

SAFETY DATA SHEET

LaserForm Ti Gr5 (A), LaserForm Ti Gr23 (A)

1. Product and company identification

Product name : LaserForm Ti Gr5 (A), LaserForm Ti Gr23 (A)

Supplier's details : 3D Systems, Inc.
333 Three D Systems Circle
Rock Hill, South Carolina, USA

Phone: +1 803 326 3900 or
Toll-free Phone: +1 800 793 3669

3D Systems Japan K.K.
Ebisu Garden Place Tower 27F
4-20-3, Ebisu, Shibuya-ku,
Tokyo 50-6027, Japan

Phone No. +81-3-5798-2500

e-mail address of person responsible for this SDS : moreinfo@3dsystems.com

Emergency telephone number (with hours of operation) : +81 345 209 637 (Chemtrec)

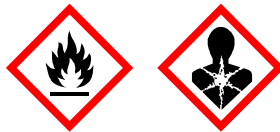
Product use : For use with 3D Systems' Direct Metal Printing equipment.

2. Hazards identification

GHS Classification : FLAMMABLE SOLIDS - Category 1
SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE) - Category 2
SPECIFIC TARGET ORGAN TOXICITY (REPEATED EXPOSURE) - Category 2

GHS label elements

Hazard pictograms :



Signal word : Danger

Hazard statements : Flammable solid.
May cause damage to organs. (respiratory system)
May cause damage to organs through prolonged or repeated exposure. (respiratory system)

Precautionary statements

General : Not applicable.

Prevention : P210 - Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.
P241 - Use explosion-proof electrical, ventilating, lighting and all material-handling equipment.
P260 - Do not breathe dust or mist.
P270 - Do not eat, drink or smoke when using this product.
P280 - Wear protective gloves. Wear protective clothing. Wear eye or face protection.

Response : P308 + P311 - IF exposed or concerned: Call a POISON CENTER or doctor.
P370 + P378 - In case of fire: Use special metal fire powder to extinguish.

2. Hazards identification

- Storage** : Not applicable.
- Disposal** : P501 - Dispose of contents and container in accordance with all local, regional, national and international regulations.
- Supplemental label elements** : None known.

Other hazards which do not result in classification : May form explosible dust-air mixture if dispersed.
Take action to prevent static discharges.

3. Composition/information on ingredients

Substance/mixture : Mixture

Ingredient name	%	CAS number	Official Gazette notice reference number	
			CSCCL	ISHL
Titanium (powder)	≥75 - ≤90	7440-32-6	Not available.	Not available.
Aluminium	≤10	7429-90-5	Not available.	Not available.
vanadium	≤10	7440-62-2	Not available.	Not available.

4. First aid measures

- Inhalation** : Remove victim to fresh air and keep at rest in a position comfortable for breathing. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Get medical attention following exposure or if feeling unwell. If necessary, call a poison center or physician. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.
- Skin contact** : Flush contaminated skin with plenty of water. Remove contaminated clothing and shoes. Continue to rinse for at least 10 minutes. Get medical attention following exposure or if feeling unwell. If necessary, call a poison center or physician. Wash clothing before reuse. Clean shoes thoroughly before reuse.
- Eye contact** : Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Continue to rinse for at least 10 minutes. Get medical attention following exposure or if feeling unwell. If necessary, call a poison center or physician.
- Ingestion** : Wash out mouth with water. Remove dentures if any. Remove victim to fresh air and keep at rest in a position comfortable for breathing. If material has been swallowed and the exposed person is conscious, give small quantities of water to drink. Stop if the exposed person feels sick as vomiting may be dangerous. Do not induce vomiting unless directed to do so by medical personnel. If vomiting occurs, the head should be kept low so that vomit does not enter the lungs. Get medical attention following exposure or if feeling unwell. If necessary, call a poison center or physician. Never give anything by mouth to an unconscious person. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.

Most important symptoms/effects, acute and delayed

Potential acute health effects

- Inhalation** : May cause damage to organs following a single exposure if inhaled. Exposure to airborne concentrations above statutory or recommended exposure limits may cause irritation of the nose, throat and lungs.
- Skin contact** : May cause damage to organs following a single exposure in contact with skin.
- Eye contact** : Exposure to airborne concentrations above statutory or recommended exposure limits may cause irritation of the eyes.

4. First aid measures

Ingestion : May cause damage to organs following a single exposure if swallowed.

Over-exposure signs/symptoms

Inhalation : Adverse symptoms may include the following:
respiratory tract irritation
coughing

Eye contact : Adverse symptoms may include the following:
irritation
redness

Protection of first-aiders : No action shall be taken involving any personal risk or without suitable training. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation.

Notes to physician : Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled.

5. Fire-fighting measures

Suitable extinguishing media : Use approved Class D extinguisher or smother with dry sand, dry clay or dry ground limestone. Use an extinguishing agent suitable for the surrounding fire.

Unsuitable extinguishing media : CO₂, water, ABC powder and foam.

Specific hazards arising from the chemical : Flammable solid. May form explosible dust-air mixture if dispersed.

Kst Value 60 bar m/s - Class ST 1
Minimum ignition energy (mJ): 3-5

Special protective actions for fire-fighters : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training. Move containers from fire area if this can be done without risk. Use water spray to keep fire-exposed containers cool.

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

6. Accidental release measures

Personal precautions, protective equipment and emergency procedures

For non-emergency personnel : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilled material. Shut off all ignition sources. No flares, smoking or flames in hazard area. Avoid breathing dust. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment.

For emergency responders : If specialized clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For non-emergency personnel".

Environmental precautions : Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).

Methods and materials for containment and cleaning up

6. Accidental release measures

- Small spill** : Move containers from spill area. Use spark-proof tools and explosion-proof equipment. Avoid dust generation. Do not dry sweep. Use only vacuum cleaners equipped with a wet separator system and a grounding cable (ATEX, Hazardous locations certified / Suitable for use with Group E (IIIC) Conductive Dusts / Suitable for use in Class 2, Division II (Zone 22) locations or better). Dispose of via a licensed waste disposal contractor.
- Large spill** : Move containers from spill area. Use spark-proof tools and explosion-proof equipment. Approach release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Avoid dust generation. Do not dry sweep. Use only vacuum cleaners equipped with a wet separator system and a grounding cable (ATEX, Hazardous locations certified / Suitable for use with Group E (IIIC) Conductive Dusts / Suitable for use in Class 2, Division II (Zone 22) locations or better). Avoid creating dusty conditions and prevent wind dispersal. Dispose of via a licensed waste disposal contractor. Note: see Section 1 for emergency contact information and Section 13 for waste disposal.

7. Handling and storage

Precautions for safe handling

- Protective measures** : Put on appropriate personal protective equipment (see Section 8). Do not get in eyes or on skin or clothing. Do not breathe dust. Do not ingest. May form explosible dust-air mixture if dispersed. Avoid the creation of dust when handling and avoid all possible sources of ignition (spark or flame). Prevent dust accumulation. Use only with adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Do not enter storage areas and confined spaces unless adequately ventilated. Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use. Use explosion-proof electrical (ventilating, lighting and material handling) equipment. Electrical equipment and lighting should be protected to appropriate standards to prevent dust coming into contact with hot surfaces, sparks or other ignition sources. Use only non-sparking tools. Empty containers retain product residue and can be hazardous. Do not reuse container.
- Advice on general occupational hygiene** : Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. See also Section 8 for additional information on hygiene measures.

Storage

- Conditions for safe storage** : Store in accordance with local regulations. Store in a segregated and approved area. Store in original container protected from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10) and food and drink. Store locked up. Eliminate all ignition sources. Separate from oxidizing materials. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabeled containers. Use appropriate containment to avoid environmental contamination. See Section 10 for incompatible materials before handling or use.

8. Exposure controls/personal protection

- Appropriate engineering controls** : Use only with adequate ventilation. If user operations generate dust, fumes, gas, vapor or mist, use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. The engineering controls also need to keep gas, vapor or dust concentrations below any lower explosive limits. Use explosion-proof ventilation equipment.

Occupational exposure limits

8. Exposure controls/personal protection

Ingredient name	Exposure limits
aluminium metal	Japan Society for Occupational Health (Japan, 5/2019). OEL-M: 0.5 mg/m ³ 8 hours. Form: Respirable dust OEL-M: 2 mg/m ³ 8 hours. Form: Total dust

Individual protection measures

- Respiratory protection** : Based on the hazard and potential for exposure, select a respirator that meets the appropriate standard or certification. Respirators must be used according to a respiratory protection program to ensure proper fitting, training, and other important aspects of use.
- Hand protection** : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. Considering the parameters specified by the glove manufacturer, check during use that the gloves are still retaining their protective properties. It should be noted that the time to breakthrough for any glove material may be different for different glove manufacturers. In the case of mixtures, consisting of several substances, the protection time of the gloves cannot be accurately estimated.
- Eye protection** : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists, gases or dusts. If contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: safety glasses with side-shields. If operating conditions cause high dust concentrations to be produced, use dust goggles.
- Skin protection** : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product. When there is a risk of ignition from static electricity, wear anti-static protective clothing. For the greatest protection from static discharges, clothing should include anti-static overalls, boots and gloves. For the greatest protection from static discharges, clothing should include anti-static overalls, boots and gloves.
- Appropriate footwear and any additional skin protection measures should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

9. Physical and chemical properties

Appearance

- Physical state** : Solid. [Powder. particle size: 100% <100 µm]
- Color** : Silver. Gray.
- Odor** : Odorless.
- pH** : Not applicable.
- Melting point/freezing point** : 1605 to 1665°C (2921 to 3029°F)
- Boiling point, initial boiling point, and boiling range** : 3287°C (5948.6°F)
- Flash point** : Not applicable.
- Flammability (solid, gas)** : Flammable.
- Lower and upper explosive (flammable) limits** : Lower: 50 mg/m³ (minimum explosive concentration of dust)
- Vapor pressure** : Not available.
- Specific gravity (Relative density)** : Not available.
- Solubility** : Not available.

9. Physical and chemical properties

- Partition coefficient: n-octanol/water** : Not applicable.
- Auto-ignition temperature** : Minimum cloud ignition temperature (°C): 710 (1310°F)
Minimum layer ignition temperature (°C): >400 (>752°F)
- Decomposition temperature** : Not applicable.
- Solubility in water** : Insoluble.

10. Stability and reactivity

- Reactivity** : Under normal conditions of storage and use, hazardous reactions will not occur.
- Chemical stability** : The product is stable.
- Possibility of hazardous reactions** : May form explosible dust-air mixture if dispersed.
- Conditions to avoid** : Keep away from heat, sparks and flame. Avoid dust generation. Avoid static electrical charge.
- Incompatible materials** : Reactive or incompatible with the following materials: alkalis, acids, oxidizing materials, halogenated hydrocarbons, combustible materials.
- Hazardous decomposition products** : Under normal conditions of storage and use, hazardous decomposition products should not be produced.

11. Toxicological information

Acute toxicity

Product/ingredient name	Result	Species	Dose	Exposure
Aluminium powder (stabilized)	LC50 Inhalation Dusts and mists	Rat	>0.888 mg/l	4 hours
	LD50 Oral	Rat	>2000 mg/kg	-
	NOAEL Inhalation Dusts and mists	Rat	10 mg/m ³	4 hours

Acute toxicity estimates

Not available.

Conclusion/Summary : Based on available data, the classification criteria are not met.

Irritation/Corrosion

Conclusion/Summary : Not available.

Respiratory sensitization/Skin sensitization

Conclusion/Summary : Not available.

Germ Cell Mutagenicity

Conclusion/Summary : Not available.

Carcinogenicity

Conclusion/Summary : Not available.

Reproductive toxicity

Conclusion/Summary : Not available.

Specific target organ toxicity (single exposure)

11. Toxicological information

Name	Category	Route of exposure	Target organs
Aluminium powder (stabilized)	Category 1	-	respiratory system

Specific target organ toxicity (repeated exposure)

Name	Category	Route of exposure	Target organs
Aluminium powder (stabilized)	Category 1	-	respiratory system

Aspiration hazard

Not available.

12. Ecological information

Ecotoxicity

Conclusion/Summary : Not available.

Persistence/degradability

Conclusion/Summary : The methods for determining the biological degradability are not applicable to inorganic substances.

Bioaccumulative potential

Not available.

Mobility in soil

: Not available.

Hazardous to the ozone layer

: Not applicable.

Other adverse effects

: No known significant effects or critical hazards.




13. Disposal considerations

Disposal methods

: The generation of waste should be avoided or minimized wherever possible. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of all authorities with jurisdiction. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Care should be taken when handling emptied containers that have not been cleaned or rinsed out. Empty containers or liners may retain some product residues. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

14. Transport information

14. Transport information

	UN	IMDG	IATA
UN number	UN3089	UN3089	UN3089
UN proper shipping name	METAL POWDER, FLAMMABLE, N.O.S.	METAL POWDER, FLAMMABLE, N.O.S.	Metal powder, flammable, n.o.s.
Transport hazard class(es)	4.1	4.1	4.1
Label			
Packing group	II	II	II
Environmental hazards	No.	Marine Pollutant: No	No.

Additional information

IMDG : **Emergency schedules** F-G, S-G

IATA : **Quantity limitation** Passenger and Cargo Aircraft: 15 kg. Packaging instructions: 445. Cargo Aircraft Only: 50 kg. Packaging instructions: 448. Limited Quantities - Passenger Aircraft: 5 kg. Packaging instructions: Y441.
Special provisions A3, A803

Special precautions for user : **Transport within user's premises:** always transport in closed containers that are upright and secure. Ensure that persons transporting the product know what to do in the event of an accident or spillage.

Transport in bulk according to IMO instruments : Not applicable.

15. Regulatory information

Fire Service Law

Category	Substance name/Type	Danger category	Signal word	Designated quantity
non-hazardous substances	Material that contains: Metal powder.	Not available.	Not available.	Not available.

ISHL

Use of specified chemical substances

None of the components are listed.

Substances requiring labelling

Ingredient name	%	Status	Reference number
Aluminium and its water-soluble salts	<10	Listed	37

Chemicals requiring notification

Ingredient name	%	Status	Reference number
Aluminium and its water-soluble salts	<10	Listed	37

Guideline for Preventing Health Hazard by chemical substances (Carcinogenicity)

15. Regulatory information

None of the components are listed.

Mutagen

None of the components are listed.

Chemical Substances Control Law (CSCL)

None of the components are listed.

Poisonous and Deleterious Substances

None of the components are listed.

Pollutant Release and Transfer Registers (PRTR)

Ingredient name	%	Status	Reference number
vanadium compounds	≤10	Class 1	321

High Pressure Gas Control Law : Not applicable.

International regulations

Chemical Weapon Convention List Schedules I, II & III Chemicals

Not listed.

Montreal Protocol

Not listed.

Stockholm Convention on Persistent Organic Pollutants

Not listed.

Rotterdam Convention on Prior Informed Consent (PIC)

Not listed.

UNECE Aarhus Protocol on POPs and Heavy Metals

Not listed.

Inventory list

Australia	: All components are listed or exempted.
Canada	: All components are listed or exempted.
China	: All components are listed or exempted.
Europe	: All components are listed or exempted.
New Zealand	: All components are listed or exempted.
Philippines	: All components are listed or exempted.
Republic of Korea	: All components are listed or exempted.
Taiwan	: All components are listed or exempted.
United States	: All components are active or exempted.
Viet Nam	: All components are listed or exempted.

16. Other information

History

Date of printing : 24/03/2021

Date of issue/Date of revision : 24/03/2021

Date of previous issue : 03/12/2020

Version : 1.1

16. Other information

Key to abbreviations

- : ATE = Acute Toxicity Estimate
- BCF = Bioconcentration Factor
- GHS = Globally Harmonized System of Classification and Labelling of Chemicals
- IATA = International Air Transport Association
- IBC = Intermediate Bulk Container
- IMDG = International Maritime Dangerous Goods
- LogPow = logarithm of the octanol/water partition coefficient
- MARPOL = International Convention for the Prevention of Pollution From Ships, 1973 as modified by the Protocol of 1978. ("Marpol" = marine pollution)
- N/A = Not available
- SGG = Segregation Group
- UN = United Nations

Procedure used to derive the classification

Classification	Justification
FLAMMABLE SOLIDS - Category 1	On basis of test data
SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE) - Category 2	Calculation method
SPECIFIC TARGET ORGAN TOXICITY (REPEATED EXPOSURE) - Category 2	Calculation method

References : Not available.

Indicates information that has changed from previously issued version.

Notice to reader

To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein.

Final determination of suitability of any material is the sole responsibility of the user. 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.

DISCLAIMER OF LIABILITY: The following supersedes any related provision in your company's forms, letters, and agreements from, by or with 3D Systems Corporation. 3D SYSTEMS, INC. MAKES NO WARRANTY WHETHER EXPRESSED OR IMPLIED, INCLUDING WARRANTIES OF MERCHANTABILITY OR OF FITNESS FOR A PARTICULAR PURPOSE FOR THIS PRODUCT. No statements or recommendations contained in the product literature are to be construed as inducements to infringe any relevant patent now or hereafter in existence. Under no circumstances shall 3D Systems, Inc. be liable for incidental, consequential, or other damages from alleged negligence, breach of warranty, strict liability or any other theory, arising out of the use or handling of this product. The sole liability of 3D Systems, Inc. for any claims arising out of the manufacture, use or sale of its products shall be for the buyer's purchase price.

The contents of this safety data sheet are subject to change without notice. 3D Systems, Inc. recommends that you periodically check www.3dsystems.com to make sure you are using the most current safety data sheet.

© Copyright 2020 by 3D Systems, Inc. All rights reserved. The 3D logo, LaserForm and ProX are registered trademarks of 3D Systems, Inc.