Nylon White FS

Safety Data Sheet

Listed 2024/10/11

According To Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules And Regulations And According To The Hazardous Products Regulation (February 11, 2015).

Revision date: 11/04/2024 Date of Issue: 04/08/2019 Version: 2.0

SECTION 1: IDENTIFICATION

1.1. Product Identifier

Product Form: Mixture

Product Name: Nylon White FS

1.2. Intended Use of the Product

MarkForged 3D printing material

1.3. Name, Address, and Telephone of the Responsible Party

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
www.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

GHS-US/CA Classification

Not classified

2.2. Label Elements

GHS-US/CA Labeling

No labeling applicable

2.3. Other Hazards

Exposure may aggravate those with pre-existing eye, skin, or respiratory conditions. Risk of thermal burns on contact with molten or hot product. Irritating fumes may be given off during processing or normal conditions of use, ensure adequate ventilation. Fibers are not expected to be released under normal conditions of use. If the product is altered outside of its intended use, and dust is formed, proper precautions should be taken to ensure material is not respired.

2.4. Unknown Acute Toxicity (GHS-US/CA)

No data available

SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS

3.1. Substance

Not applicable

3.2. Mixture

Name	Product Identifier	% *	GHS Ingredient Classification
Titanium dioxide	(CAS-No.) 13463-67-7	0.3 - 1.2	Not classified
.epsilon.-Caprolactam	(CAS-No.) 105-60-2	< 0.3	Acute Tox. 4 (Oral), H302 Acute Tox. 4 (Dermal), H312 Acute Tox. 4 (Inhalation), H332 Skin Irrit. 2, H315 Eye Irrit. 2A, H319 STOT SE 3, H335

Full text of H-phrases: see section 16

*Percentages are listed in weight by weight percentage (w/w%) for liquid and solid ingredients. Gas ingredients are listed in volume by volume percentage (v/v%).

SECTION 4: FIRST AID MEASURES

4.1. Description of 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).

Inhalation: When symptoms occur: go into open air and ventilate suspected area. Obtain medical attention if breathing difficulty persists.

Skin Contact: Gently wash with plenty of soap and water. Cool skin rapidly with cold water after contact with molten product. Removal of solidified molten material from skin requires medical assistance.

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.

Ingestion: Rinse mouth. Do NOT induce vomiting. Obtain medical attention.

4.2. Most Important Symptoms and Effects Both Acute and Delayed

General: 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.

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 (Pneumoconiosis).

Skin Contact: Prolonged exposure may cause skin irritation. Risk of thermal burns on contact with molten product.

Eye Contact: May cause slight irritation to eyes. Risk of thermal burns on contact with molten product.

Ingestion: Ingestion may cause adverse effects. Gastrointestinal irritation.

Chronic Symptoms: None known. There are no known health effects from the long term use or contact with non-respirable continuous filament fibers, which the type of fiber that is used. Non-respirable fibers cannot reach the deep lung because they have a diameter of greater than 3.5 micrometers. Fibers of this diameter cannot penetrate the narrow, bending passages of the human respiratory tract to reach the lower regions of the lung, and thus have no possibility of causing serious pulmonary damage. They deposit on the surfaces of the upper respiratory tract, nose, or pharynx. These fibers are then cleared through normal physiological mechanisms. If dust or fumes are generated, repeated exposure through inhalation may cause cancer or respiratory diseases.

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: FIRE-FIGHTING 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.

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.

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 vapors from decomposition.

Protection During Firefighting: Do not enter fire area without proper protective equipment, including respiratory protection.

Hazardous Combustion Products: Carbon oxides (CO, CO_2). Hydrocarbons. Ammonia. Amines. Ketones. Hydrogen cyanide. Nitrogen oxides. Nitriles.

Other Information: Do not allow run-off from fire fighting to enter drains or water courses. Do not add water to molten material as this may cause spattering.

5.4. Reference to Other Sections

Refer to Section 9 for flammability properties.

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. Avoid generating 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 Personnel

Protective Equipment: Equip cleanup crew with proper protection.

Emergency Procedures: Ventilate area. 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.

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. 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: When processed, the product dust is combustible. Use care during processing to minimize generation of dust. Risk of thermal burns on contact with molten product. Contains a hygroscopic material which can absorb moisture from the air. Avoid temperatures > 315 °C, product decomposes and creates irritating fumes.

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. Moisture.

7.3. Specific End Use(s)

MarkForged 3D printing material

SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1. Control Parameters

For substances listed in section 3 that are not listed here, there are no established Exposure limits from the manufacturer, supplier, importer, or the appropriate advisory agency including: ACGIH (TLV), AIHA (WEEL), NIOSH (REL), OSHA (PEL), or Canadian provincial governments.

.epsilon.-Caprolactam (105-60-2)		
USA ACGIH	ACGIH TWA (mg/m³)	5 mg/m³ (inhalable fraction and vapor)
USA ACGIH	ACGIH chemical category	Not Suspected as a Human Carcinogen
USA NIOSH	NIOSH REL (TWA) (mg/m³)	1 mg/m³ (dust) 1 mg/m³ (vapor)
USA NIOSH	NIOSH REL (TWA) (ppm)	0.22 ppm (vapor)
USA NIOSH	NIOSH REL (STEL) (mg/m³)	3 mg/m³ (dust) 3 mg/m³ (vapor)
USA NIOSH	NIOSH REL (STEL) (ppm)	0.66 ppm (vapor)
Alberta	OEL TWA (mg/m³)	5 mg/m³
British Columbia	OEL STEL (mg/m³)	3 mg/m³ (dust)
British Columbia	OEL TWA (mg/m³)	1 mg/m³ (dust)
Manitoba	OEL TWA (mg/m³)	5 mg/m³ (inhalable fraction and vapor)
New Brunswick	OEL STEL (mg/m³)	46 mg/m³ (vapor) 3 mg/m³ (dust)
New Brunswick	OEL STEL (ppm)	10 ppm (vapor)
New Brunswick	OEL TWA (mg/m³)	1 mg/m³ (dust) 23 mg/m³ (vapor)
New Brunswick	OEL TWA (ppm)	5 ppm (vapor)
Newfoundland & Labrador	OEL TWA (mg/m³)	5 mg/m³ (inhalable fraction and vapor)
Nova Scotia	OEL TWA (mg/m³)	5 mg/m³ (inhalable fraction and vapor)
Nunavut	OEL STEL (mg/m³)	10 mg/m³ (inhalable fraction and vapor)
Nunavut	OEL TWA (mg/m³)	5 mg/m³ (inhalable fraction and vapor)
Northwest Territories	OEL STEL (mg/m³)	10 mg/m³ (inhalable fraction and vapor)
Northwest Territories	OEL TWA (mg/m³)	5 mg/m³ (inhalable fraction and vapor)
Ontario	OEL TWA (mg/m³)	5 mg/m³ (inhalable fraction and vapor)
Prince Edward Island	OEL TWA (mg/m³)	5 mg/m³ (inhalable fraction and vapor)
Québec	VECD (mg/m³)	46 mg/m³ (vapor) 3 mg/m³ (dust)
Québec	VECD (ppm)	10 ppm (vapor)
Québec	VEMP (mg/m³)	23 mg/m³ (vapor) 1 mg/m³ (dust)
Québec	VEMP (ppm)	5 ppm (vapor)
Saskatchewan	OEL STEL (mg/m³)	10 mg/m³ (inhalable fraction and vapor)
Saskatchewan	OEL TWA (mg/m³)	5 mg/m³ (inhalable fraction and vapor)
Yukon	OEL STEL (mg/m³)	3 mg/m³ (dust) 40 mg/m³ (vapor)
Yukon	OEL STEL (ppm)	10 ppm (vapor)
Yukon	OEL TWA (mg/m³)	1 mg/m³ (dust) 20 mg/m³ (vapor)
Yukon	OEL TWA (ppm)	5 ppm (vapor)

Titanium dioxide (13463-67-7)		
USA ACGIH	ACGIH TWA (mg/m³)	10 mg/m³
USA ACGIH	ACGIH chemical category	Not Classifiable as a Human Carcinogen
USA OSHA	OSHA PEL (TWA) (mg/m³)	15 mg/m³ (total dust)
USA NIOSH	NIOSH REL (TWA) (mg/m³)	2.4 mg/m³ (CIB 63-fine) 0.3 mg/m³ (CIB 63-ultrafine, including engineered nanoscale)

USA IDLH	US IDLH (mg/m³)	5000 mg/m³
Alberta	OEL TWA (mg/m³)	10 mg/m³
British Columbia	OEL TWA (mg/m³)	10 mg/m³ (total dust) 3 mg/m³ (respirable fraction)
Manitoba	OEL TWA (mg/m³)	10 mg/m³
New Brunswick	OEL TWA (mg/m³)	10 mg/m³
Newfoundland & Labrador	OEL TWA (mg/m³)	10 mg/m³
Nova Scotia	OEL TWA (mg/m³)	10 mg/m³
Nunavut	OEL STEL (mg/m³)	20 mg/m³
Nunavut	OEL TWA (mg/m³)	10 mg/m³
Northwest Territories	OEL STEL (mg/m³)	20 mg/m³
Northwest Territories	OEL TWA (mg/m³)	10 mg/m³
Ontario	OEL TWA (mg/m³)	10 mg/m³
Prince Edward Island	OEL TWA (mg/m³)	10 mg/m³
Québec	VEMP (mg/m³)	10 mg/m³ (containing no Asbestos and <1% Crystalline silica-total dust)
Saskatchewan	OEL STEL (mg/m³)	20 mg/m³
Saskatchewan	OEL TWA (mg/m³)	10 mg/m³
Yukon	OEL STEL (mg/m³)	20 mg/m³
Yukon	OEL TWA (mg/m³)	30 mppcf 10 mg/m³

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. Avoid creating or spreading dust. Maintain sufficient mechanical or natural ventilation to assure 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.

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

Thermal Hazard Protection: When working with hot material, use suitable thermally protective clothing.

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	:	Not available
Odor	:	Not available
Odor Threshold	:	Not available
pH	:	Not available
Evaporation Rate	:	Not available
Melting Point	:	Not available
Freezing Point	:	Not available
Boiling Point	:	Not available
Flash Point	:	> 400 °F (204.44 °C)
Auto-ignition Temperature	:	Not available
Decomposition Temperature	:	> 315 °C (599 °F)
Flammability (solid, gas)	:	Not available
Lower Flammable Limit	:	Not available
Upper Flammable Limit	:	Not available
Vapor Pressure	:	Not available
Relative Vapor Density at 20°C	:	Not available
Relative Density	:	> 1 (Water=1)
Solubility	:	Not available
Partition Coefficient: N-Octanol/Water	:	Not available
Viscosity	:	Not 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. Avoid creating or spreading dust.

10.5. Incompatible Materials: Strong acids, strong bases, strong oxidizers. Moisture.

10.6. Hazardous Decomposition Products: Thermal decomposition generates: Carbon oxides (CO, CO_2). Nitrogen oxides. Hydrocarbons. Ammonia. Amines. Ketones. Hydrogen cyanide.

SECTION 11: TOXICOLOGICAL INFORMATION

11.1. Information on Toxicological Effects - Product

Acute Toxicity (Oral): Not classified

Acute Toxicity (Dermal): Not classified

Acute Toxicity (Inhalation): Not classified

LD50 and LC50 Data: Not available

Skin Corrosion/Irritation: Not classified

Eye Damage/Irritation: Not classified

Respiratory or Skin Sensitization: Not classified

Germ Cell Mutagenicity: Not classified

Carcinogenicity: Not classified

Specific Target Organ Toxicity (Repeated Exposure): Not classified

Reproductive Toxicity: Not classified

Specific Target Organ Toxicity (Single Exposure): Not classified

Aspiration Hazard: Not classified

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 (Pneumoconiosis).

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 slight irritation to eyes. Risk of thermal burns on contact with molten product.

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

Chronic Symptoms: None known. There are no known health effects from the long term use or contact with non-respirable continuous filament fibers, which the type of fiber that is used. Non-respirable fibers cannot reach the deep lung because they have a diameter of greater than 3.5 micrometers. Fibers of this diameter cannot penetrate the narrow, bending passages of the human respiratory tract to reach the lower regions of the lung, and thus have no possibility of causing serious pulmonary damage. They deposit on the surfaces of the upper respiratory tract, nose, or pharynx. These fibers are then cleared through normal physiological mechanisms. If dust or fumes are generated, repeated exposure through inhalation may cause cancer or respiratory diseases.

11.2. Information on Toxicological Effects - Ingredient(s)

LD50 and LC50 Data:

.epsilon.-Caprolactam (105-60-2)	
LD50 Oral Rat	1210 mg/kg
LD50 Dermal Rabbit	1438 mg/kg
LC50 Inhalation Rat	8.16 mg/l/4h
ATE US/CA (gas)	4,500.00 ppmV/4h
ATE US/CA (dust, mist)	1.50 mg/l/4h

Titanium dioxide (13463-67-7)	
LD50 Oral Rat	> 10000 mg/kg

.epsilon.-Caprolactam (105-60-2)	
IARC Group	4

Titanium dioxide (13463-67-7)	
IARC Group	2B
OSHA Hazard Communication Carcinogen List	In OSHA Hazard Communication Carcinogen list.

SECTION 12: ECOLOGICAL INFORMATION

12.1. Toxicity

Ecology - General: Not classified.

.epsilon.-Caprolactam (105-60-2)	
LC50 Fish 1	930 mg/l (Exposure time: 96 h - Species: Lepomis macrochirus [static])
EC50 Daphnia 1	> 500 mg/l (Exposure time: 48 h - Species: Daphnia magna Straus)
LC50 Fish 2	1400 mg/l (Exposure time: 96 h - Species: Pimephales promelas [static])
EC50 Daphnia 2	828 - 2920 mg/l (Exposure time: 48 h - Species: Daphnia magna)

12.2. Persistence and Degradability

Nylon White FS	
Persistence and Degradability	Not established.

12.3. Bioaccumulative Potential

Nylon White FS	
Bioaccumulative Potential	Not established.

.epsilon.-Caprolactam (105-60-2)	
BCF Fish 1	< 1

Log Pow	-0.02

12.4. Mobility in Soil Not available

12.5. Other Adverse Effects

Other Information: Avoid release to the environment.

SECTION 13: DISPOSAL CONSIDERATIONS

13.1. Waste treatment methods

Waste 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 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.

14.1. In Accordance with DOT Not regulated for transport

14.2. In Accordance with IMDG Not regulated for transport

14.3. In Accordance with IATA Not regulated for transport

14.4. In Accordance with TDG Not regulated for transport

SECTION 15: REGULATORY INFORMATION

15.1. US Federal Regulations

.epsilon.-Caprolactam (105-60-2)
Listed on the United States TSCA (Toxic Substances Control Act) inventory

Titanium dioxide (13463-67-7)
Listed on the United States TSCA (Toxic Substances Control Act) inventory

15.2. US State Regulations

.epsilon.-Caprolactam (105-60-2)
U.S. - Massachusetts - Right To Know List U.S. - New Jersey - Right to Know Hazardous Substance List U.S. - Pennsylvania - RTK (Right to Know) List

Titanium dioxide (13463-67-7)
U.S. - Massachusetts - Right To Know List U.S. - New Jersey - Right to Know Hazardous Substance List U.S. - Pennsylvania - RTK (Right to Know) List

15.3. Canadian Regulations

.epsilon.-Caprolactam (105-60-2)
Listed on the Canadian DSL (Domestic Substances List)

Titanium dioxide (13463-67-7)
Listed on the Canadian DSL (Domestic Substances List)

SECTION 16: OTHER INFORMATION, INCLUDING DATE OF PREPARATION OR LAST REVISION

Date of Preparation or Latest Revision : 04/25/2019

Other Information : This document has been prepared in accordance with the SDS requirements of the OSHA Hazard Communication Standard 29 CFR 1910.1200 and Canada's Hazardous Products Regulations (HPR) SOR/2015-17.

GHS Full Text Phrases:

Acute Tox. 4 (Dermal)	Acute toxicity (dermal) Category 4

Acute Tox. 4 (Inhalation)	Acute toxicity (inhalation) Category 4
Acute Tox. 4 (Oral)	Acute toxicity (oral) Category 4
Aquatic Acute 3	Hazardous to the aquatic environment - Acute Hazard Category 3
Aquatic Chronic 3	Hazardous to the aquatic environment - Chronic Hazard Category 3
Eye Irrit. 2	Serious eye damage/eye irritation Category 2
Eye Irrit. 2A	Serious eye damage/eye irritation Category 2A
Skin Irrit. 2	Skin corrosion/irritation Category 2
STOT SE 3	Specific target organ toxicity (single exposure) Category 3
H302	Harmful if swallowed
H312	Harmful in contact with skin
H315	Causes skin irritation
H319	Causes serious eye irritation
H332	Harmful if inhaled
H335	May cause respiratory irritation
H402	Harmful to aquatic life
H412	Harmful to aquatic life with long lasting effects

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.

NA GHS SDS 2015 (Can, US)