

EMERALD

The Education, Scholarships, Apprenticeships and Youth
Entrepreneurship
EUROPEAN NETWORK FOR 3D PRINTING OF BIOMIMETIC
MECHATRONIC SYSTEMS

E-toolkit – New materials used for the developed biomimetic mechatronic systems

Project Title	European network for 3D printing of biomimetic mechatronic systems 21-COP-0019
Output	IO2 - EMERALD e-toolkit manual for digital learning in producing biomimetic manufacturing method
Module	Database used for the smart (intelligent) materials properties
Date of Delivery	January 2023
Authors	Diana BĂILĂ, PUB
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Total Materia used for determination of the materials properties

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Total Materia used for determination of the materials properties.

1 Total Materia database – Quick search for alloys

Total Materia is the world's most comprehensive materials database, having more than 20,000,000 property records for over 450,000 metallic and non-metallic materials presented in 26 languages. This database is world class quality, service and support, being trusted in over 160 countries, the smallest companies to global industry leaders all receive our complete specialist technical support. Total Materia is proprietary algorithms for the identification of unknown materials, using composition data from analytical sources, find matching materials, property data and equivalents in just seconds. This database is the largest single collection of advanced property data on the planet, having more than 150,000 materials with stress strain, fatigue data and much more for the design community, being a free page. This database permits lightning fast access for finding and comparing equivalent materials, existing international cross-references for 450,000 materials from 74 standards providing over 15,000,000 material connections.

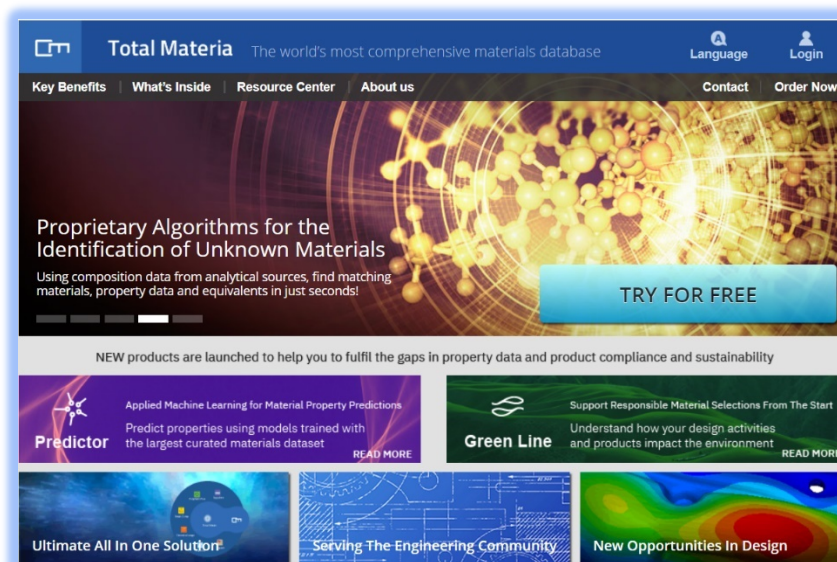


Fig.1. Total Materia database

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Total Materia database help solve diverse engineering challenges from the simplest to the complex, being used in: medicine industry, aerospace industry, energy industry, automotive industry, machinery industry, engineering industry, diversified.

By example, for the alloy Ti6Al4 V, we want to know the chemical composition and the mechanical properties, and we click on Advanced Search, as in the Figure 2.

Total Materia
The World's Most Comprehensive METALS Database

PowerDemo Home | **Advanced Search** | SmartComp | Suppliers | Extended Range | Standard List | Order Now

Advanced Search

Designation, Standard

Material:
 Standard Number:
 Group of Materials: -- All --
 Standard Description:
 Country/Standard: - / Approval
 Submit Clear

Full Text Search

Search for:

Chemical Composition (%)

Element	Min.	Max.	Element	Min.	Max.	Element	Min.	Max.
<input type="checkbox"/> C	<input type="text"/>	<input type="text"/>	<input type="checkbox"/> Mo	<input type="text"/>	<input type="text"/>	<input type="checkbox"/> Cu	<input type="text"/>	<input type="text"/>

Fig.2. Advanced Search

In the figure 3, it is presented the choice of the standard in function of the country and group of materials.

It was choosing the alloy Ti6Al4V, making part of Titanium materials and was choose European Union standard, as in Figure 3. It must specify the material type, as example Bulk Materials, in Figure 4.

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Total Materia
The World's Most Comprehensive METALS Database

Select Language Support Log out

PowerDemo Home Advanced Search SmartComp Suppliers BETA Extended Range Standard List Order Now

Advanced Search

Designation, Standard

Material:

Standard Number:

Group of Materials:

Standard Description:

Country/Standard:

Submit Clear

Fig.3. European Union standard choice

Registration information for Total Materia - Subscribers Home

portal.totalmateria.com/en/search/quick

Google Translate News

TOTAL SEARCH EXTENDED RANGE DATA PLUS ENVIRO COMPLIANCE SUPPLIERS SMARTCOMP EXPORTER TRACKER MATERIAL CONSOLE

Quick Search Advanced Search Standard list Material Discovery

Material Designation: Bulk Materials

SEARCH

Bulk Materials x Material group Standard Producer

Bulk Materials
3D Materials
Adhesives
Coatings
Lubricants
Substances

Welcome Irina Bail

MESSAGE SAVED SEARCHES FAVORITES

Subscription expires: 04/05/2023 (nn/dd/yy)
Want to return to the old version of the Total Materia platform?
[Click here to go back](#)

490K NUMBER OF MATERIALS
80 STANDARD ORGANIZATIONS
20K DATA SOURCES
25M DATA POINTS

Resource Hub

UPCOMING WEBINARS RECORDINGS GUIDED TOURS

Green Line: PRODUCT COMPLIANCE AND SUSTAINABILITY
Predictor: MISSING DATA - FILLING THE GAPS
Total Materia - Resolving Material Challenges
Total Materia - Resolving Material Challenges

0°C Cloudy 20:06 04.02.2023

Fig.4. Material type

In figure 5, it is specifying the material group and in this case, nonferrous alloys and European standard choice, as in figure 6.

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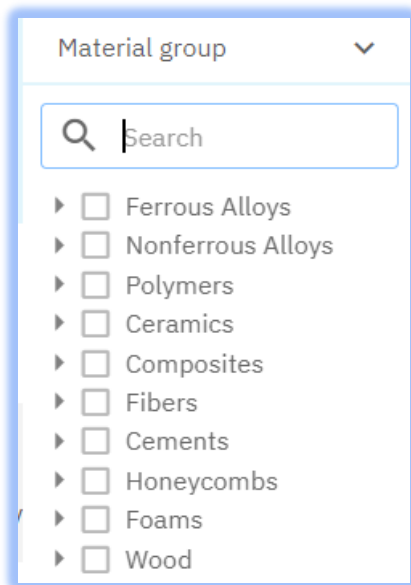


Fig.5. Material group

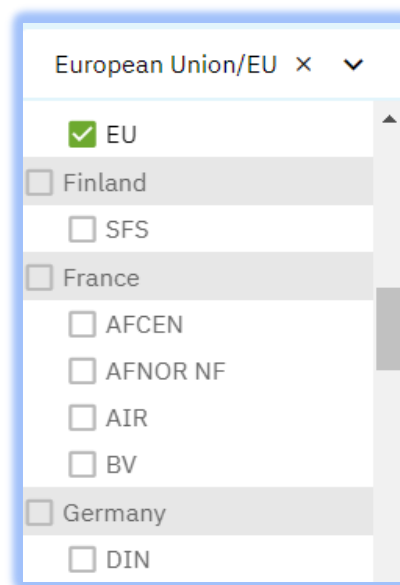


Fig.6. European standard choice

	MATERIAL	STANDARD	COUNTRY / PRODUCER	CLASSIFICATION
1	MIM-Ti6Al4V-600	AFNOR NF	France	Ferrous Alloys / Sintered powdered metals
2	MIM-Ti6Al4V-600	ASRO	Romania	Ferrous Alloys / Sintered powdered metals
3	MIM-Ti6Al4V-600	B.S.	United Kingdom	Ferrous Alloys / Sintered powdered metals
4	MIM-Ti6Al4V-600	BDS	Bulgaria	Ferrous Alloys / Sintered powdered metals
5	MIM-Ti6Al4V-600	CSN	Czech Republic	Ferrous Alloys / Sintered powdered metals
6	MIM-Ti6Al4V-600	DIN	Germany	Ferrous Alloys / Sintered powdered metals
7	MIM-Ti6Al4V-600	EN	European Union	Ferrous Alloys / Sintered powdered metals
8	MIM-Ti6Al4V-600	ISO	International	Ferrous Alloys / Sintered powdered metals

Fig.7. Different Ti6Al4V producers

When we give a quick search, as in figure 7, are presented different Ti6Al4V producers from different countries and using different standards.

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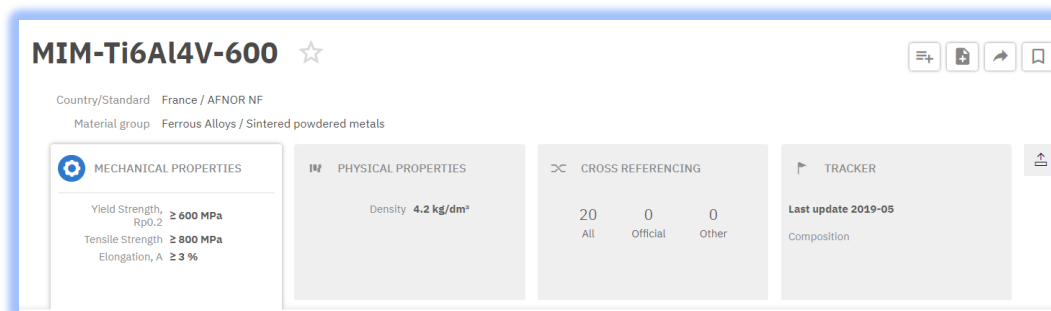


Fig.8. Ti6Al4V standard Fr AFNOR NF-Mechanical properties

The results it is the mechanical properties of the alloy Ti6Al4V, conforming of FR AFNOR NF standard, as in figure 8 and figure 9.

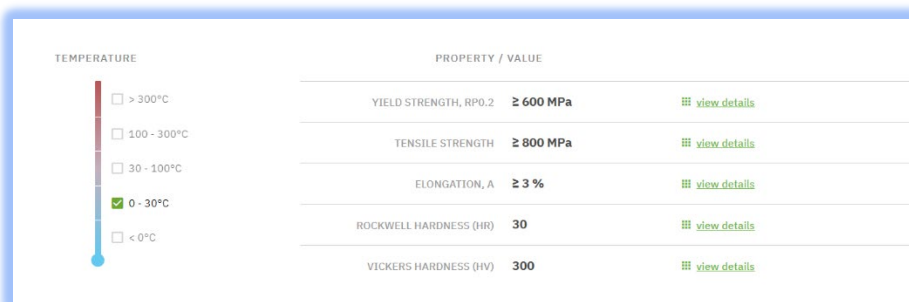


Fig.9. Mechanical properties Ti6Al4V at the temperature between 0-30°C

Composition						
SELECTED REFERENCE						
EN ISO 22068: 2014 / Sintered metal injection moulded materials - Specifications						
CRITERIA	VALUE	UNIT	NOTE	CAS NUMBER	CRITICAL RAW MATERIALS / CONFLICT MINERALS	
Al	5.0 - 7.0	%		7429-90-5	-	
C	≤ 0.2	%		7440-44-0	-	
N	≤ 0.1	%		7727-37-9; 17738-98-0	-	
O	≤ 0.4	%		7782-44-7; 17738-98-2	-	
Other total	≤ 1.0	%		-	-	
Ti			Balance	7440-32-6	United	
V	3.0 - 5.0	%		7440-42-2	United	

Reference for the selected material and condition
1 EN ISO 22068: 2014 / Sintered metal injection moulded materials - Specifications

Fig.10. Chemical composition of Ti6Al4V

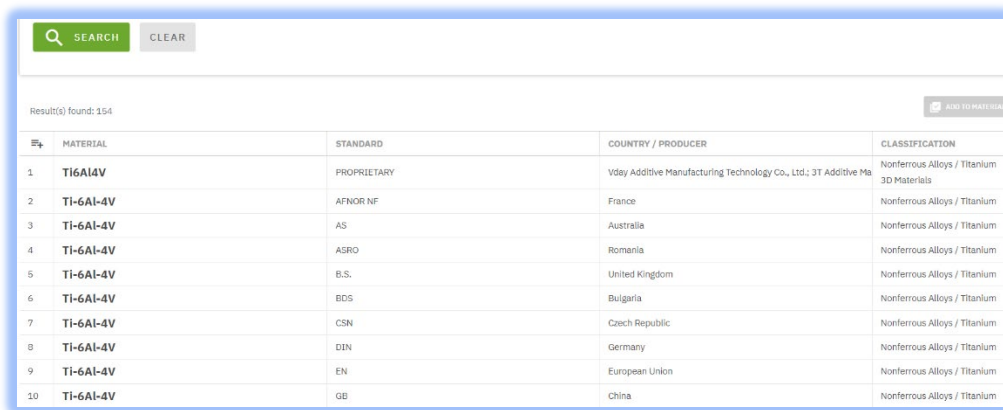
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In figure 9, the database gives us all information about the mechanical properties of the alloy Ti6Al4V in function of the temperature used in the process where it is used this material.

In figure 10, the database shows us the chemical composition of the alloy Ti6Al4V.

2. Total Materia database – Advanced Research for alloys

In the case of Advanced Research, by example for the Ti6Al4V, producer Vday Additive Manufacturing Technology Co., it is given the classification of different Ti alloys producers, as in figure 11.



	MATERIAL	STANDARD	COUNTRY / PRODUCER	CLASSIFICATION
1	Ti6Al4V	PROPRIETARY	Vday Additive Manufacturing Technology Co., Ltd.; 3T Additive Ma	Nonferrous Alloys / Titanium 3D Materials
2	Ti-6Al-4V	AFNOR NF	France	Nonferrous Alloys / Titanium
3	Ti-6Al-4V	AS	Australia	Nonferrous Alloys / Titanium
4	Ti-6Al-4V	ASRO	Romania	Nonferrous Alloys / Titanium
5	Ti-6Al-4V	B.S.	United Kingdom	Nonferrous Alloys / Titanium
6	Ti-6Al-4V	BDS	Bulgaria	Nonferrous Alloys / Titanium
7	Ti-6Al-4V	CSN	Czech Republic	Nonferrous Alloys / Titanium
8	Ti-6Al-4V	DIN	Germany	Nonferrous Alloys / Titanium
9	Ti-6Al-4V	EN	European Union	Nonferrous Alloys / Titanium
10	Ti-6Al-4V	GB	China	Nonferrous Alloys / Titanium

Fig.11. Ti6Al4V alloy used in Additive Manufacturing

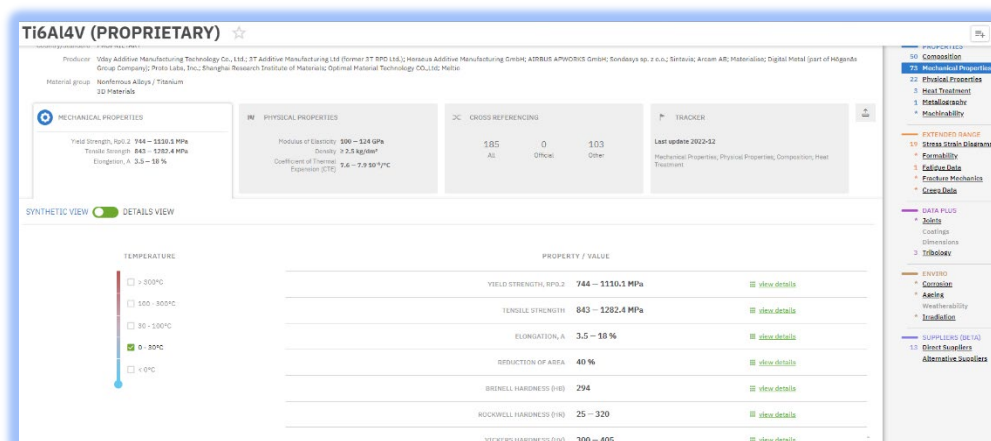


Fig.12. Mechanical properties of Ti6Al4V used in Additive Manufacturing

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In the figure 12, are presented the mechanical properties of Ti6Al4V used in Additive Manufacturing, for different temperature domains. The chemical composition of Ti6Al4V used in Additive Manufacturing is given in the figure 13. In the figure 14, the physical properties of Ti6Al4V used in Additive Manufacturing, for different temperature domains.

Ti6Al4V (PROPRIETARY) ☆

REFERENCES

3T Additive Manufacturing Ltd, Product Data Sheets / Available at: [www.3t-am.com](#), visited 2019

Arcam AB, Product Data Sheets / Available at: [www.arcam.com](#), visited 2015

Digital Metal, Product Data Sheets / Available at: [www.digitalmetal.tech](#), visited 2021

Heraeus Additive Manufacturing GmbH, Product Data Sheets / Available at: [www.heraeus.com](#), visited 2020

Meltio, Product Data Sheets / Available at: [https://meltio3d.com/](#), visited 2022

Shanghai Research Institute of Material, Product Data Sheet / Available at: [www.srim.com.cn](#), visited 2022

SELECTED REFERENCE

3T Additive Manufacturing Ltd, Product Data Sheets / Available at: [www.3t-am.com](#), visited 2019

CRITERIA	VALUE	UNIT	NOTE	CAS NUMBER	CRITICAL RAW MATERIALS CONFLICT MINERALS
Al	5.50 – 6.75	%		7429-90-5	-
C	≤ 0.08	%		7440-44-0	-
Fe	≤ 0.3	%		7439-89-6	-
H	≤ 0.015	%		1333-74-0	-
N	≤ 0.05	%		7727-37-9; 17778-88-0	-
O	≤ 0.2	%		7782-44-7; 17778-80-2	-
Ti			Balance	7440-32-6	Listed
V	3.50 – 4.50	%		7440-42-2	Listed

Fig.13. Chemical composition of Ti6Al4V used in Additive Manufacturing

TEMPERATURE	PROPERTY / VALUE
<input type="checkbox"/> > 300°C	MODULUS OF ELASTICITY 100 – 124 GPa
<input type="checkbox"/> 100 - 300°C	DENSITY ≥ 2.5 kg/dm³
<input type="checkbox"/> 30 - 100°C	COEFFICIENT OF THERMAL EXPANSION (CTE) 7.6 – 7.9 10 ⁻⁶ /°C
<input checked="" type="checkbox"/> 0 - 30°C	MELTING TEMPERATURE 1600 – 1750 °C
<input type="checkbox"/> < 0°C	

Fig.14. Physical properties of Ti6Al4V used in Additive Manufacturing

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Heat Treatment	
Reference	Descriptions
Arcam AB, Product Data Sheets / Available at: www.arcam.com , visited 2015	Hot Isostatic Pressing (HIP) at 920°C for 120 minutes, 100 MPa.
3T Additive Manufacturing Ltd, Product Data Sheets / Available at: www.3t-am.com , visited 2019	Stress relieved at 800°C for 2 hours in a vacuum furnace with specimens on build plate.
Meltio, Product Data Sheets / Available at: https://meltio3d.com/ , visited 2022	Stress Relief - Heat up to 730°C in 2 h - Hold at 730°C during 2 h - Cool down to Ambient T* in 1 h 50 min
All references for the selected material	
1 3T Additive Manufacturing Ltd, Product Data Sheets / Available at: www.3t-am.com , visited 2019	
2 Arcam AB, Product Data Sheets / Available at: www.arcam.com , visited 2015	
3 Meltio, Product Data Sheets / Available at: https://meltio3d.com/ , visited 2022	

Fig.15. Heat treatment used for the alloy Ti6Al4V used in Additive Manufacturing

The database gives us details concerning the heat treatment used for the alloy Ti6Al4V used in Additive Manufacturing, as in the figure 15.

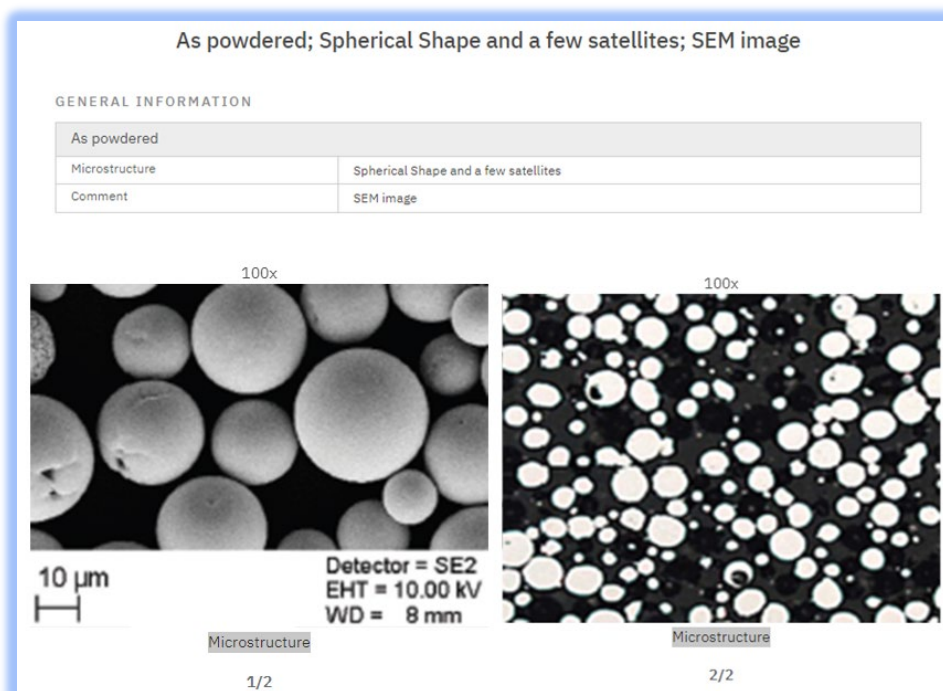


Fig.16. Metallography details for Ti6Al4V powders used in Additive Manufacturing

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Total Materia gives us details concerning the metallography of the alloy Ti6Al4V used in Additive Manufacturing, as in the figure 16 and the tribology is given in figure 18. In figure 17 are presented the similar materials with the same composition existing on the market.

The material does not have direct properties.
Similar materials that have these properties are listed in the table below.
Click on the material to view properties.

Result(s) found: 156

ADD TO MATERIAL LIST BUILDER ← FORWARD TO...

	MATERIAL	STANDARD	COUNTRY / PRODUCER	EQUIVALENCE CATEGORY		
1	S Ti 6408J (TiAl6V4AJ)	3IS	Japan	Composition 100%	↕	<input type="checkbox"/>
2	TA6V	AFINOR NF	France	Composition 100%	↕	<input type="checkbox"/>
3	Ti 6Al-4V Grade 5	PROPRIETARY	Allegheny Technologies Incorporated; Ulbrich Stainless Steel	Composition 100%	↕	<input type="checkbox"/>
4	Ti-6Al-4V	ONORM	Austria	Composition 100%	↕	<input type="checkbox"/>
5	Ti-6Al-4V	NBN	Belgium	Composition 100%	↕	<input type="checkbox"/>
6	Ti-6Al-4V	NBR	Brazil	Composition 100%	↕	<input type="checkbox"/>
7	Ti-6Al-4V	BDS	Bulgaria	Composition 100%	↕	<input type="checkbox"/>
8	Ti-6Al-4V	CSN	Czech Republic	Composition 100%	↕	<input type="checkbox"/>
9	Ti-6Al-4V	EN	European Union	Composition 100%	↕	<input type="checkbox"/>
10	Ti-6Al-4V	SFS	Finland	Composition 100%	↕	<input type="checkbox"/>

Fig.17. Similar Materials with the same composition existing on the market

Tribology

CONDITIONS (3)

☒ Tested Material - Heat treatment: As Built

☐ Tested Material - General comment: Standard Grade

☐ Tested Material - General comment: Performance Grade

SELECTED CONDITION

Tested Material Heat treatment: As Built

Tested Material

PROPERTY	T(°C)	VALUE	UNIT	NOTE
Surface Roughness		10	µm	Ra
		80	µm	Rz

Reference for the selected material and condition

1 Airbus Apworks GmbH, Product Data Sheets / Available at: www.apworks.de, visited 2018

All references for the selected material

1 Airbus Apworks GmbH, Product Data Sheets / Available at: www.apworks.de, visited 2018

2 Materialise, Product Data Sheets / Available at: www.materialise.com, visited Oct-2019

Fig.18. Tribology properties of Ti6Al4V used in Additive Manufacturing

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For welding and brazing are given different variants similar alloy of Ti, as in figure 19. In the figure 20, it is presented the stress strain diagram for Ti6Al4V used in Electron Beam Melting (EBM). The fatigue data is given in the figure 21, by ARCAM company.

Joints

Welding * Brazing *

The material does not have direct properties.
Similar materials that have these properties are listed in the table below.
Click on the material to view properties.

Result(s) found: 50

	MATERIAL	STANDARD	COUNTRY / PRODUCER	EQUIVALENCE CATEGORY
1	YTAW 640 E	KS	Korea	Composition 100%
2	AB-1	SAE	United States	Other sources
3	B 265 Grade 5	ASTM	United States	Other sources
4	B 265 Grade Ti-6Al-4V	ASTM	United States	Other sources
5	ERTI-5	AWS	United States	Other sources
6	S Ti 6402	ONORM	Austria	Other sources
7	S Ti 6402	NBN	Belgium	Other sources
8	S Ti 6402	BDS	Bulgaria	Other sources
9	S Ti 6402	CSN	Czech Republic	Other sources
10	S Ti 6402	EN	European Union	Other sources

Fig.19. Different variants similar alloy of Ti, used in welding and in brazing

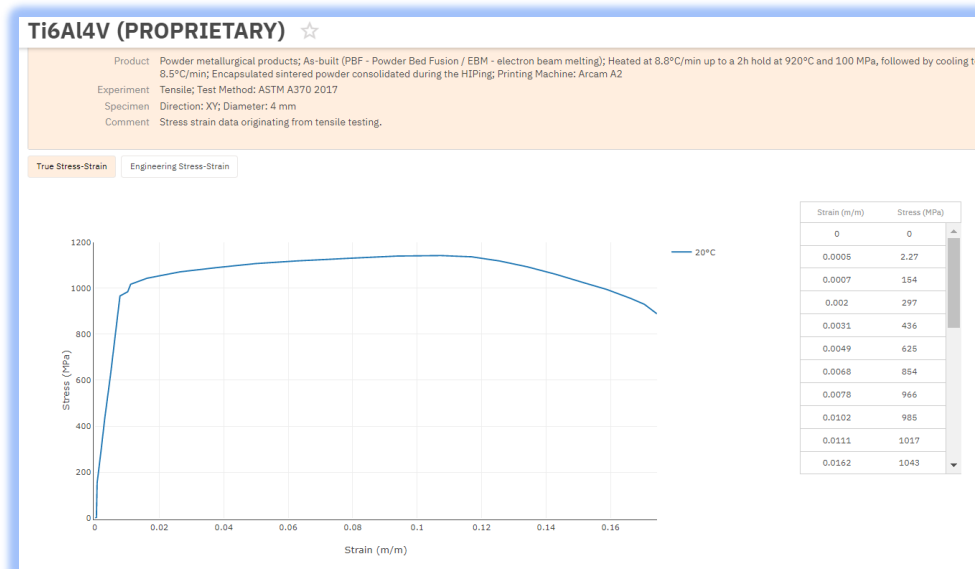


Fig.20. Stress strain diagram for Ti6Al4V used in Electron Beam Melting (EBM)

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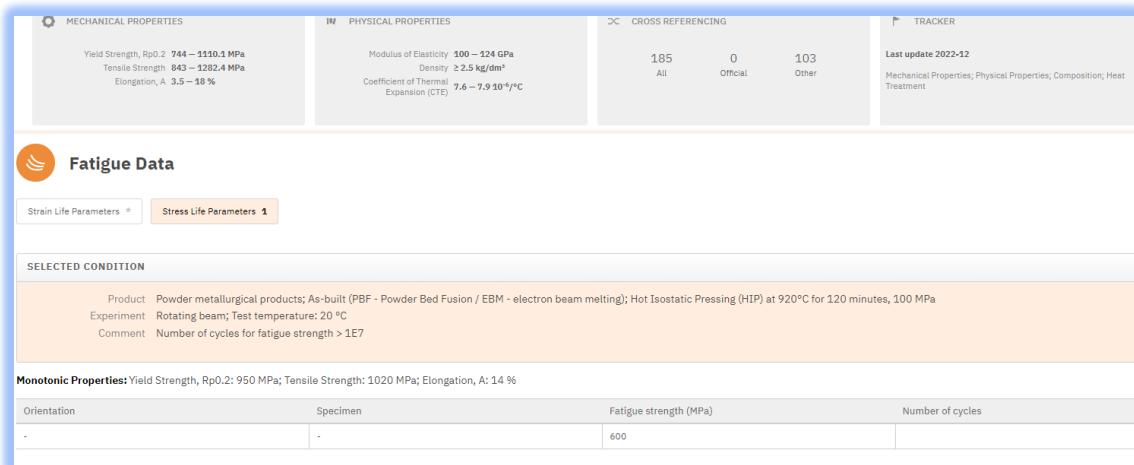


Fig.21. Fatigue data given for Ti6Al4V used in Electron Beam Melting (EBM)

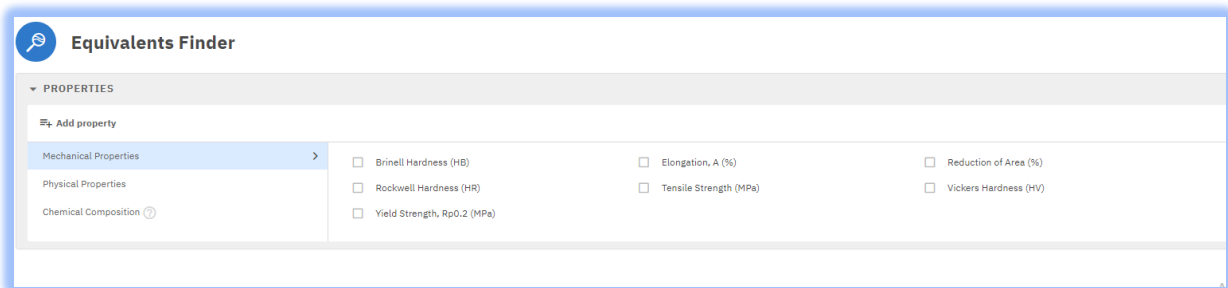


Fig.22. Equivalents finder

The database permits us to find equivalents finder in function of the Brinell hardness [HB], Rockwell hardness [HR], Yield strength $Rp0.2$ [MPa], elongation A [%], tensile strength [MPa], reduction of area [%], Vickers hardness [HV], modulus of elasticity [GPa], density [kg/dm^3], melting temperature [$^{\circ}C$], coefficient of thermal expansion (CTE) ($10^{-6}/^{\circ}C$) or chemical composition, as in figure 22.

Total Materia give us the material description for the alloy Ti6Al4V used in Electron Beam Melting (EBM), specifying the applications domain, in the case of powder, is given the particles size distribution, additive laser manufacturing systems type that used this powder, the biocompatibility, as in figure 23.

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Material Description		Application	Source
		It is used in a variety of medical applications which require high strength.	Digital Metal (part of Hiperco Group Company)
Source	Meltio		
Comment	3D printing (Additive manufacturing) - Direct Energy Deposition (DED) Machine: Meltio M450 Titanium alloy with high strength, low density, high fracture toughness, excellent corrosion resistance and superior biocompatibility	3D printing (Additive manufacturing) - Binder Jetting Machine: DM P2500	Waterlube
Application	Tools and prototypes, aerospace, marine, chemical		
Source	Optimal Material Technology CO.,Ltd		
Comment	3D printing (Additive manufacturing) - Selective Laser Melting (SLM) Machine: Concept Laser M2, EOS M 280. It has high purity, low oxygen content and good fluidity. Particle size distribution: 15-53 µm. Hall flow rate: 36 s/50g	3D printing (Additive manufacturing) Titanium alloy with the high strength, good machinability, low weight ratio and outstanding corrosion resistance.	Accum AB
Source	Shanghai Research Institute of Materials		
Comment	3D printing (Additive manufacturing) - Selective Laser Melting (SLM), Electron Beam Melting (EBM) Particle size range: 15-45 µm. Particle size distribution d ₉₀ : ≤ 30 µm. Liquidity/Flowability: ≤ 40s.	Typically used for direct manufacturing of parts and prototype for racing and aerospace industry, biomedical applications, such as implants and prosthesis, marine applications, chemical industry, gas turbines.	Sintavia
Source	Proto Labs, Inc.		
Comment	3D printing (Additive manufacturing) - Direct Metal Laser Sintering (DMLS) Mechanical properties of Ti6Al4V are comparable to wrought titanium for tensile strength, elongation, and hardness.	3D printing (Additive manufacturing) - Direct Metal Laser Sintering (DMLS) Corrosion resistance, strength, temperature resistance and weight reduction.	Sandberg sp. z o.o.
Application	It is used in a variety of medical applications which require high strength.		
Source	Heraeus Additive Manufacturing GmbH		
Comment	3D printing (Additive manufacturing) - Laser Powder Bed Fusion (LPBF-LB) High strength titanium alloy with low weight, good biocompatibility and high corrosion resistance. Particle Size Distribution (µm): 15-45 and 15-53		
Application	Medical, aerospace and automotive		
Source	3T Additive Manufacturing Ltd (former 3T RPD Ltd.)		
Comment	3D printing (Additive manufacturing) - Direct Metal Laser Sintering (DMLS) Machine: EOSINT M290, EOSINT M280, EOSINT M400, EOSINT M400-4 Titanium alloy powder. Corrosion resistance, lightweight, biocompatible, weldable.		
Application	Prototyping, engineering, biomedical implants, small series production		
Source	Vday Additive Manufacturing Technology Co., Ltd.		
Comment	3D printing (Additive manufacturing) - Selective Laser Melting (SLM), Electron Beam Melting (EBM) Titanium alloy powder. High strength to weight ratio, good mechanical properties, excellent corrosion resistance, good biocompatibility		
Application	Medical implants, automotive, aerospace, mold, energy and power, electronics		

Fig.23. Material Description - for Ti6Al4V used in Electron Beam Melting (EBM)

In the figure 24, it is presented how can discovery the material type, choosing the domain for Brinell Hardness [HB], for the temperature 0-30°C on X axis, meaning from 500 to 800, and the compression modulus [GPa], for the temperature 0-30°C, from 100-124, and are given 2 group types, ferrous alloys and nonferrous alloy. In figure 25, the database permits us to see the material properties if it is known the standard ASTM, the standard number.

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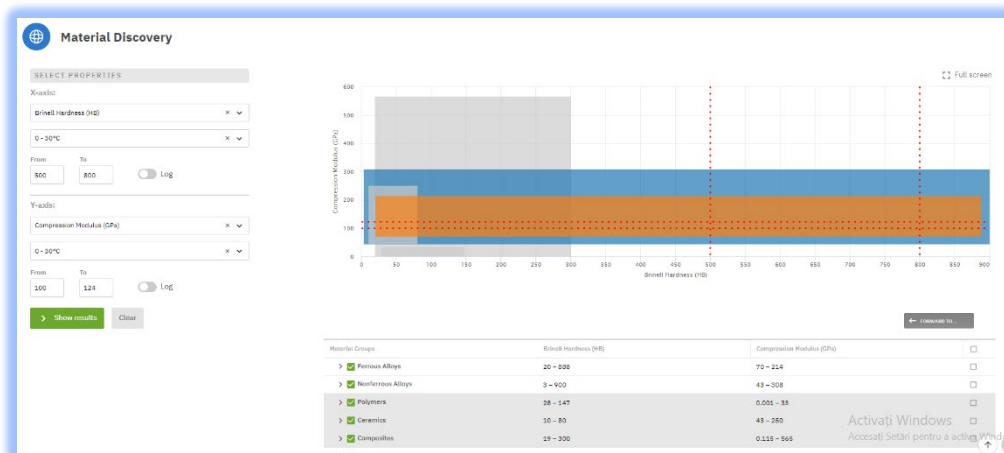


Fig.24. Material discovery

The Standard list interface displays a table of standards. The table has columns for #, STANDARD, STANDARD NUMBER, LAST VERSION, ICS NUMBER, and STATUS.

#	STANDARD	STANDARD NUMBER	LAST VERSION	ICS NUMBER	STATUS
1	ASTM	C458	2007	85.080	Reapproved 2010

Fig.25. Standard list

3. Total Materia database – Search algorithms used for identification the unknown metallic materials

For the chemical composition Co 54,31 %, Cr 23,08 %, Mo 11,12 %, W 7,85 %, Si 3,35 % and Mn, Fe < 0,1, using the algorithms of the Total Materia database, it will identify the material with this chemical composition, as in the figures 26 and 27.

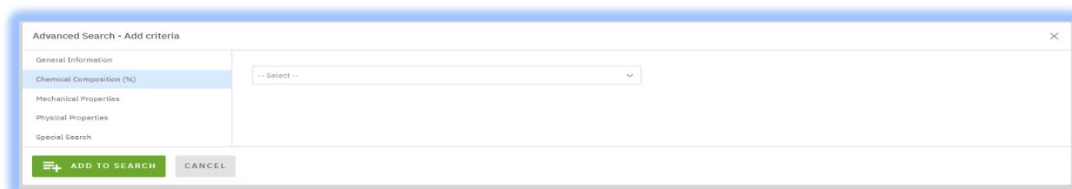


Fig.26. Algorithms used for identification the unknown materials

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Advanced Search - Add criteria

General Information

Chemical Composition (%)

Mechanical Properties

Physical Properties

Special Search

-- Select --

Co: 50 - 55 ☐ Not Allowed ❌

Cr: 20 - 24 ☐ Not Allowed ❌

Mo: 10 - 12 ☐ Not Allowed ❌

W: 5 - 10 ☐ Not Allowed ❌

Si: 2 - 4 ☐ Not Allowed ❌

Mn: 0 - 1 ☐ Not Allowed ❌

Fe: 0 - 1 ☐ Not Allowed ❌

+ ADD TO SEARCH CANCEL

Fig.27. Chemical composition selection

When we want to change the chemical composition, it must click on clear.

Advanced Search

ADVANCED SEARCH (Chemical Composition (%): Co: 45 - 60 AND Cr: 20 - 30)

Chemical Composition (%): Co: 45 - 60 AND Cr: 20 - 30 ✕ OR + Add search criteria

+ Add search criteria

Q SEARCH CLEAR

Result(s) found: 91

	MATERIAL	STANDARD	COUNTRY / PRODUCER	CLASSIFICATION
1	2.4778	AFNOR NF	France	Nonferrous Alloys / Cobalt
2	2.4778	ASRO	Romania	Nonferrous Alloys / Cobalt
3	2.4778	B.S.	United Kingdom	Nonferrous Alloys / Cobalt
4	2.4778	BOS	Bulgaria	Nonferrous Alloys / Cobalt
5	2.4778	CSN	Czech Republic	Nonferrous Alloys / Cobalt
6	2.4778	DIN	Germany	Nonferrous Alloys / Cobalt
7	2.4778	EN	European Union	Nonferrous Alloys / Cobalt
8	2.4778	ISO	International	Nonferrous Alloys / Cobalt
9	2.4778	MSZ	Hungary	Nonferrous Alloys / Cobalt

Fig.28. Co-Cr alloy results that have the respective chemical composition

In the figure 28 are presented the Co-Cr alloy results that have the respective chemical composition.

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The first is the material 2.4778, standard AFNOR NF, France and if we give click, can know the mechanical properties, the chemical composition, and its applications. In the figure 29 is presented the determination of the material: CoCr28 and their properties. The material description is presented in the figure 30.

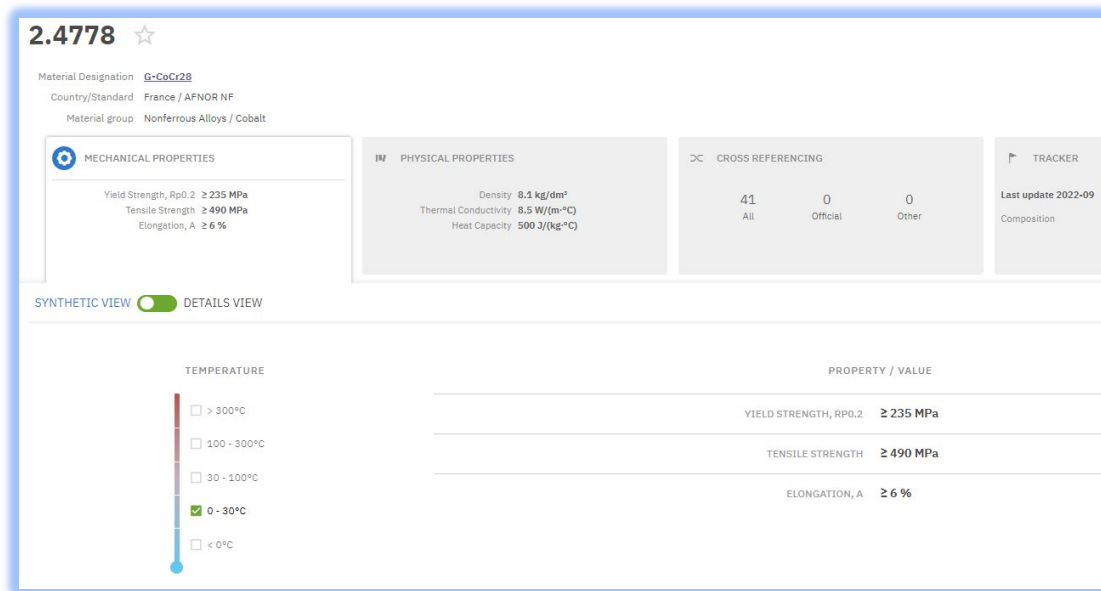


Fig.29. Determination of the material: CoCr28 and their properties

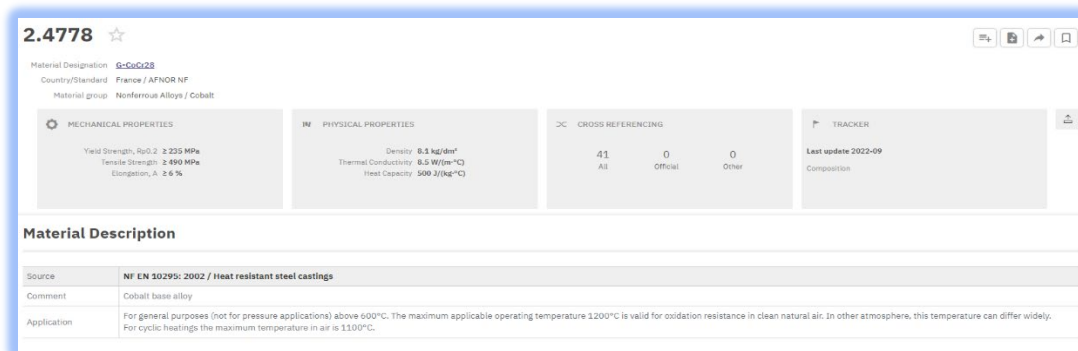


Fig.30. Material description of CoCr28

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4. Total Materia database – polymers, ceramics and composite materials

Total Materia database is used too for the polymers (Fig.31), ceramics and composite materials.

The database given 125 results of PLA types, as in the figure 32.

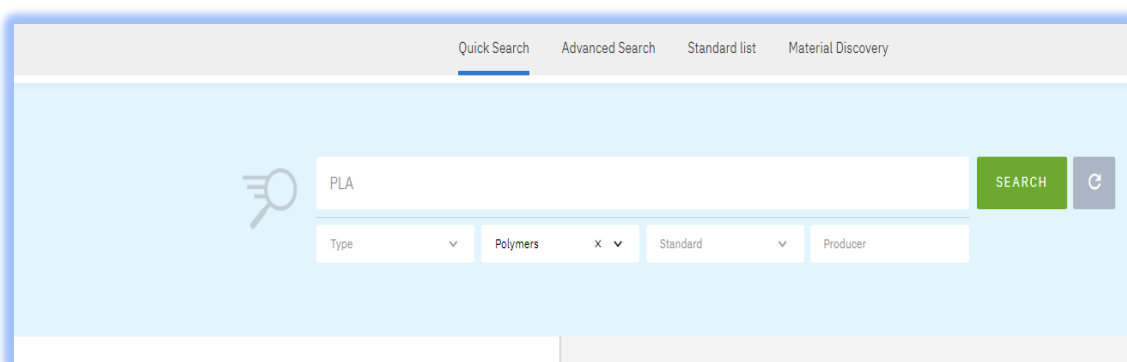


Fig.31. Total Materia database for the polymers

Result(s) found: 125

	MATERIAL	STANDARD	COUNTRY / PRODUCER	CLASSIFICATION
1	PLA	GENERIC		Polymers / Plastics, thermoplasts / Biopolymers (CA, CAB, PLA...) / PLA 3D Materials
2	PLA++	PROPRIETARY	Brethe-3DP	Polymers / Plastics, thermoplasts / Biopolymers (CA, CAB, PLA...) / PLA 3D Materials
3	PLA Crystal Clear	PROPRIETARY	Filamentum	Polymers / Plastics, thermoplasts / Biopolymers (CA, CAB, PLA...) / PLA 3D Materials
4	PLA Extrafill	PROPRIETARY	Filamentum	Polymers / Plastics, thermoplasts / Biopolymers (CA, CAB, PLA...) / PLA 3D Materials
5	PLA Filament	PROPRIETARY	Filament PM	Polymers / Plastics, thermoplasts / Biopolymers (CA, CAB, PLA...) / PLA 3D Materials
6	PLA Plus ProSpeed	PROPRIETARY	Rosa 3D	Polymers / Plastics, thermoplasts / Biopolymers (CA, CAB, PLA...) / PLA 3D Materials
7	PLA Premium Filament	PROPRIETARY	Airwolf 3D	Polymers / Plastics, thermoplasts / Biopolymers (CA, CAB, PLA...) / PLA 3D Materials
8	PLA Prografon color	PROPRIETARY	Advanced Graphene Products	Polymers / Plastics, thermoplasts / Biopolymers (CA, CAB, PLA...) / PLA 3D Materials

Fig.32. 125 results of PLA types existing on the database

In figure 33, are presented the mechanical properties of PLA crystal clear.

Database give us the manufacturing processes of PLA crystal clear, such as 3D Printing and temperature used in the manufacturing processes, as in figure 34.

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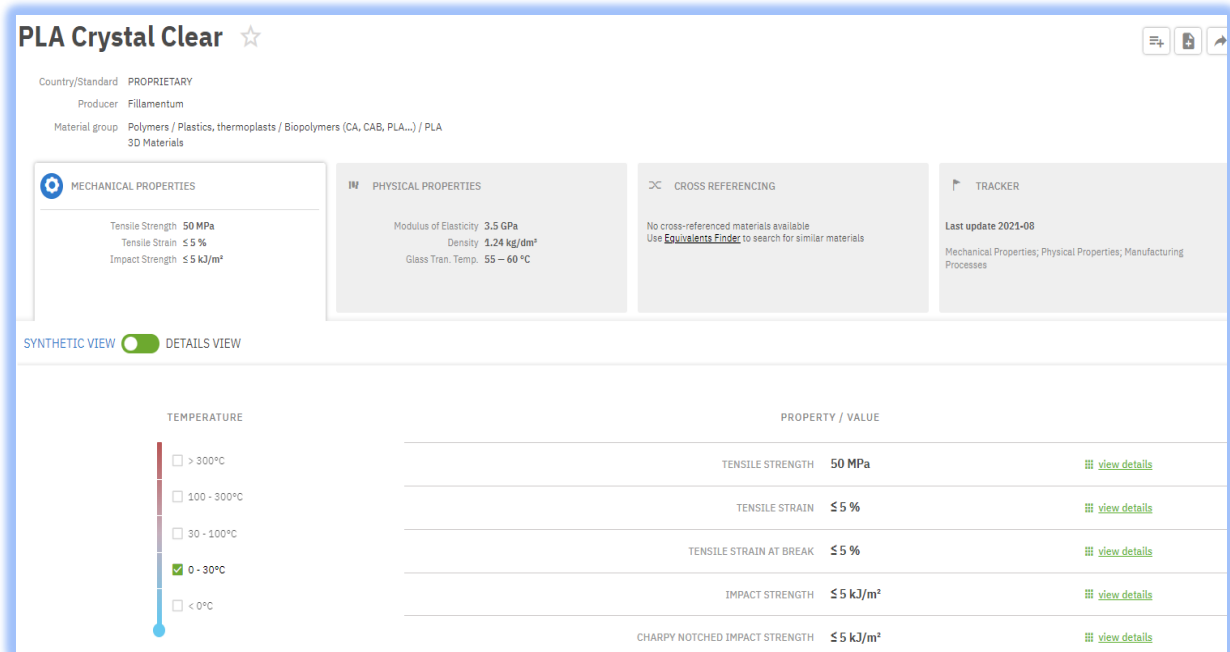


Fig.33. Mechanical properties of PLA crystal clear

Manufacturing Processes		
PROPERTY	VALUE	UNIT
3D printing machine settings		
Reference: Fillamentum, Product Data Sheets / Available at: www.fillamentum.com, visited 2021		
Heated Bed Temperature	50 – 60	°C
Printing Temperature	210 – 230	°C
Reference for the selected material and condition		
1 Fillamentum, Product Data Sheets / Available at: www.fillamentum.com, visited 2021		

Fig.34. Manufacturing processes of PLA crystal clear

In the figure 35 is realized the material description for PLA materials, being specify that it is used in Fused Deposition Modeling (FDM) process.

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PLA Crystal Clear ☆	
Country/Standard	PROPRIETARY
Producer	Filamentum
Material group	Polymers / Plastics, thermoplasts / Biopolymers (CA, CAB, PLA...) / PLA 3D Materials
MECHANICAL PROPERTIES	PHYSICAL PROPERTIES
Tensile Strength 50 MPa Tensile Strain ≤ 5 % Impact Strength ≤ 5 kJ/m²	Modulus of Elasticity 3.5 GPa Density 1.24 kg/dm³ Glass Tran. Temp. 55 – 60 °C
CROSS REFERENCING	
No cross-referenced materials available Use Equivalents Finder to search for similar materials	
TRACKER	
Last update 2021-08 Mechanical Properties; Physical Properties; Manufacturing Processes	
Material Description	
Source	Filamentum
Comment	Poly(lactic acid) (PLA), unreinforced; good chemical resistance to oils and greases, BPA free, styrene free Appearance: transparent, available in blue, green, orange and purple colors
Form	Filament
Processing	3D printing (Additive manufacturing) - Fused Deposition Modeling (FDM)

Fig.35. Material description for PLA filament

For ceramics, by example Hap, we obtain the results as in the figure 36.

Type
Ceramics
Standard
Producer

Fig.36. Ceramic search

Quick Search			
You are currently viewing results which contain part of your search criteria as part of the material designation. If you would like to view more possible matches for your search, please click here .			
Result(s) found: 6			
#	MATERIAL	STANDARD	COUNTRY / PRODUCER
1	3DMIX HAP	PROPRIETARY	3DCeram
2	Shapal - M	PROPRIETARY	CoorsTek, Inc.
3	Shapal Hi M soft	PROPRIETARY	Tokuyama Corporation
4	Shapal SH-15	PROPRIETARY	Tokuyama Corporation
5	Shapal SH-30	PROPRIETARY	Tokuyama Corporation
6	Shapal SH-50	PROPRIETARY	Tokuyama Corporation

Fig.37. Hap variants existing on the database

In the figure 37, are given the Hap variants existing on the database, their producers, country and standards. In the figure 38 are given the mechanical properties of Hap.

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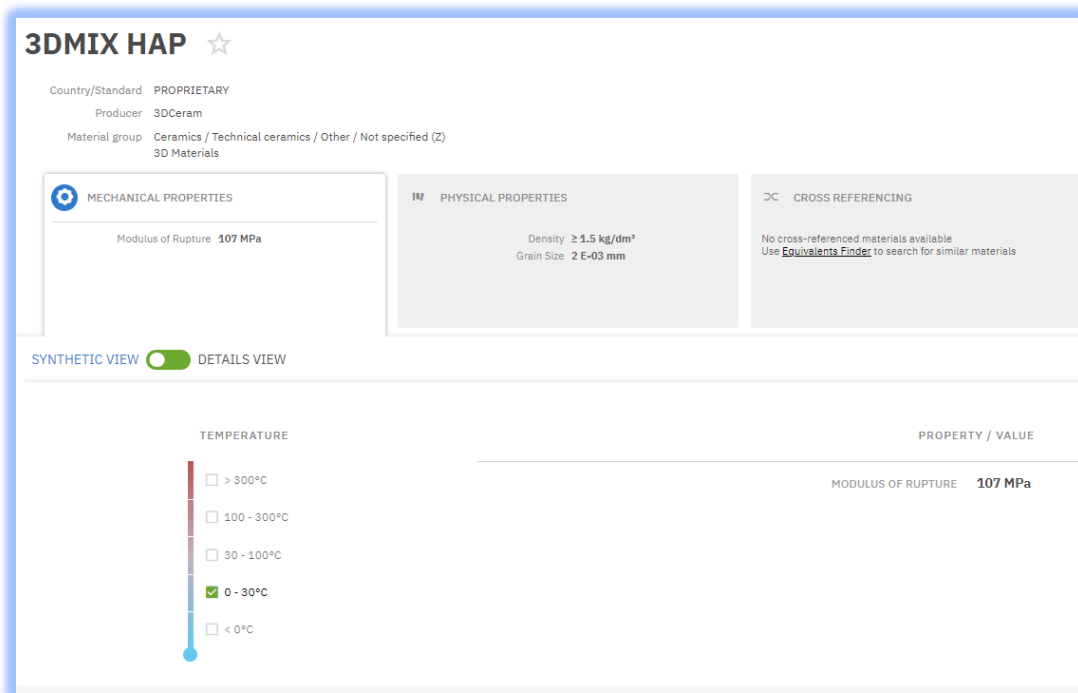


Fig.38. Mechanical properties of HAp

Material Description	
Source	3DCeram
Comment	Hydroxyapatite (HAP), calcium phosphate; excellent bioactivity, good osseointegration Ca/P ratio = 1.65 - 1.82
Application	For tibial osteotomy wedges, intervertebral cages, cranial implants, bone substitutes, spine implants, orthopedic implants
Form	Paste
Processing	3D printing (Additive manufacturing) - Stereolithography (SLA), Sintering Machine: Ceramaker C900, Ceramaker C100

Fig.39. Material description of HAp

Hap is used in additive manufacturing in SLS and in SLA, using Ceramaker C900 or Ceramaker C100, the platform gives us inclusive information about the manufacturing systems that used this material. Hydroxyapatite is used as paste in the additive manufacturing process to obtain tibial osteotomy wedges, intervertebral cages, cranial implants, bone substitutes, spine implants or orthopaedic implants, as in the figure 39

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Concerning the composite materials, by example plywood, the database give us 3 results, such in the figures 40 and 41.

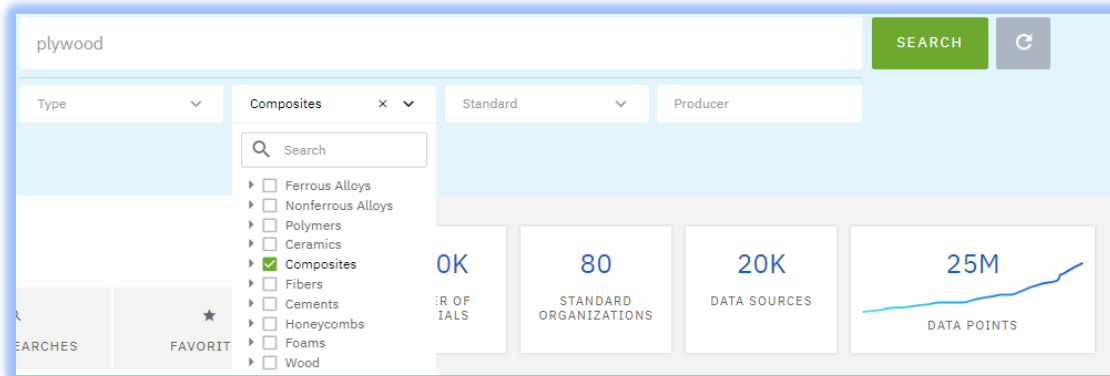


Fig.40. Quick search of plywood

Result(s) found: 3

	MATERIAL	STANDARD	COUNTRY / PRODUCER	CLASSIFICATION
1	Class I	GB	China	Wood / Wood-based panels / Plywood
2	Class II	GB	China	Wood / Wood-based panels / Plywood
3	Class III	GB	China	Wood / Wood-based panels / Plywood

Fig.41. For composite plywood – 3 results

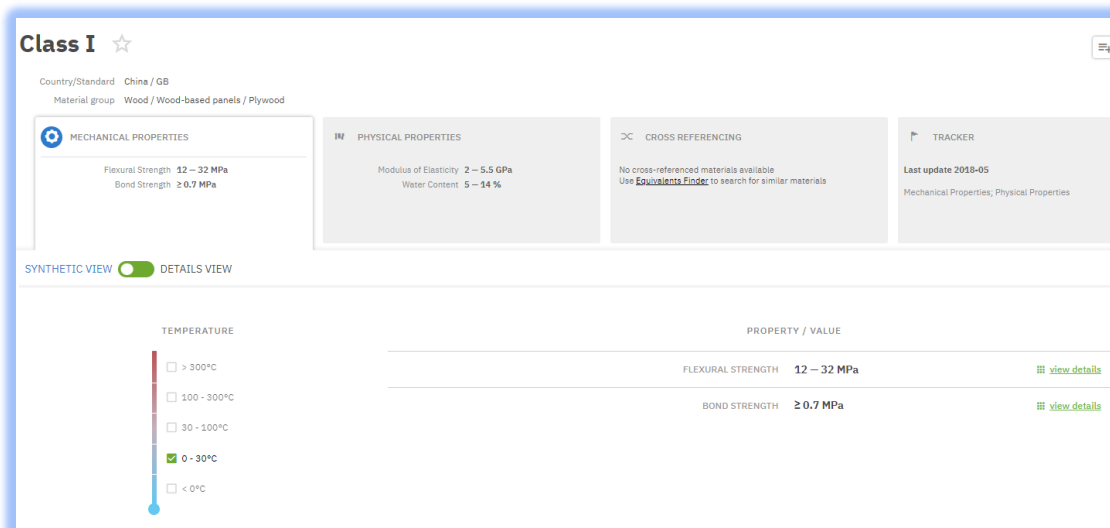


Fig.42. Mechanical properties of plywood class I

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In the figure 42 are presented the mechanical properties of plywood class I. In the figure 43 is presented the material description of plywood class I, that can be used in outdoor environment.

Material Description	
Source	GB/T 9846: 2015 / Plywood for general use
Comment	Plywood which can pass boiling test and can be used in outdoor environment

Fig.43. Material description of plywood class I

5. Conclusions

In the last years, the materials developed very much, appeared different news materials with very interesting properties realized by different world companies, that can be used in Additive Manufacturing and in other manufacturing domain to realize medical parts or for industrial domain and grace to this database, all materials developed are introduced in this platform, giving us the possibility to choose, the chemical composition, the mechanical properties, or using the search algorithms, finding the unknown material, in function of the chemical or mechanical properties.

The implications of the present research would be interesting for the manufacture by Additive Manufacturing different medical parts, using different materials using the database Total Materia, or others to know the mechanical and chemical properties that are very important to establish the manufacturing parameters and manufacturing systems and tools.

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