SECTION 1 - IDENTIFICATION

COMPANY ADDRESS:
The Virtual Foundry, LLC
211 S Water St
Stoughton WI 53589
USA

PRODUCT NAME: **High Carbon Iron Filamet™**
PRODUCT USE: Manufacture of metal parts by extrusion, injection-molding, or 3D printing

SECTION 2 - HAZARDS IDENTIFICATION SUMMARY

(As defined by OSHA Hazard Communication Standard, 29 CFR 1910.1200)

HEALTH HAZARDS: Material not intended for use at temperatures exceeding 250°C. Furthermore, there is a danger of burns while handling the heated or molten product.

PHYSICAL HAZARDS: The components of this product are embedded in a polymer matrix and are therefore considered to present a negligible exposure risk under normal conditions of processing and handling, unless they are liberated during processing (fumes from melting, dusts).

ENVIRONMENTAL HAZARDS: No toxicological studies have been performed so far on this compound. This material is NOT intended to be used for medical applications, and NOT intended to be used for applications in contact with food and/or drinking water.

SECTION 3 - COMPOSITION, INFORMATION OF INGREDIENTS

COMPONENT	PERCENTAGE	CAS NUMBER
Iron	>80%	7439-89-6
2-Propenenitrile, polymer with 1,3-butadiene and ethenylbenzene	trace	9003-56-9
Binding Additive	trace	Proprietary
Polylactic Acid	<20%	9051-89-2

SECTION 4 - FIRST AID MEASURES

IF SWALLOWED: Call a poison control center or doctor immediately for treatment advice. Have person sip a glass of water if able to swallow. Do not induce vomiting unless told to do so by the poison control center or consult a doctor if necessary.

IF ON SKIN OR CLOTHING: Wash hands and contact skin with soap and water. If irritation persists, consult a physician. Cool skin rapidly with cold water after contact with hot polymer. DO NOT attempt to remove hot polymer from skin or contaminated clothing as skin may be easily damaged. For molten polymer burns, get medical attention.

IF IN EYES: May cause eye irritation. Rinse immediately with plenty of water, also under eyelids, for at least 15 minutes. If eye irritation persists, consult a physician.

IF INHALED: May cause respiratory tract irritation. Dust may be generated while sanding and cause irritation. If processing causes discomfort, move victim to a well-ventilated area. Move person to fresh air.

If symptoms persist, call a physician. If person is not breathing, call 911 or an ambulance, then provide medical aid. Call a poison control center or doctor for further treatment advice.

NOTE TO PHYSICIAN: No specific antidote, treat symptomatically.

SECTION 5 - FIRE FIGHTING MEASURES

FLAMMABILITY

AUTOIGNITION TEMPERATURE: 388°C

SUITABLE EXTINGUISHING MEDIA: Use foam, Carbon Dioxide (CO2), dry chemical, or alcohol resistant foams (preferred if available). General-purpose synthetic foams (including ADDD) or protein foams may function, but much less effectively.

UNSUITABLE EXTINGUISHING MEDIA: Do not use a solid water stream as it may scatter and spread fire.

SPECIFIC HAZARDS ARISING FROM THE CHEMICAL: Thermal decomposition can lead to release of irritating gases and vapors. Do not breathe fumes in case of fire.

HAZARDOUS COMBUSTION PRODUCTS: Carbon oxides, Nitrogen oxides (NOx), Hydrocarbons

EXPLOSION DATA:

SENSITIVITY TO MECHANICAL IMPACT: Not sensitive

SENSITIVITY TO STATIC DISCHARGE: Fine dust dispersed in air, in sufficient concentrations, and in the presence of an ignition source is a potential dust explosion hazard.

FIRE FIGHTING INSTRUCTIONS AND FIRE FIGHTING EQUIPMENT: As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and in full protective gear. Cool containers / tanks with water spray. Water mist may be used to cool closed containers.

SECTION 6 - ACCIDENTAL RELEASE MEASURES

PERSONAL PRECAUTIONS: Standard personal protection equipment (PPE). Avoid contact with eyes. Avoid dust formation. Remove all sources of ignition. Sweep up to prevent slipping hazard. Ensure adequate ventilation. Keep unnecessary personnel away.

ENVIRONMENTAL PRECAUTIONS: Avoid dispersal of spilled material, runoff and contact with soil, waterways, drains, and sewers. Should not be released into the environment, may be dangerous to birds and small animals.

METHODS FOR CLEANING UP: Vacuum or carefully scoop up spilled material and place in appropriate container for disposal. Avoid creating dusty conditions and prevent wind dispersal.

SECTION 7 - HANDLING AND STORAGE

HANDLING: Use personal protective equipment, use caution when near molten resin. Avoid contact with eyes. Low hazard for usual industrial or commercial handling. Workers should be protected from the possibility of contact with molten material during fabrication. Avoid dust formation. If small particles are generated during further processing, handling or by other means, combustible dust concentrations in air

may form.

STORAGE: Store at temperatures not exceeding 50°C. Keep tightly closed in cool, dry and well-ventilated environment. Keep away from heat, sparks, and flames. No special restrictions on storage with other products.

SECTION 8 - EXPOSURE CONTROLS, PERSONAL PROTECTION

EXPOSURE LIMITS:

COMPONENT	OSHA PEL	ACIGH TLV	NIOSH IDLH
Iron	TWA: 10mg/m^3	-	-
2-Propenenitrile, polymer with 1,3-butadiene and ethenylbenzene 9003-56-9	-	-	-

ENGINEERING CONTROLS:
Engineering Measures: Apply technical measures to comply with the occupational exposure limits. Where reasonably practicable this should be achieved by the use of local exhaust ventilation and good general extraction. Provide appropriate exhaust ventilation at places where dust is formed. Ensure that eyewash stations and safety showers are close to the workstation location.

Exposure Monitoring: Personal, workplace atmosphere or biological monitoring may be required to determine the effectiveness of the ventilation or other control measures and/or the necessity to use respiratory protective equipment. If occupational exposure is suspected to be reached or dust levels are high exposure measurement is recommended.

Exposure Limits: None established. This material can generate Particulates Not Otherwise Classifiable (PNOC). The Occupational Safety and Health Administration (OSHA) PEL/TWA for PNOC is 15mg/m^3 for the respirable fraction. The American Conference of Governmental Industrial Hygienists (ACGIH) TLV/TWA for PNOC is 10 mg/m^3 for inhalable particulates and 3 mg/m^3 for respirable particulates.

Hygiene Measures: Provide regular cleaning of equipment, work area and clothing. Handle in accordance with good industrial hygiene and safety practices. Do not eat, drink or smoke when using this product. Wash hands before breaks and immediately after handling product. Avoid contact with eyes. Do not breathe dust. Use personal protective equipment as required. Use process enclosures, local exhaust ventilation or other engineering controls to keep airborne levels below recommended exposure limits. If use operations generate dust, fumes or mist, use ventilation to keep exposure to airborne contaminants below the exposure level.

PERSONAL PROTECTIVE EQUIPMENT:
Eye protection: Safety glasses with side-shields. Goggles. Avoid contact with eyes.

Skin protection: Long sleeved/impervious clothing. Protect contact with skin when processing; while material is hot, wear insulated safety gloves; wash hands after handling.

Respiratory protection: Respirator must be worn if exposed to dust. Wear respirator with dust filter. Respiratory protection is needed if any of the exposure limits in Section 3 are exceeded. Consult an industrial hygiene professional prior to respirator selection and use. Use a positive-pressure air supplied

respirator if there is any potential for an uncontrolled release, exposure levels are not known, or any other circumstances where air-purifying respirators may not provide adequate protection. WARNING: Air purifying respirators do not protect workers in oxygen-deficient atmospheres.

Hand protection: Preventative skin protection.

Hygiene measures: Avoid contact with eyes.

Special hazard: Workers should be protected from the possibility of contact with molten material during fabrication.

SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES

Physical State:	Solid
Appearance:	Filament, Pellets
Color:	Black, grey
Odor:	Slight
Odor Threshold:	No information available.
Melting/Freezing Point:	1535ºC / 150-180ºC, Tg (Glass transition temperature): 60-65ºC
Boiling Point:	No information available.
Evaporation Rate:	Not applicable
Flammability:	No information available.
Flammability Limits:	No information available.
Vapor Pressure:	No information available.
Vapor Density:	No information available.
Specific gravity:	3.5-5g/cm^3
Relative Density:	The only known value is 7.8 (Iron)
Water Solubility:	Insoluble in cold and hot water
Chemical Stability:	The product is stable.
Conditions to avoid:	Reactive with oxidizing materials and reducing materials.
Solubility in other solvents:	No information available.
Partition Coefficient:	No information available.
Auto-Ignition Temperature:	388 ºC
Hazardous Decomposition Products:	Under normal conditions of storage and use, hazardous reactions will not occur.
Possibility of Hazardous Reactions:	Under normal conditions of storage and use, hazardous reactions will not occur.
Hazardous Polymerization:	Under normal conditions of storage and use, hazardous reactions will not occur.
Viscosity:	No information available.
Explosive Properties:	Fine dust dispersed in air may ignite.
Oxidizing Properties:	Not applicable
Other Information:	
Softening Point:	80-100ºC / 176-212ºF
Molecular weight:	No information available.
VOC Content (%)	negligible
Bulk Density:	No information available.

SECTION 10 - STABILITY AND REACTIVITY

PRODUCT REACTIVITY: None expected under conditions of normal use.

CHEMICAL STABILITY: Stable under recommended storage conditions.

HAZARDOUS POLYMERIZATION: Product will not undergo hazardous polymerization.

CONDITIONS TO AVOID: Avoid temperatures above 80°C. Avoid keeping material molten for excessive periods of time at elevated temperatures. Prolonged exposure will cause polymer degradation. Open flame. To avoid thermal decomposition, do not overheat. Dust formation.

MATERIALS TO AVOID: Oxidizing agents/materials, Strong bases, Reducing agents materials.

HAZARDOUS DECOMPOSITION PRODUCTS: Burning produces noxious and toxic fumes, Carbon monoxide (CO), Carbon Dioxide (CO^2), Nitrogen Oxides (NO_x). Hydrocarbons.

POSSIBILITY OF HAZARDOUS REACTIONS: None expected under conditions of normal use.

SECTION 11 - TOXICOLOGICAL INFORMATION

Principal routes of exposure: Eye contact, Skin contact, Inhalation, Ingestion.

PRODUCT INFORMATION:
Acute toxicity: Product does not present an acute toxicity hazard based on known information.

Local effects: Product dust may be irritating to eyes, skin and respiratory system. Particles, like other inert materials, are mechanically irritating to eyes. Ingestion may cause gastrointestinal irritation, nausea, vomiting, and diarrhea.

Specific effects: May cause skin irritation and/or dermatitis. Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhea. Inhalation of dust may cause shortness of breath, tightness of chest, a sore throat and cough. Burning produces irritant fumes.

Reproductive toxicity: No data is available on the product itself.

Carcinogenic effects: This product contains one or more substances which are classified by IARC as carcinogenic to humans (Group I), probably carcinogenic to humans (Group 2A) or possibly carcinogenic to humans (Group 2B).

COMPONENT	ACGIH	IARC	NTP	OSHA
2-Propenenitrile, polymer with 1,3-butadiene and ethenylbenzene 9003-56-9	-	Group 3	-	--

Target organ effects: Eyes, Respiratory system.

Ingestion: May cause gastrointestinal discomfort if consumed in large amounts. Not an expected route of exposure.

Inhalation: Inhalation of dust in high concentration may cause irritation of respiratory system.

Eye Contact: Dust contact with the eyes can lead to mechanical irritation.

COMPONENT	LD50 ORAL	LD50 DERMAL	INHALATION LC50
2-Propenenitrile, polymer with 1,3-butadiene and ethenylbenzene 9003-56-9	-	-	-

Symptoms related to the physical, chemical, and toxicological characteristics:
Symptoms: Redness. Coughing and/or wheezing.

Delayed and immediate effects and also chronic effects from short and long term exposure:
Irritation: Product dust may be irritating to eyes, skin, and respiratory system.

Corrosivity: Not applicable.

SECTION 12 - ECOLOGICAL INFORMATION

Ecotoxicity: EC50/72h/algae > 1100 mg/L

Bioaccumulation: Not expected to bioconcentrate or bioaccumulate.

Mobility: Is not likely mobile in the environment.

Other adverse effects: This substance is not considered to be persistent, bioaccumulating nor toxic (PBT)

Ozone: Not applicable.

SECTION 13 - DISPOSAL CONSIDERATIONS

Waste treatment

WASTE DISPOSAL METHODS: In accordance with local and national regulations. Do not contaminate ponds, waterways or ditches with chemical or used container. This product is not classified as hazardous waste as defined under US EPA 40 CFR part 261. The generation of waste should be avoided or minimized whenever possible. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Empty containers or liners may retain some product residues. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor.

SECTION 14 - TRANSPORT INFORMATION

DOT: Not regulated.
TDG: Not regulated.
MEX: Not regulated.
ICAO: Not regulated.
IATA: Not regulated.
IMDG: Not regulated.

SECTION 15 - REGULATORY INFORMATION

INTERNATIONAL INVENTORIES:

TSCA: Complies
DSL/NDSL: Complies
EINECS/ELINCS: Exempt
ENCS: Complies
IECSC: Complies
KECL: Complies
PICCS: Complies
AICS: Complies

US FEDERAL REGULATIONS:

CLEAN WATER ACT: This product contains the following substances which are regulated pollutants pursuant to the Clean Water Act (40 CFR 122.21 and 40 CFR 122.42):

COMPONENT	CWA – Reportable Quantities	CWA – Toxic Pollutants	CWA – Priority Pollutants	CWA – Hazardous Substances
2-Propenenitrile, polymer with 1,3-butadiene and ethenylbenzene 9003-56-9	-	-	-	-
Iron	-	-	-	X

CERCLA: This material, as supplied, contains one or more substances regulated as a hazardous substance under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302):

COMPONENT	Hazardous Substances RQs	Extremely Hazardous Substances RQs	RQ
2-Propenenitrile, polymer with 1,3-butadiene and ethenylbenzene 9003-56-9	-	-	-

U.S STATE REGULATIONS:

CALIFORNIA PROPOSITION 65: This product contains the following Proposition 65 chemicals:

COMPONENT	CALIFORNIA Prop. 65
1,3-butadiene	Carcinogen Developmental Female Reproductive

WHMIS (Canada): Not controlled under WHMIS (Canada)

INTERNATIONAL REGULATIONS:

International Lists:

Australia inventory (AICS): All components are listed or exempted.
China inventory (IECSC): All components are listed or exempted.
Japan inventory: Not determined
Korea inventory: All components are listed or exempted.
New Zealand inventory of Chemicals (NZIoc): All components are listed or exempted.
Philippines inventory (PICCS): All components are listed or exempted. Contact The Virtual Foundry for additional information.

SECTION 16 - OTHER INFORMATION, INCLUDING DATE OF PREPARATION OF THE LAST REVISION

LABEL REQUIREMENTS: Not expected to produce significant adverse health effects when the recommended instructions for use are followed.

NFPA HAZARD RATINGS	HEALTH	0
	FLAMMABILITY	1
	PHYSICAL HAZARD	0
	INSTABILITY	-
	4=Severe 3=Serious 2=Moderate 1=Slight 0=Minimal	

HMIS HAZARD RATINGS	HEALTH	0
	FLAMMABILITY	1
	PHYSICAL HAZARD	1
	PERSONAL PROTECTION	X
	4=Severe 3=Serious 2=Moderate 1=Slight 0=Minimal	

DISCLAIMER: The information provided in this SDS is based on available data from reliable sources and is correct to the best of The Virtual Foundry, LLC's knowledge. The Virtual Foundry, LLC makes no warranty, express or implied, regarding the accuracy of the data or the results obtained from the use of this product. Nothing herein may be construed as recommending any practice or any product in violation of any law or regulations. The user is solely responsible for determining the suitability of any material or product for a specific purpose and for adopting any appropriate safety precautions. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.

REVISED DATE: July 2018
REFERENCE: Revised for GHS compliance