Graphy

3D Print the World with Graphy's Solutions

Graphy

World's 1st 3D print the world with graphy's solutions

(주) 그래피

World's 1st 3D printed Shape Memory Aligner®

Graphy Inc. manufactures photocurable resin, a new material used in 3D printers, and holds domestic and foreign patents. We are currently supplying specialized materials for various industries worldwide.

Especially in the digital dentistry market, the clinical effectiveness and excellence of Graphy materials have been recognized by many consumers and, as a result, its fame has expanded. Unlike the indirect method of manufacturing aligners using previously made models, the Shape Memory Aligner® material is the world's first to directly print orthodontic aligners using a 3D printer. The technological prowess of Graphy has been recognized by independently developing this Shape Memory Aligner® material that is Tera Harz Clear and the world's best permanent material for crowns and bridges that is TC-80DP.

Also, with the technological capabilities Graphy successfully commercialized the world's first direct 3D printing transparent aligner material, Tera Harz Clear, which everyone thought was impossible.

These new materials and the development technologies, which is the core business of Graphy, are so significant that it can create billions of dollars in technological value in the future.

Graphy plans to create a variety of solutions based on expertise and continue to develop and introduce specialized materials across all related industries, including the dental and bio market. With the photocurable materials and photopolymerization 3D printing products, we will give a distinguished value to the world and lead future industries for the coming era.

HISTORY

ABOUT GRAPHY INC

2017

01. Graphy Inc. was founded.
06. Annex Research Institute was established.
09. Certified as Venture Company
11. Factory was registered.

2018

01. Patent of [Digital Castings Using 3D Data] was registered.
04. [Technology Evaluation Outstanding Company T-5 Certification] was granted for the technology of [Modifying casts and splints with 3D data].
06. Selected as a finalist from First Round Recruitment of Item Commercialization of Entrepreneurship University Startup
09. [Technology Evaluation Outstanding Company T-5 Certification] was granted for the techniques for developing 3D cast fabrication solutions.
Won the grand prize in the preliminary round of the [Challenge K-Startup Innovation League].

2019

02. Signed an agreement with JW Holdings Healthcare to jointly develop new materials.
04. 3D Printing Material (Tera Harz) Development Technology
05. [Technology Evaluation Outstanding Company T-4] certified
Cast and Splint Manufacturing with 3D Data
11. [Technology Evaluation Outstanding Company T-4] certified
12. Successfully raised $5.3 billion in A Series funding
Formnext Exhibits, Partners with Multiple Global Companies
Selected as an outstanding invention for UV post-curing by the Korea Invention Promotion Association
Received the Minister of SMEs and Startups Award and the Korea Information and Communication Technology Agency Award
ISO 13485 Quality Management System Certified

2020

01. Light-curable polymer compositions for 3D printers were patented.
02. World's First Dentistry to have dental crown resin for 3D printing.
04. Acquired certification of the resin used for orthodontic appliances (CE Class2, FDA)
05. Credit Guarantee Fund from First Penguin Startup Selectio was granted.
07. Expanded through Graphy's own agencies in over 10 countries.
09. Raised KRW 100 million in B-series funding.
10. Selected for the Jumpstart entrepreneurship package
11. Selected as Material parts equipment startups 100
Establishment of Graphy corporate research center in Ulsan
12. THD MFDS medical device manufacturing certification level 2 obtained

2021

02. Established a subsidiary [Digital Graphy]
06. Certified as Technology Innovation Small Business (INNO-BIZ)
Designated as an Export-Promising SME
07. Acquisition of CE Class I for Photopolymerizable dental resins (THD & TFDH)
Investment from Ray Medical Public Company was acquired- 3 billion KRW
09. FDA 510K acquisition for Dental Crown Resin(TC-80DP)
11. Supply agreement with Henry Schein, the world's #1 dental company
12. 3D Printing Competition Award of Excellence and Information and Communication Industry Promotion Agency Award
Acquisition of New Excellent Product certification for Orthodontic 3D printing resin with UV-curable polyurethane acrylate

2022

05. Supply agreement with Frontier Inc.(Japan) by Dr. Kenji Ojima
Supply agreement with Scheu Group (Germany, Switzerland, Austria)
06. Supply agreement with Rodo, Aunum Group (USA, Canada)
Global supply agreement with Forestadent
07. Obtained MFDS medical device certification for TFDH(Flexible Denture) MFDS
The patent for "3D printable light-curable compositions for manufacturing transparent aligners" was registered in USA.
08. Acquisition of FDA510K for TFDH (Flexible Denture)
11. Acquisition of FDA510K for Tera Harz Clear as a resin for orthodontic aligners
Resin for orthodontic aligners, selected as World's Next Greatest Product 2022
Minister of Science, ICT and Future Planning Award granted

2023

03. Held Graphy Shape Memory Aligner Symposium
04. Participated in AAO signed multiple global scale supply contracts
Appointed for national projects totaling 4 million USD
06. Recognized as a [Technology Growth Excellent Company TI-2] by Korea Rating & Data for development and manufacturing technology of shape memory aligner using UV curable 3D printing resin
10. Completed C funding of 11 million USD
11. BR-23 Obtained FDA 510k (Class II) for BR-23
12. Awarded "Tower of Export: 3 million USD" at the Day of Trading
Awarded as one of "Outstanding Export Companies" at Hi Seoul Enterprise Festival by mayor of Seoul
Awarded as an Industrial Technology Development Merit Organization for new technology utilization development by Prime Minister
Awarded by Minister of Industry, Trade and Resources for "Contribution to Development of Convergence Manufacturing Industry"
Awarded "Future Creative Enterprise Management Award" & "Minister of Employment and Labor Award" (Sponsored by the Ministry of Science and ICT, Ministry of Employment and Labor, hosted by Money Today)
1st place in the Outstanding Brand of the Year (sponsored by JoongAng Ilbo)

DENTAL

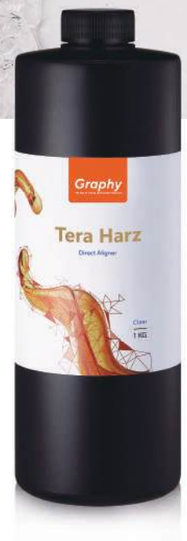
The Dental Industry is changing rapidly from the analogue method to the digital than any other industries. With the start of the transition to the 4th industrial revolution, 3D printers were first introduced for practical use and various attempts are also being made most actively.

However, despite numerous attempts to utilize 3D printing in the field of dentistry so far, there have been many clinical limitations due to lack of equipment quality and material properties.

Graphy overcame these limitations and developed and manufactured photopolymer resins for dental use, thereby acquiring acknowledgment from numerous consumers for its technology. Graphy developed and are selling nontoxic, hypo-allergenic and biocompatibility materials with excellent material properties such as high-strength, high-temperature resistance, high precision, and are holding photopolymer resins for dental use such as world's first 3D printing clear aligner, flexible dentures, as well as permanent prosthetics, denture base, dental model and implant surgical guide resins.

Graphy materials are praised by the leading companies in the world, while reducing and simplifying the manufacturing processes using the materials developed by supplementing the problems such as long preparation processes, complex manufacturing processes, and inconvenient post-processes in manufacturing various prostheses. Graphy continues research and develop various materials and will lead innovation of the dental 3D printing market.

Shape Memory Aligner®
(Tera Harz Clear)



This innovative Graphy's world-first directly 3D printable material for aligners breaks the preexisting concept of clear aligners and offers a significant advance toward the digital dentistry.

Tera Harz Clear is a material that can be optimized and customized on a patient-by-patient basis and depending on the treatment plan, you can adjust the printing thickness as thin as 0.3mm or thicker, taking advantage of the benefits of 3D printing.

The Shape Memory Effect allows for a flexible and comfortable fit during fitting, and effective control of tooth movement afterward.

Compared to the thermoforming production of transparent aligners, the production time of Tera Harz Clear aligners is relatively much shorter since manual operations such as thermo-forming, cutting, finishing, etc. are not necessary not to mention dental model printing.

Properties	Unit	TC-85	TA-28	TR-07	Remark
Color	-	Clear	Clear	Clear	
Density	g/cm³ @ 25 ℃	1.061 ± 0.02	1.091 ± 0.02	1.064 ± 0.02	
Viscosity	cps @ 25 ℃	800 ± 200	700 ± 200	800 ± 200	BrookField
Solid content	% @ 80 ℃ x 1h	≥ 98	≥ 98	≥ 98	
Shore Hardness (D)	-	≥ 85	≥ 85	≥ 85	
Flexural Strength	MPa	≥ 50	≥ 70	≥ 60	ISO 20795-2
Flexural Modulus	MPa	≥ 1500	≥ 2000	≥ 1600	ISO 20795-2
water solubility	μg/mm³	2.0	≤ 0.5	1.0	ISO 20795-2

Advantages of 3D Design

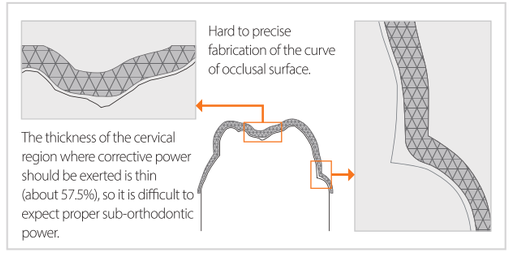
Possible to printout in the form designed by 3D Software as desired by the operator

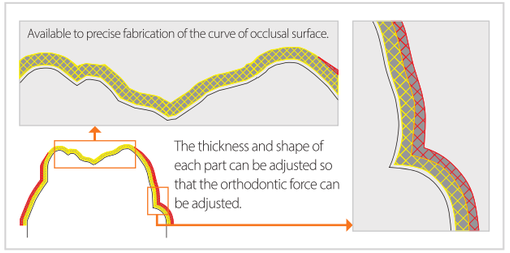
- The world first clear aligner material that can be printed with 3D printer. Direct Aligner has no shape limitation for fabrication with optimized 3D design.
- Available to adjust and design the form and the thickness of each tooth in order to make the optimal orthodontic force by designated orthodontics' plan.
- On the other hand, the current method making clear aligner such as vacuum forming has no way to adjust the form and thickness of each tooth.
- Graphy's direct 3d printed clear aligner can overcome the limitation of existing clear aligner by designing combined and optimized form and thickness for making ideal and effective tooth movement and rotation.
- Compared to the thermoforming clear aligner which is difficult to contact with detailed and complex surface, Direct aligner is expected the better treatment effect due to the perfect contact surface between teeth and aligner which is 3D Printed and Designed from 3D Scan data.

Possible to produce with minimal Block Out using 3D Software

- In case of the current method, due to the deformation and inconvenience during inserting and removing, blocking out of the cervical and interproximal space is necessary by fabricated dental model.
- Direct Aligner needs only limited blocking out onto only the excess under cut of the interproximal space using 3d software.
- The difference of the amount of block out comes from the orthodontic force by the characteristic of aligner which holds and moves the teeth. In case of the existing method, there is a risk that the tooth axis can become tilted as the contact point with the tooth is mainly formed on the upper and middle part of the crown and the cervical part proceeded with block out is reduced.
- In case of direct aligner, the orthodontic force is exerted since the entire part of the crown, up to the cervical part, is held. So, it can minimize the side effect of tilting the tooth axis and maximize the orthodontic force.

Orthodontic Force Adjustable





Proven clinical effectiveness in the literature

The mechanical properties of the 3D printed Shape Memory Aligner® using the Tera Harz Clear showed no change in properties even one week after the patient wore it.

(quoted from: European Journal of Orthodontics, 2021, 1–5 / doi: 10.1093/ejo/cjab022 / University of Zurich / Dr. Nearchos Panayi)

Undeniable strong points

TC-85DAC	Other materials
The thickness is uniform as designed, and the undercuts are fully joined thanks to Shape Memory	Not uniform, stretches during thermoforming, resulting in a thin, floating shape that blocks out the undercuts

Shape Memory

Minimize inconvenience of wearing and removing through shape memory function

The softening action of Shape Memory Aligner® in warm water reduces patients' inconvenience of wearing and removing even the minimized block out makes the patients uncomfortable.

Enhancement of orthodontic force through shape memory function

Minimized block out of direct aligner brings the maximum orthodontic force using shape memory function.

The recovering of orthodontic force through shape memory function

When you feel the orthodontics force and elasticity of Shape Memory Aligner® decrease, simply dipping it in warm water will make it recover the force and the original form.

Convenience of heat disinfection

Shape Memory Aligner® can be disinfected by heat, whereas the thermo-formed materials get completely deformed in hot water. After a long use and subsequent contamination from FOB(foreign Object Debris), the Shape Memory Aligner® can be disinfected by heat of temperature under 100℃ where its clear state, its original shape as well as its mechanical properties are recovered all together.

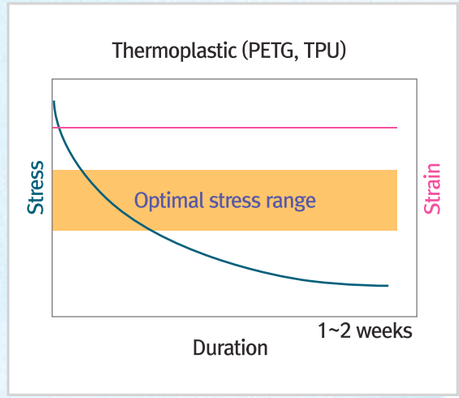
Convenience of Storage

Shape Memory Aligner® can be stored in any little case. Its commercial case has a mirror inside and is very small and compact so you can carry around to store your aligner when having a meal. After the meal, all you need to do is simply brush your teeth before wearing your aligner and warm your aligner in warm water to disinfect it and bring it back to its original shape.

Perfectly transparent

Graphy's Tera Harz Clear maintains its perfect transparency unlike other materials that are easily contaminated after a week or so of using. It is hard to notice that you wear the Shape Memory Aligner®. Whenever it's losing its transparency, you can make it clear again just by brushing it with toothpaste and a brush.

Aligner-Stress Relaxation



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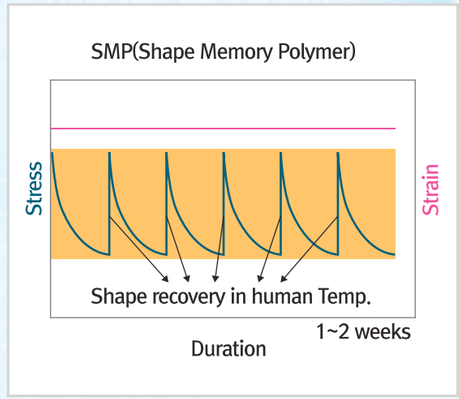
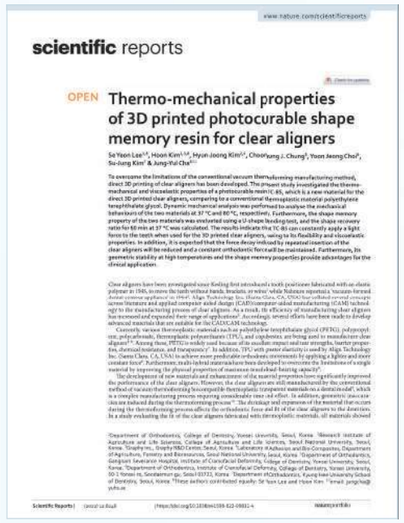




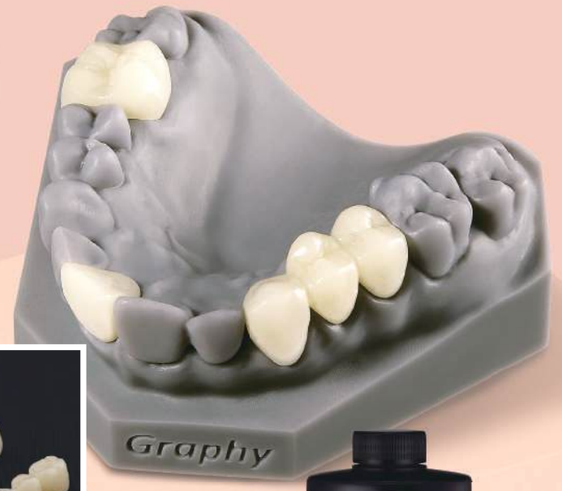
nature SCIENTIFIC REPORTS

Scientific Repors

To overcome the limitations of vacuum thermoforming manufacturing methods, a technology to directly 3D print transparent aligners has been developed.

In this study, we investigated the thermal and viscoelastic properties of photocurable resin Tera Harz Clear, a new material for direct 3D printing transparent aligners, compared to polyethylene terephthalate glycol, a conventional thermoplastic material. The U-bend test was carried out to evaluate the shape memory properties of both materials and calculate the shape recovery rate at 37℃ for 60 minutes. The results indicate that the Tera Harz Clear can continuously apply a light force to the teeth when used in 3D printed clear aligner. Geometric stability and shape memory at high temperatures is an advantage in clinical settings.

Permanent C&B (TC-80DP)



Tera Harz C&B(TC-80DP) is a permanent C&B resin with the world's highest flexural strength (ISO-10477). TC-80DP has obtained KFDA Class II, CE Class II-a medical device certification, which means its stability of physical properties is approved by the international authorities.

TC-80DP is an internationally proven 3D printing material and you can use it not only for temporary treatments but also for permanent ones from single crown to full bridge.

Properties	Unit	TC-80DP	Remark
Color	-	A1, A2, A3, B1, OM1	
Density	g/cm³ @ 25 ℃	1.076 ± 0.02	
Viscosity	cps @ 25 ℃	2000 ± 300	BrookField
Solid content	% @ 80 ℃ x 1h	≥ 98	
Shore Hardness (D)	-	≥ 90	
Bi-axial Flexural Strength	MPa	≥ 350	ISO 6872
Flexural Strength	MPa	160(ISO Standard), 220(Graphy Standard)	ISO 10477
Flexural Modulus	MPa	3500(ISO Standard), 4500(Graphy Standard)	ISO 10477
water sorption	μg/mm³	18.9	ISO 10477
water solubility	μg/mm³	0.5	ISO 10477

Permanent C&B (BR23)

For Long Bridge

Opaque, A/B/C/D shade

This is the best material for implant prosthetics or natural tooth prosthetics for bridges of six or more teeth. It was developed to be used as a resin for permanent dental crowns for long bridges, and has been verified for its physical stability and obtained MFDS Class 2 and CE Class IIa. The material has a soft, stable bond and high elongation.
It can be used temporarily or permanently for all indications, including full-mouth bridges, and is a 3D printer-specific material.
It is extremely durable due to its high flexural strength and abrasion resistance, and its absorbency and solubility make it suitable for long-term prosthetics. In addition, the material has the advantage of being applicable to a variety of treatment validations.
Product Features: non-toxic and biocompatible / high bending and tensile strength / applicable to a variety of indications including long bridge, C&B, inlay, onlay, veneer, etc.

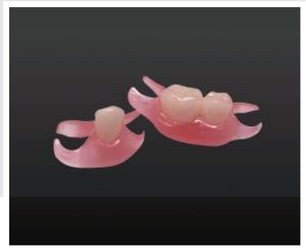
Properties	Unit	BR-23	Remark
Color	-	A,B,C,D, OM	
Density	g/cm³ @ 25 ℃	1.015 ± 0.02	
Viscosity	cps @ 25 ℃	1300 ± 300	BrookField
Solid content	% @ 80 ℃ x 1h	≥ 98	
Shore Hardness (D)	-	≥ 85	
Flexural Strength	MPa	≥ 100	ISO 10477
Flexural Modulus	MPa	≥ 2500	ISO 10477
water sorption	μg/mm³	10	ISO 10477
water solubility	μg/mm³	0.2	ISO 10477

Denture Base
(THD)

Tera Harz Denture Base(THD) is removable and brings high satisfaction to the patients due to its excellent color expression and its durability from remarkable water sorption. When used with Graphy's permanent materials, it guarantees the best strength and stability and esthetical performance, offering the best results to the patients.

Properties	Unit	THD	Remark
Color	-	Magenta	
Density	g/cm³ @ 25 ℃	1.063 ± 0.02	
Viscosity	cps @ 25 ℃	1500 ± 300	BrookField
Solid content	% @ 80 ℃ x 1h	≥ 98	
Shore Hardness (D)	-	≥ 85	
Flexural Strength	MPa	140(ISO Standard), 190(Graphy Standard)	ISO 20795-1
Flexural Modulus	MPa	3000(ISO Standard), 3900(Graphy Standard)	ISO 20795-1
water sorption	μg/mm³	15.9	ISO 20795-1
water solubility	μg/mm³	0.6	ISO 20795-1

Flexible Denture
(TFDH)



Tera Harz Flexible Denture (TFDH) is a resin for flexible and removable partial dentures.

This material is best suited to fill in the gap of a missing tooth to prevent other teeth from shifting, and it is also a soft material for easy wearing and removal.

When used with Graphy's permanent materials, it guarantees the best strength and stability and esthetical performance, offering the best results to the patients.

Properties	Unit	TFDH	Remark
Color	-	Magenta	
Density	g/cm³ @ 25 ℃	0.998 ± 0.02	
Viscosity	cps @ 25 ℃	700 ± 200	BrookField
Solid content	% @ 80 ℃ x 1h	≥ 98	
Shore Hardness (D)	-	≥ 80	
Flexural Strength	MPa	≥ 110	ISO 20795-1
Flexural Modulus	MPa	≥ 2800	ISO 20795-1
water sorption	μg/mm³	10.8	ISO 20795-1
water solubility	μg/mm³	1.4	ISO 20795-1

Model
(S-100M)

One of the earliest and most common 3D printed creations used in dentistry is the dental model.

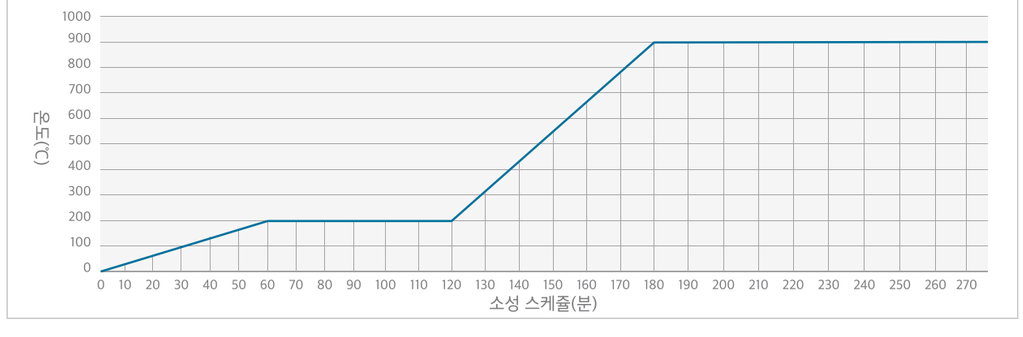
With the S-100M material, traditional impressions are no longer necessary, as the intraoral scanner can be used to acquire oral data and the model can be created directly by the printer. This saves dentists time and money in transferring a patient's intraoral image to its making, and the simplicity of the process brings a more accurate intraoral image as the fewer the steps of the whole process, the less the error is.

Properties	Unit	S-100M	Remark
Color	-	Grey·Beige	
Density	g/cm³ @ 25 ℃	1.110 ± 0.02	
Viscosity	cps @ 25 ℃	600 ± 200	BrookField
Solid content	% @ 80 ℃ x 1h	≥ 98	
Shore Hardness (D)	-	≥ 90	
Flexural Strength	MPa	≥ 110	ASTM D790
Flexural Modulus	MPa	≥ 2500	ASTM D790
Tensile Strength	MPa	≥ 60	ASTM D638
Tensile Modulus	MPa	≥ 2500	ASTM D638
Elongation	%	≤ 10	ASTM D638
Impact strength	J/m²	≥ 3000	ASTM D256 (Notched)

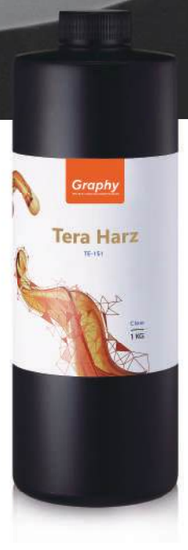
Castable
(SC-130)

Metal prostheses have such a long history in dentistry. Until now, metal prostheses have been made by using wax as a casting material, which requires a great deal of time and effort for specialized personnel to handle with precision. Now that 3D printers are widely used in the dental field, it is possible to design castings using 3D modeling and print them with precision and accuracy, allowing for faster and more accurate castings than ever before.

Properties	Unit	SC-130	Remark
Color	-	Green	
Density	g/cm³ @ 25 ℃	1.110 ± 0.02	
Viscosity	cps @ 25 ℃	100 ± 50	BrookField
Solid content	% @ 80 ℃ x 1h	≥ 98	



TE-151



The demand for flexible and elastic materials in dental applications such as mouthguards continues to grow. Most products of the materials like silicone are pretty much off-the-shelf, but dentistry requires personalized products, so it's very time-consuming and expensive to customize them.

However, when 3D printing the products, they can be made with a personalized design and that saves time and costs. This material was created to make that possible.

Properties	Unit	TE-151	Remark
Color	-	Clear	
Density	g/cm³ @ 25 ℃	1.063 ± 0.02	
Viscosity	cps @ 25 ℃	1300 ± 200	BrookField
Solid content	% @ 80 ℃ x 1h	≥ 98	
Shore Hardness (A)	-	≥ 75	
Tensile Strength	MPa	≥ 10	ASTM D638
Elongation	%	≤ 110	ASTM D638
Water sorption	μg/mm³	37.9	ASTM D638
Water solubility	μg/mm³	3.4	ASTM D638

Gingiva Mask (TE-600)

Tera Harz Gingiva Mask is a gingiva-like material with a flexible and soft texture. It is ideal for combination with implant models. Tera Harz Gingiva Mask resin has excellent elasticity and tear resistance and reproduces the feeling of actual gums. Due to its high accuracy, the dental technician can print gingiva mask more easily, which perfectly fits the dental models, and with its smooth surface finish can have the optimum results in the aesthetic aspect.

Properties	Unit	TE-600	Remark
Color	-	Red	
Viscosity	cps @ 25 ℃	400 ± 100	BrookField
Solid content	% @ 80 ℃ x 1h	≥ 98	
Shore Hardness (A)	-	≥ 50	
Tensile Strength	MPa	≥ 1.5	ASTM D638
Tear Strength	kN/m	≥ 6	ASTM D638
Elongation	%	≥ 150	ASTM D638

Surgical Guide (SG-100)

This implant surgical guide resin from Graphy allows the surgeon to implement an optimized design exactly as intended for the patient's situation, or the case.

This allows the users to drill at the correct angle and depth. What this surgical guide resin from Graphy more special is that users don't need drill sleeve because the guide hole is precise and tight.

With a Heat Distortion Temperature (HDT) of over 130℃, there is no problem with sterilization via autoclave, and the transparency can be adjusted depending on the post-processing method.

Properties	Unit	SG-100	Remark
Color	-	Clear	
Density	g/cm³ @ 25 ℃	1.110 ± 0.02	
Viscosity	cps @ 25 ℃	600 ± 200	BrookField
Solid content	% @ 80 ℃ x 1h	≥ 98	
Shore Hardness (A)	-	≥ 90	
Flexural Strength	MPa	≥ 110	ISO-20795-1
Flexural Modulus	MPa	≥ 2500	ISO-20795-1
Tensile Strength	MPa	≥ 60	ASTM D638
Tensile Modulus	MPa	≥ 2500	ASTM D638
Elongation	%	≤ 10	ASTM D638
Impact strength	J/m²	≥ 3000	ASTM D256
water sorption	μg/mm³	16.2	ISO-20795-1
water solubility	μg/mm³	0.6	ISO-20795-1

UNIZ NBEE

Key Features

Ultimate possibility with larger printing space and simpler workfolw.
Industrial printing has never been so easy and fast with the Liquid Crystal Display.

High Efficiency Liquid Cooling
Maintain system temperature below 40℃

Micro-Stereo Composite
Patent low force peel technology

High Power Collimated Light
16mW/cm² high power, 95% Uniformity

Resin Temperature Control System
Maintain optimal reaction Temp

	Description	Specification
PERFORMANCE	Printing Technology	LCD Stereo Lithography Technology
	Build Volume	192 x 120 x 180mm
	XY Resolution	49.8㎛
	Maximum Accuracy*	±10㎛
	Layer Thickness(Z Resolution)	10 ~ 200㎛ (25, 50, 100㎛ recommended)
	Separation Mechanism	Stereo-Polymer Multi-layer Film Peel
	Support	UNIZ smart support technology
STRUCTURAL	Dimension / Weight	380 X 380 X 1230mm / 60Kg
	Working Temperature	18 ~ 28℃
	Power Requirement	110V/60Hz 6A | 220V/50Hz 3A
	Optical System	4th Generation Collimated Light Source
	Connectivity	USB Flash Drive, Wi-Fi, Ethernet
	Control Pannel	7" Touch Screen

Tera Harz Smart Robot

The most advanced integrated device for Shape Memory Aligner manufacturing.

Advantages of Tera Harz Smart Robot

This system is more than just a system. The excellence of the world's first Shape Memory Aligner is more elaborated, possible by introducing a state-of-the-art robot-system for greater excellence and convenience. Shape Memory Aligner is made more efficient with the solution of Graphy's new Tera Harz Smart Robot.

01 Competitive excellency in technology

Deliver consistent quality of product, 24hr operation time and optimized automated reprogramming.

02 Improvement outcomes

Improve the quality of the outcome through sophisticated operation.

03 Economic benefits

Reduce consumables, accelerate the treatment and enhance productivity.

04 Time efficiency

Same day and convenient treatment.

Product Name	Tera Harz Smart Robot (THSR)
Model Name	R2K2U
Weight(Kg)	20
Application	In-house Aligner Manufacturing (lab/clinic)
Voltage	220V(110V Compatible Module Provided)
Usage	Production Line
After Warranty Service	Video Technical Support
Type	6-axis Vertical Multi-joint
Machine type	Aligner Manufacturing Robot Arm 6 Axis
Aligner Material	Tera Harz Clear
Warranty	1 year

Manufacturing process of Tera Harz Smart Robot

01 Aligner printing

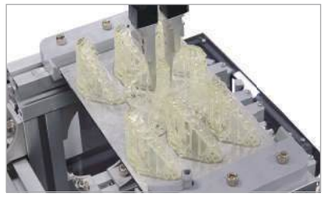
When the Tera Harz Smart Robot(THSR) picks up the pen and touches the LCD, the print will start.

Once the printing is finished, the printer door will open.

02 Detach the build plate

Tera Harz Smart Robot(THSR) loosens the knob that secures the build plate in the printer and removes it.

The build plate is then flipped and mounted onto the alignment disassembly Jig.



03 Remove the Aligner

Use the tip to initially separate the aligner from the support.

After changing the tip, completely detach the initially separated aligner.

Arrange the separated aligners and mount them in order on the Spinner holder.

04 Resin removal

Lift the Spinner holder and mount it onto the Spinner.

After mounting, turn the digital knob of the spinner to start the de-resining process.

Once de-resining is complete, open the door and remove the holder.

05 Curing

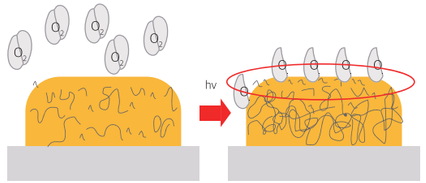
Take each aligner from the Spinner holder and mount it onto the curing plate (up to 8 pcs).

Lift the curing plate and position it inside the curing device.

Close the door and press the LCD to start curing.

Benefits of Nitrogen Curing

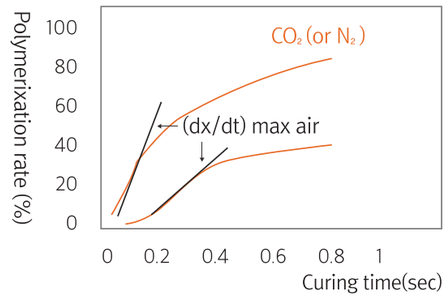
- Achieve the best mechanical property strength and optimal color depth
- Improved surface gloss (C&B, Denture, etc.) and quality and conformity of castings in nitrogen curing
- Minimize surface stickiness of printouts
- Minimize water absorption & water solubility by disrupting oxygen bonds during curing



Oxygenation Reactions on Surfaces

· Surface Tack Generation by Oxygen

· UV curing uses radical polymerization resins, and radical polymerization is the generation of radicals by UV irradiation. If radicals combine with atmospheric oxygen before resin bonds, oligomers or monomers may remain on the surface and cause surface tack.



Polymerization rate based on atmosphere

· Increased polymerization rate in CO_2,N_2 atmosphere compared to Air atmosphere

Quoted from "Optimize the UV curing process" Science&Technology,2008

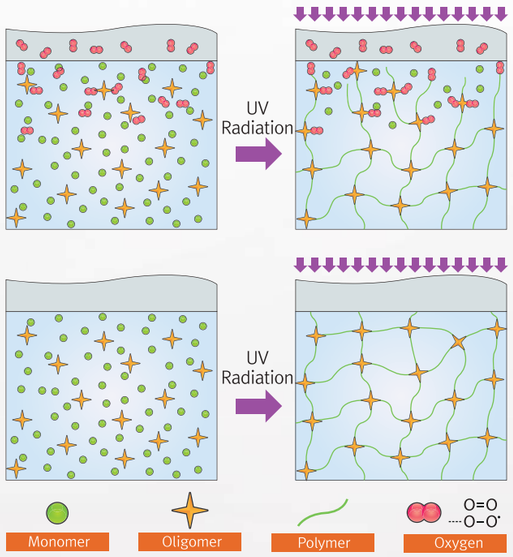
Inhibition of free radical polymerization by oxygen

Photopolymerization in the presence of atmospheric oxygen

Photocurable resins undergo a radical reaction when exposed to light. In the presence of oxygen, even if radicals are produced, the radicals and oxygen will react with each other. Because oxygen attacks radicals, it inhibits radical polymerization of the monomers and oligomers inside the resin. This mechanism produces an unreacted monomer. This results in a structure with a low cross-linking density. The surface of the cured resin, which has a low surface cross-linking density, can absorb water in a moist environment (oral cavity), resulting in haze and elution of unreacted material.

Photopolymerization in the absence of atmospheric oxygen

The probability of encountering an acyl group increases if the radical has had enough time to stabilize. A cured resin with a strong structure that exhibits high crosslinking density will be stable against moisture. In addition, there is extremely little unreacted monomer and very little risk of exfoliation due to the high crosslinking density.



Mandal, Joydeb, Kaihuan Zhang, and Nicholas D. Spencer. "Oxygen inhibition of free-radical polymerization is the dominant mechanism behind the "mold effect" on hydrogels." Soft Matter 17, no. 26 (2021): 6394-6403.

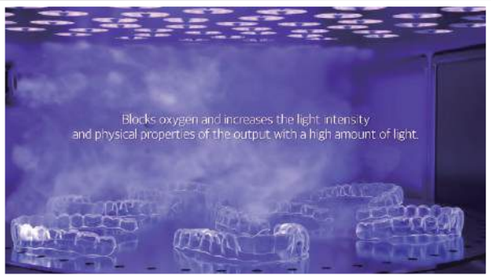
THC 3rd Generation Nitrogen Curing Machine

Tera Harz Cure

World's first UV curing device to achieve 100% polymerization conversion of materials

- 280,000Mj/cm2,1,000MW/cm2(5 minute-curing based), the best material intensity and shade with high intensity UV energy
- Ability to store 5 curing conditions per material
- The optimal light level for each printed materials(Level 1~5)
- 360° UV irradiation and optimal LED arrangement for best light uniformity
- Safety cooling system based on LED temperature
- Maximum curing size(180mm,360 Turntable)

[Nitrogen Generation]



[Minimize Oxygen in the Chamber (artificial image)]

Benefits of Nitrogen Curing

Able to obtain the best mechanical properties and optimal shading

Minimize oxygen to improve surface quality for C&B, denture fabrications, etc.

Perfect final metal crown alignment by improving casting surface quality

Nitrogen curing is mandatory for dental and medical field products

(for surface tacky and residual polymer removal)

Improved economic efficiency and convenience compared to existing nitrogen curing machines connected to a nitrogen tank.

Properties	Description
Display	7.9"TFT Touch LCD
LED Wavelength	405nm
LED Power	200W
UV Energy Density Irradiance of UV (5 minute-curing based)	280,000 mJ/cm² 1,000 mW/cm²
Curing Chamber	Ø180 x 650mm
Dimension (weight)	275 x 310 x 310mm (8.5kg)

Tera Harz Spinner

- Fast and efficient resin removal
- Powerful and noiseless spin
- Strong and practical design

SPINNER

Size	390 X 450 X 430(WDH) (MM)
Weight	6.5Kg
Capacity	MAX. 16 aligners
Time	spinning time adjustable (5 minutes for aligners)
Functions	Digital display Internal heating during operation Safety Stops Simple and efficient maintenance

Shape Memory Aligner®

Tera Harz Care

- Takes care of the hygiene of Shape Memory Aligner®s as well as its comfortable wearing and removing
- Easy operation
- Portable size

CARE

Size	Φ115 X 103H
Weight	325g
Capacity	200ml
Maximum temperature	50℃
Time	5minutes (Auto power off)
Functions	Ultrasound warmer + ultrasound Auto power off

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