 2019 on persistent organic pollutants

15.1.1.4. PIC Regulation EU (649/2012) - Export and Import of Hazardous Chemicals Information

Contains no substance subject to Regulation (EU) No 649/2012 of the European Parliament and of the Council of 4 July 2012 concerning the export and import of hazardous chemicals.

15.1.1.5. REACH Annex XIV Information

Contains no REACH Annex XIV substances

15.1.1.6. Substances Depleting the Ozone layer (1005/2009) Information

No additional information available

15.1.1.7. EC Inventory Information

Carbon (7440-44-0)
Listed on the EEC inventory EINECS (European Inventory of Existing Commercial Chemical Substances)

15.1.1.8. Other Information

No additional information available

15.1.2. National Regulations

No additional information available

15.1.3. International Inventory Lists

Carbon (7440-44-0)
Listed on the United States TSCA (Toxic Substances Control Act) inventory - Status: Active
Listed on the Canadian DSL (Domestic Substances List)
Listed introduction on Australian Industrial Chemicals Introduction Scheme (AICIS Inventory)
Listed on PICCS (Philippines Inventory of Chemicals and Chemical Substances)
Listed on the Japanese ENCS (Existing & New Chemical Substances) inventory
Listed on KECL/KECI (Korean Existing Chemicals Inventory)
Listed on IECSC (Inventory of Existing Chemical Substances Produced or Imported in China)
Listed on NZIoC (New Zealand Inventory of Chemicals)
Listed on INSQ (Mexican National Inventory of Chemical Substances)
Listed on the TCSI (Taiwan Chemical Substance Inventory)
Listed on the NCI (Vietnam - National Chemicals Inventory)

15.2. Chemical Safety Assessment

No chemical safety assessment has been carried out

SECTION 16: OTHER INFORMATION

Date of Preparation or Latest Revision : 04/03/2024

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 : Acc. to 2019 No. 758 - REACH etc. (Amendment etc.) (EU Exit) Regulations 2019 and subsequent amendments

Full Text of H- and EUH-statements:

EUH210	Safety data sheet available on request.

Indication of Changes

No additional information available

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
BEI - Biological Exposure Indices (BEI)
BOD – Biochemical Oxygen Demand
CAS No. - Chemical Abstracts Service Number
COD – Chemical Oxygen Demand
EC – European Community
EC50 - Median Effective Concentration
EEC – European Economic Community
EINECS – European Inventory of Existing Commercial Chemical Substances
EmS-No. (Fire) - IMDG Emergency Schedule Fire
EmS-No. (Spillage) - IMDG Emergency Schedule Spillage
EU – European Union
ErC50 - EC50 in Terms of Reduction Growth Rate
GB CLP - Great Britain Classification, Labelling and Packaging Regulation
LOEC - Lowest-Observed-Effect Concentration
Log Koc - Soil Organic Carbon-water Partitioning Coefficient
Log Kow - Octanol/water Partition Coefficient
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
MARPOL - International Convention for the Prevention of Pollution
NOAEL - No-Observed Adverse Effect Level
NOEC - No-Observed Effect Concentration
NTP – National Toxicology Program
OEL - Occupational Exposure Limits
PBT - Persistent, Bioaccumulative and Toxic
PEL - Permissible Exposure Limit
pH – Potential Hydrogen
REACH – Registration, Evaluation, Authorisation, and Restriction of Chemicals
RID – Regulations Concerning the International Carriage of Dangerous Goods by Rail
SADT - Self Accelerating Decomposition Temperature
SDS - Safety Data Sheet
STEL - Short Term Exposure Limit
STOT - Specific Target Organ Toxicity

GHS – Globally Harmonized System of Classification and Labeling of Chemicals
IARC - International Agency for Research on Cancer
IATA - International Air Transport Association
IBC Code - International Bulk Chemical Code
IMDG - International Maritime Dangerous Goods
IOELV – Indicative Occupational Exposure Limit Value
LC50 - Median Lethal Concentration
LD50 - Median Lethal Dose
LOAEL - Lowest Observed Adverse Effect Level
ThOD – Theoretical Oxygen Demand
TLM - Median Tolerance Limit
TLV - Threshold Limit Value
TSCA - Toxic Substances Control Act
TWA - Time Weighted Average
VOC – Volatile Organic Compounds
vPvB - Very Persistent and Very Bioaccumulative
WEL – Workplace Exposure Limit

Limit Value Legal Basis*

*Includes the below and any related regulations/provisions, and subsequent amendements
United Kingdom - EH40 - EH40/2005 Containing the workplace exposure limits (WELs) for use with the Control of Substances Hazardous to Health Regulations (COSHH) (as amended)

UK 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.