

DENTAL VISIONIST 1/14

A new variety of materials – new opportunities

The prospects that new materials
are offering in digital dentistry 2.0



Highly esthetic anterior restorations

Master dental technician Daniel Carmona Cando describes how glass ceramics can be used to achieve successful results in esthetically challenging scenarios.

> [Page 8](#)



Remarkable load capacity

Prof. Russell Giordano reports on the results of recent performance tests carried out using the hybrid ceramic.

> [Page 10](#)

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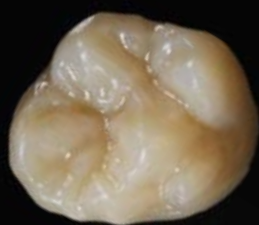


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Editorial

"Professional selection of materials and new opportunities in digital dentistry"



The variety of CAD/CAM materials available can either be a blessing or a curse. That is why Prof. Gerwin Arnetzl has looked at how to make this selection in a professional manner so that users can make the "right" decision for any indication.

How new materials fare in practice is shown by reports from clinical use such as case documentation on the VITA ENAMIC hybrid ceramic and the zirconia-reinforced glass ceramic VITA SUPRINITY.

This issue also looks at the new opportunities that have been created in digital dentistry in connection with innovative materials. Finally, interesting information is also provided on how to use your own CAD/CAM system in combination with VITA CAD/CAM materials.

DENTAL VISIONIST wishes you an enjoyable read!

Angeley Eckardt
Managing Editor



CAD/CAM: a variety of materials

Is there a "right" material for every indication and how do I select it?

> [Page 4](#)



An update on VITA ENAMIC from research

The results of recent performance tests

> [Page 10](#)



Digital dentistry 2.0

New opportunities in the computer-aided fabrication of restorations

> [Page 14](#)

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INFORMATION

The testimonials by dental surgeons and dental technicians published in this magazine are based on practical experience with the specified VITA materials gained during the course of processing, and/or on manufacturer information based on the data provided in "Technical and scientific documentation" (VITA Zahnfabrik, Bad Säckingen, Germany; download from www.vita-zahnfabrik.com). The testimonials from the dental surgeons and dental technicians named reflect the status as valid on 27.06.2014. The testimonials by developers or researchers published in this magazine are based on individual and/or internal studies conducted by VITA R&D (VITA Zahnfabrik, Bad Säckingen, Germany) and/or on the results of pilot testing.

Criteria for selecting material



CAD/CAM: is a variety of materials a blessing or a curse?

In this article, university professor Dr. Gerwin Arnetzl (Clinical Department for Prosthetic Dentistry of the University of Graz, Austria) looks at criteria for professional material selection. The central issue for many CAD/CAM practices and laboratories today is: is there a "right" material for every indication?

> What processing characteristics?

> What esthetic requirements?

> What indication: inlay, veneer, crown, ...?





Prof. Dr. Gerwin Arnetzl
Graz, Austria

The market for all-ceramics is growing, and in addition to conventional feldspar and oxide ceramics, the dental industry is also offering innovative ceramics such as the VITA ENAMIC hybrid ceramic. Yet this variety of materials can be both a blessing and a curse: it has never been possible to differentiate more clearly than today when making a patient and case-specific selection. At the same time, it has never been more difficult to maintain an overview, as there are often several material solutions for a single class of indications. Dentists require appropriate knowledge of material science in order to decide which material is the right one. Personal preference can certainly play a role in this respect. However, simply specifying all-ceramic on the order form and thus transferring the responsibility to the dental technician is not a solution.

"It has never been possible to differentiate more clearly than today when making a patient and case-specific selection."

Benchmark for evaluation

Traditionally, flexural strength is often used as a benchmark to evaluate dental materials. However, from materials science we know that other parameters have an important role to play in clinical application. The performance of a test specimen (= "bending bars") during measurement of flexural strength can only provide limited information regarding the long-term clinical behavior of a material. For this reason, greater attention should be paid to material characteristics such as fracture toughness, Weibull modulus and modulus of elasticity.

Overview of the material characteristics of dental materials and biomaterials

Material	Material class	Manufacturer	Flexural strength σ_f [MPa]	Fracture toughness K_{1c} [MPa \sqrt{m}]	Vickers hardness H [GPa]	Modulus of elasticity E [GPa]
VITABLOCS Mark II	Feldspar ceramics	VITA Zahnfabrik, Bad Säckingen, Germany	137.83 ^a (12.4)	1.12 ^a (12.4)	6.24 ^a (0.43)	57.20 ^a (3.6)
VITA ENAMIC	Hybrid ceramic		150 – 160 ^d	1.5 ^d	2.5 ^d	30 ^d (2)
VITA In-Ceram YZ	Zirconia		1358.53 ^a (136.54)	4.95 ^a	13.91 ^a (0.09)	184.21 ^a (2.57)
IPS e.max CAD	Lithium disilicate	Ivoclar Vivadent, Schaan, Liechtenstein	344.05 ^a (64.5)	2.32 ^a	6.02 ^a (0.21)	79.75 ^a (4.92)
Dentin	Biomaterial		109 – 160 ^c	2.65 ^b	0.76 ^b	18.15 ^b
Enamel	Biomaterial			1.05 ^b	4.15 ^b	76.75 ^b

a) Mean values of various measurements from reference a

b) Mean values from a variety of sources (summarized, see reference b)

c) Value for natural dentin from reference c

d) Values for VITA ENAMIC determined during internal studies conducted by VITA R&D, Bad Säckingen, Germany

Bibliography:

a) Coldea A., Swain M.V., Thiel N., 2013a, In-vitro strength degradation of dental ceramics and novel PICN material by sharp indentation. Journal of the Mechanical Behavior of Biomedical Materials 26, 34-42.

b) Coldea A., Swain M.V., Thiel N., 2013b, Mechanical properties of polymer-infiltrated-ceramic-network materials. Dental Materials 29, 419-426.

c) Arola D.D., Reppel R.K., 2006, Tubule orientation and the fatigue strength of human dentin. Biomaterials 27, 2131-2140.

d) VITA ENAMIC technical and scientific documentation, Bad Säckingen, Germany; download from www.vita-enamic.com

Decision-making criteria

The first step in selecting a material is to consider whether a material that offers high stability is required for the posterior area or whether highly esthetic material is necessary for use in the anterior area. In principle, oxide ceramics such as VITA In-Ceram YZ, for example, are preferable for bridge frameworks, while multichromatic feldspar ceramics such as VITABLOCS TriLux forte are preferable in the anterior area. The decision is already a little more difficult in the case of implant-supported restorations. This is because comparatively high failure rates have been observed in the case of implant-supported restorations with conventional ceramics.¹ A hybrid ceramic can be beneficial in this case, such as VITA ENAMIC with its modulus of elasticity similar to dentin. Moreover, a hybrid ceramic can also be useful for critical indications such as post abutments in devitalized teeth and in patients with functional disorders. These types of restorations are, however, still at an experimental stage until sufficient clinical data becomes available.

Processing

As a general rule, material-specific requirements and process-related circumstances must be taken into consideration during preparation and design for every CAD/CAM material.² Adhesive cementation is mandatory for all-ceramics as the stability of the restoration is effectively doubled as a result of the adhesive bond.³ If compromises are made during processing with the intention of saving time, the entire system will inevitably suffer as a result.

References

- 1) Brägger U., Aeschlimann S., Bürgin W., Hämmerle C., Lang N.P., Biological and technical complications and failures with fixed partial dentures (FPD) on implants and teeth after four to five years of function. Clin Oral Implants Res. 2001 Feb; 12(1):26-34.
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- 3) Mörmann W. et al.; "Der Einfluss von Präparation und Befestigungsmethode auf die Bruchlast vollkeramischer Computerkronen" [The influence of preparation and the approach to cementation on the fracture load of all-ceramic computer crowns], Acta Med Dent Helv, Vol.3:2/1998.

POSSIBLE DECISION-MAKING CRITERIA FOR MATERIAL SELECTION (EXAMPLE)

1. INDICATION?

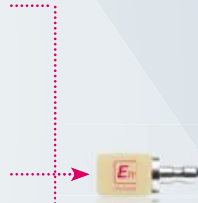
> Crown restoration that is gentle on tooth substance

2. ESTHETIC REQUIREMENTS?

> Highly esthetic requirements in the anterior area
> Average esthetic requirements in the posterior area

3. PROCESSING CHARACTERISTICS?

> Simple and fast
> Precise results



RECOMMENDED INDICATION AREAS FOR VITA CAD/CAM MATERIALS











	Smaller, esthetic reconstructions		VITABLOCS® Mark II Feldspar ceramic/monochromatic
	Highly esthetic reconstructions in the visible area		VITABLOCS® TriLux/TriLux forte/RealLife® Feldspar ceramic/multichromatic
	Minimally invasive restorations and posterior crowns		VITA ENAMIC® Hybrid ceramic/monochromatic
	High-strength material with a wide range of indications		VITA SUPRINITY® Glass ceramic, precrystallized/monochromatic
	Simple, small and esthetic reconstructions		VITA SUPRINITY®FC* Glass ceramic, fully crystallized/monochromatic

Fig. 1 Process-oriented sample illustration of material selection

Fig. 2 Overview of the indication areas recommended by the manufacturer

* Scheduled for availability during 2015

Initial findings of a follow-up evaluation of VITABLOCS crowns

In a study published in 2005 on monolithic molar crowns fabricated using VITABLOCS ceramics, associate professor Dr. Andreas Bindl of the Dept. for Computer-Aided Restorative Dentistry at the Center of Dental Medicine of the University of Zurich, who also has a practice near Zürichberg, Switzerland, determined clinical success rates of up to 94.6 % over an observation period of up to 6 years.¹

In this article he now describes his clinical experience based on the findings of a current follow-up evaluation.



Associate professor Dr. Andreas Bindl
Zurich, Switzerland

We have been using VITABLOCS for many years for single-tooth restorations, from inlays and onlays to veneers through to partial crowns and crowns. Patients who were fitted with a CEREC crown made from VITABLOCS ceramic from 1995 to 2005 are currently being called for follow-up evaluation in order to investigate the clinical performance. Investigation and evaluation – e.g. based on the USPHS (United States Public Health Service) criteria and on the gingival situation – have not yet been concluded. However initial examination of the data that has been collected indicates results ranging from good to excellent.

Success factors

The good to excellent clinical success rates of VITABLOCS crowns are due to the interaction of a variety of parameters. On the one hand, the homogenous structure of the ceramic blocks, which are industrially fabricated under standardized conditions, has a large role to play. On the other hand, VITABLOCS restorations should always be carefully seated adhesively while observing sufficient wall strengths, particularly in the posterior area (e.g. in the case of crowns at least 1.5 mm in the occlusal area according to the manufacturer), in order to ensure long-term clinical viability of the crown.

"The data indicates results ranging from good to excellent."

Thanks to the considerable homogeneity of the material and the effective polishing related to this, experience has shown, for example, that a low level of plaque accumulation is observed.

References

- 1) Bindl A. et al., "Survival of ceramic CAD/CAM crowns bonded to preparations with reduced macroretention geometry." I J P. 2005 May-Jun;18(3): 219-24.



Fig. 1 Initial situation/preparation



Fig. 2 Baseline study; VITABLOCS posterior crowns on teeth 24-27



Fig. 3 Follow-up examination after 14.5 years in situ, intact VITABLOCS posterior crowns on teeth 24-27



Clinical case study: esthetic anterior restoration with VITA SUPRINITY



*Daniel Carmona Cando,
master dental technician
Barcelona, Spain*

Daniel Carmona Cando, a master dental technician from Barcelona, Spain, uses the following complex patient case to report on how laboratory users can achieve excellent results with VITA SUPRINITY restorations. This article provides a step-by-step explanation of how VITA SUPRINITY and the VITA VM 11 veneering ceramic can be used to achieve esthetic results in a challenging clinical scenario.



→ BEFORE

Fig. 1 Initial situation

1. Initial situation

The case documentation shows a 39 year old patient who presented at Dr. Diego Alexander Cardenas' practice in Barcelona, Spain, with two aging metal-ceramic crowns and loss of soft tissue in regions 11 and 21 (Fig. 1). Following comprehensive consultation, she opted for a new crown restoration fabricated using VITA SUPRINITY. Crucial in this respect was the unique characteristic of this new material that combines the esthetic potential of a glass ceramic with the improved strength provided by reinforcement with zirconia.

2. Complexity and material selection

Just how complex this case actually was only became apparent following removal of the inadequate restorations for preparation: the tooth stumps were strongly discolored and fitted with gold metal abutments. The question needed to be addressed as to whether the planned restoration could mask this sufficiently in order to achieve a satisfactory result from a visual perspective. In the LABORATORIO DENTAL FONT-CAR laboratory, we met this challenge by combining the esthetic possibilities afforded by VITA SUPRINITY using the cut-back technique with the low-melting fine-structure feldspar ceramic VITA VM 11.



Fig. 2 Preparation for the post abutment fabricated using VITA ENAMIC



Fig. 5 Following reduction using cut-back technique



Fig. 3 Virtual design of the anterior crowns



Fig. 6 Try-in of the crystallized, and as yet unveneered VITA SUPRINITY crowns



Fig. 4 Try-in of the milled VITA SUPRINITY crowns prior to crystallization



Fig. 7 Crowns veneered using VITA VM 11 successfully cover the dark stumps

Can dark stumps really be sufficiently masked using VITA SUPRINITY?

3. Milling and reworking

The inLab MC XL system (Sirona Dental GmbH, Wals, Austria) was used for virtual design and milling of the crowns. Following the CAM process, reworking of the new high-performance glass ceramic should only be carried out at low pressure using fine-grained diamond-tipped milling tools as well as special polishing instruments. For cost-effective surface processing that is gentle on the material, the technical and clinical versions of the VITA SUPRINITY Polishing Set are recommended. For crystallization firing, any vacuum furnace that supports slow cooling can be used. The crowns can be placed directly on to honeycomb firing trays with platinum pins, without using firing paste.

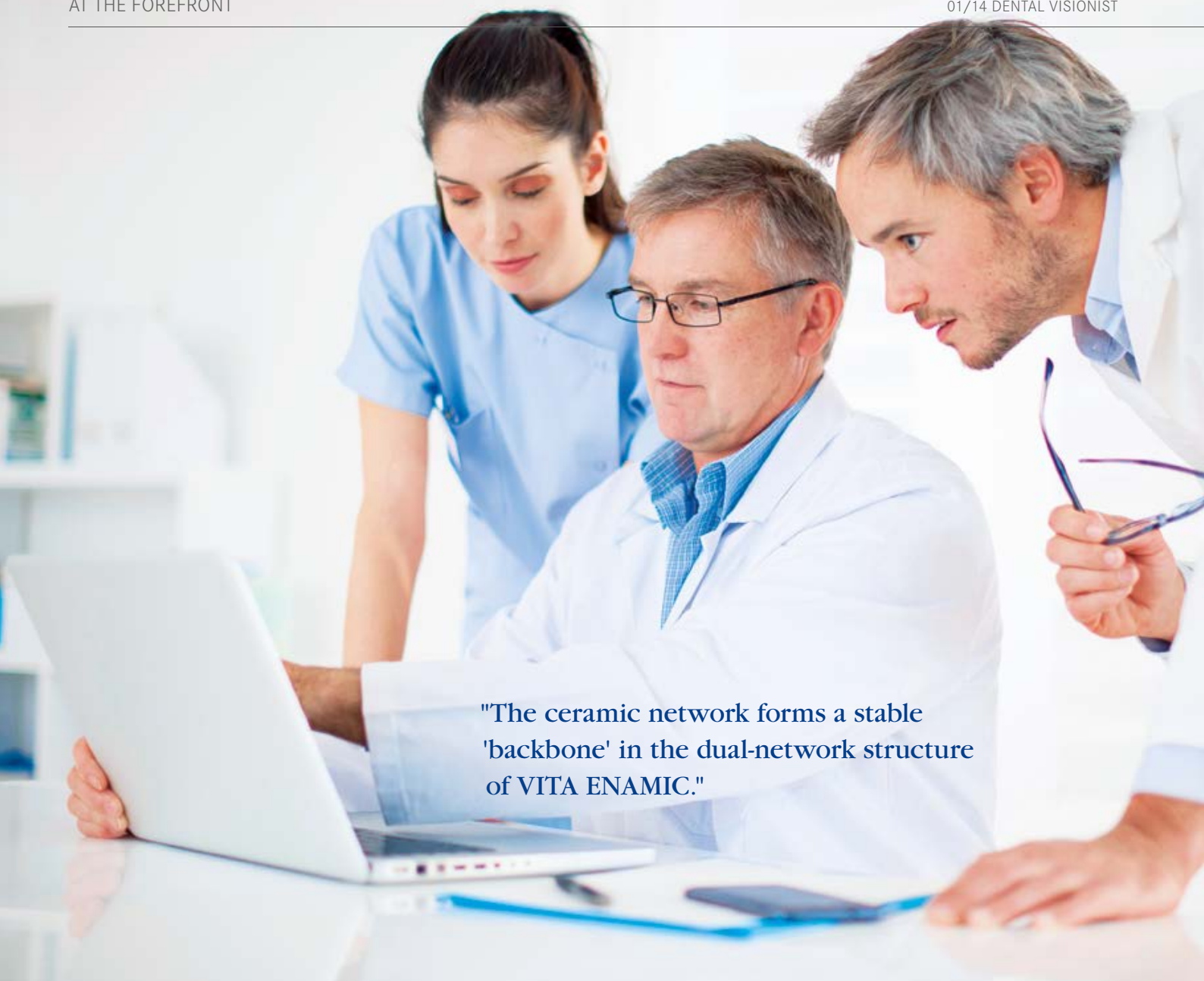
4. Final result

Despite the unfavorable initial situation, VITA SUPRINITY enabled a comparatively good final esthetic result to be achieved in highly efficient fashion, restoring the patient's natural smile. The expectations and hopes of the patient and the entire treatment team were met in full. We would like to thank master dental technician Thomas Gausmann for his enormous local support!



→ AFTER

Fig.10 Final result



"The ceramic network forms a stable 'backbone' in the dual-network structure of VITA ENAMIC."

VITA ENAMIC: new developments from science and research

Professor Russell Giordano (Boston University, Henry M. Goldman School of Dental Medicine, USA) already registered the first patent in 1996 for the VITA ENAMIC hybrid ceramic. His research work was an important milestone in the continued further development of the material up until its introduction to the market in 2013. Over the last few months, he has also carried out a variety of performance tests with the new CAD/CAM material, which he reports on in the following interview.



Professor Russell Giordano
Boston, USA

DV: Prof. Giordano, during the course of fracture load testing you compared the VITA ENAMIC hybrid ceramic with other CAD/CAM materials – what was the result?

Professor Russell Giordano: In a comparison of crown restorations (with an occlusal wall thickness of 1.5 mm and marginal wall thickness of 1.0 mm) fabricated using VITA ENAMIC and IPS e.max CAD (Ivoclar Vivadent, Schaan, Liechtenstein), a higher mean value was determined for the hybrid ceramic in static fracture tests, although the fracture load values for both materials were within a similar range. When the same fracture load test was conducted following dynamic loading of the materials, VITA ENAMIC achieved a fracture load value that was significantly higher than that of IPS e.max CAD.

DV: How should this be interpreted?

Professor Russell Giordano: In the dual-network structure of VITA ENAMIC, the ceramic network forms a stable "backbone", while the polymer network stops cracking. Both networks are not only integrated with one another, they

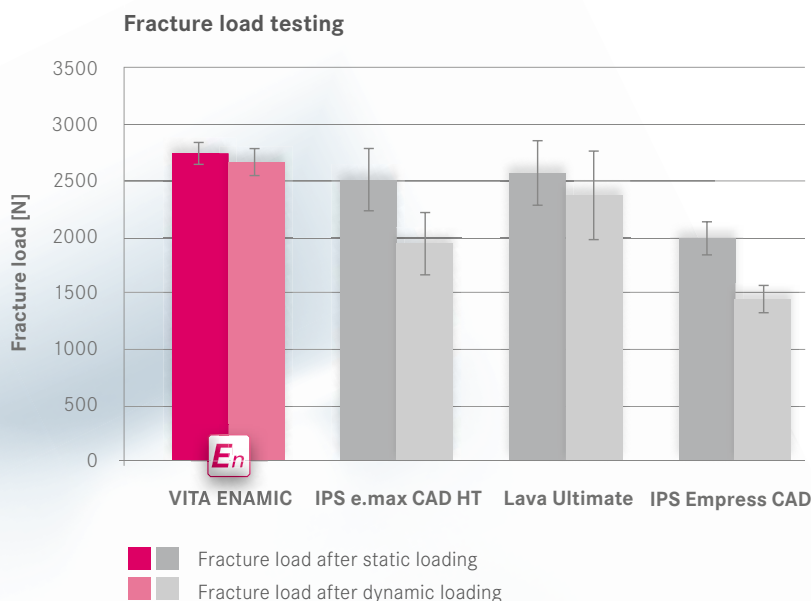
also each form a separate, intact structure. In composites on the other hand, such as Lava Ultimate (3M ESPE, Seefeld, Germany), for example, there are many individual ceramic particles that are surrounded by a polymer matrix. VITA ENAMIC is also different to conventional ceramics: these may offer high strength, however, they are also comparatively brittle and therefore cannot deform so easily without fracturing as a result.

DV: Is a lesser tendency towards material fatigue to be expected in VITA ENAMIC than in conventional ceramics?

Professor Russell Giordano: Natural teeth often show numerous microcracks or enamel cracks, and yet the patient will have them for their entire lives. For this reason it is also important in a restorative material that any microcracks that do occur do not lead to failure of the restoration. Thanks to its polymer network, VITA ENAMIC can absorb compressive load and stop any cracks that may occur.

DV: What did you and your team at Boston University find particularly convincing during clinical application of VITA ENAMIC?

Professor Russell Giordano: VITA ENAMIC offers shade stability and can be easily and quickly machined using the Sirona MC XL unit (Sirona Dental GmbH, Wals, Austria), while also facilitating a longer service life for milling tools. A wall thickness of 0.3 mm can be achieved with exact edges, and without the "chipping issue" that is otherwise often typical of conventional ceramics. VITA ENAMIC veneers can even be reduced to as far as 0.2 mm. This allows a significant gap in the range of CAD/CAM materials to be filled. Even our dean Prof. Jeffrey W. Hutter has VITA ENAMIC restorations!



Source: Fracture load tests conducted by Prof. R. Giordano, Boston University, USA, have been published in the tech. & scient. docu. from VITA ENAMIC, VITA Zahnfabrik, Germany.

Test method: 1. Static fracture load: molar crowns on standardized, prefabricated, filled acrylic dies, cemented using Multilink Automix (Ivoclar Vivadent, Schaan, Liechtenstein), were removed and then subject to static loading until fracturing occurred. 2. Static fracture load after dynamic loading: molar crowns on standardized, prefabricated, filled acrylic dies, cemented using Multilink Automix, were removed and then subject to dynamic loading for 150,000 cycles at a maximum load of 450 N as well as a minimum load of 0 N at room temperature. This was followed by static loading until fracturing occurred.

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Non-invasive restorations using hybrid ceramic

Dr. Saskia Preissner (Department for Conservative Dentistry and Preventive Dental Medicine at Charité University Hospital, Berlin, Germany) has almost two years of experience in clinical use of the VITA ENAMIC hybrid ceramic. In this time she was also able to gain insight with regard to non-invasive patient treatment. In the following interview, she reports on her experiences.



*Dr. Saskia Preissner
Berlin, Germany*

DV: Dr. Preissner, for how long have you been monitoring the clinical use of VITA ENAMIC at Charité University Hospital in Berlin?

Dr. Preissner: We were already able to treat our first cases with the material during the clinical pilot phase. As a result, we can draw on experience gained with patients who we have already been monitoring for two years. That is perhaps not long enough in order to draw any scientifically meaningful conclusions, however, all of our restorations have remained intact during this period. We are investigating the edge behavior of some restorations at the moment using a scanning electron microscope (SEM).

DV: In case documentation published in the "Open Dentistry Journal", you report on the treatment of a patient whose severely abraded dentition was restored using crowns. The wall thickness of the crowns in some cases was in the range of 0.5 mm. What leads you to expect that restorations with such thin walls will prove clinically viable in the long-term?

Dr. Preissner: As a practitioner, I would never dream of milling crowns to a wall thickness of 0.5 mm if sufficient space were available. However, in the case described, the initial situation was such that the patient had lost almost the entirety of her coronal tooth substance, and obviously did not wish to sacrifice even more substance as a result of crown preparations on 18 teeth. Following bite elevation treatment, we fitted her with crowns without needing to mill even a single tooth, and so were truly able to offer non-invasive treatment – if we disregard the few micrometers of tooth substance that were lost as a result of the acid-etching technique. It is precisely because of this non-invasive approach to therapy that I am confident that the biomimetic material properties of VITA ENAMIC will be sufficiently favorable to enable the patient to benefit from her restoration for many years to come, because as dentists, we want to retain tooth substance as far as possible.

DV: You have been monitoring this case for well over a year now, on the basis of regular check-ups. How do you rate the clinical performance of restorations fabricated using the hybrid ceramic after they have been in situ for this length of time?



1a



1b



2a



2b

Fig. 1a + b Initial situation: a patient with eroded dentition
Fig. 2a + b Final result: following restoration with VITA ENAMIC

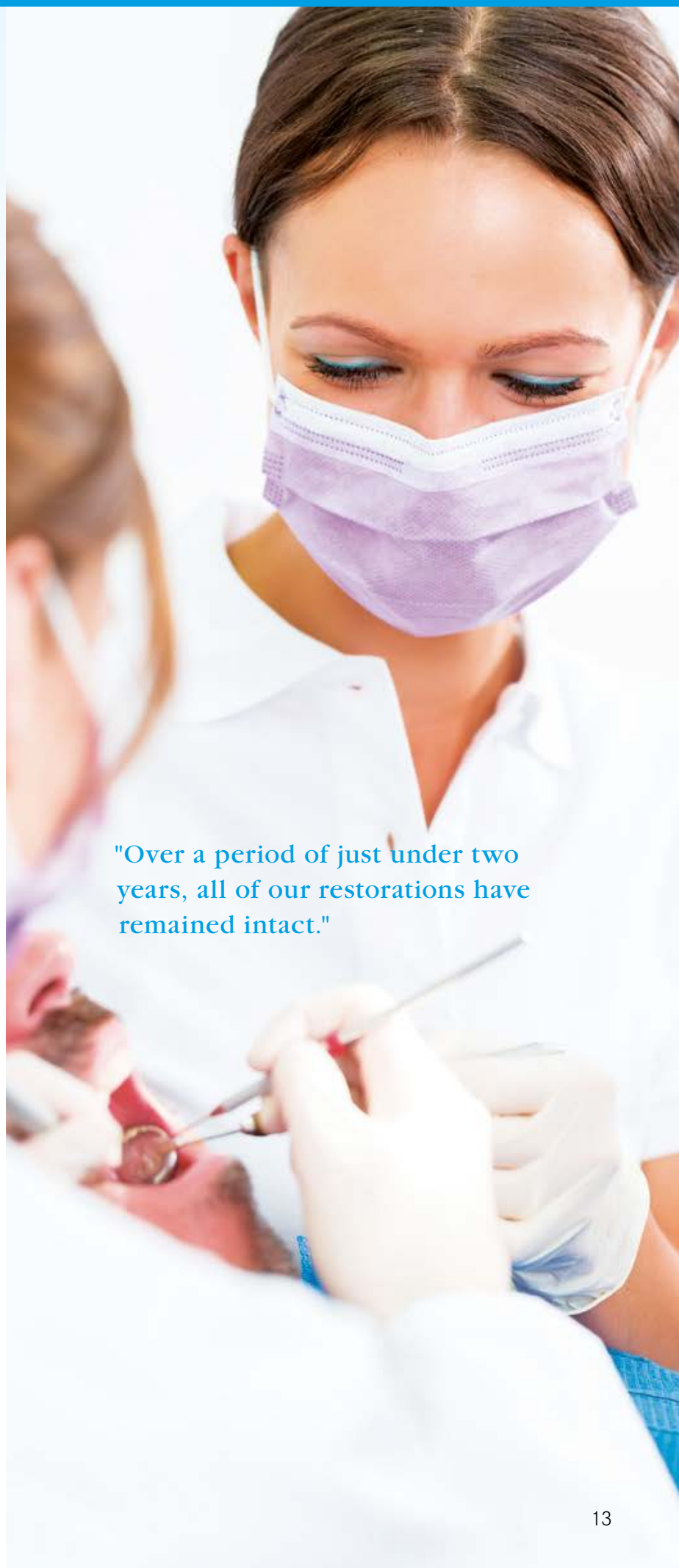
Dr. Preissner: They have in fact been in situ now for almost two years. The patient is as satisfied as ever. The cervical edges are all intact, and as they are supragingival for the most part, they are also readily accessible when performing oral hygiene at home. Moreover, we regularly polish the crowns during our check-ups or during the course of professional dental cleaning.

DV: You have used the hybrid ceramic in particular in minimally-invasive and in non-invasive restorations. To what other indications is this material suited as a result of its particular properties and where could it prove additionally viable in the future?

Dr. Preissner: The indication area is large in principle, however, we are more specifically interested in those cases for which other materials are less suitable. We were wondering, for example, whether the idea of endodontic crowns could be given a new lease on life with the hybrid ceramic. In my opinion, endodontic crowns were quite a good approach for optimum restoration of severely damaged teeth, without resulting in a "barrel-hooped" appearance. This was why the root canal orifices were used as a retention aid. Unfortunately, these teeth had a greater tendency to fracture. Perhaps this was due to the high rigidity of the ceramics. The behavior of VITA ENAMIC, however, is similar to that of dentin. An in-vitro study is currently in progress with this matter, but regardless, we are treating selected patients with endodontic crowns who would otherwise face extraction as an alternative form of therapy.



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"Over a period of just under two years, all of our restorations have remained intact."

New prospects and opportunities – digital dentistry 2.0

For Dr. Gerhard Werling (Bellheim, Germany) and Dr. Bernhild-Elke Stammnitz (Langen, Germany), the new hybrid ceramic has, up until now, not just clearly proven its worth, but also extended the range of possibilities in computer-aided fabrication of restorations. In the following interview, these two practice users report on how this revolutionary material is creating new opportunities for digital dentistry 2.0.



Fig. 1 Unsatisfactory initial situation in the anterior area



Fig. 2 Three veneers that have already been constructed; the original tooth is still visible in region 11



Fig. 3 Final result in the patient's mouth



*Dr. Gerhard Werling
Bellheim, Germany*

DV: Dr. Werling, what type of restorations are you now carrying out using the hybrid ceramic that previously, were rarely possible using conventional, tooth-colored CAD/CAM ceramics?

Dr. Gerhard Werling: VITA ENAMIC is ideally suited to delicate, minimal-invasive constructions, and always in cases where a highly precise marginal fit is required. In the treatment of severely abraded dentition or in the case of those who grind their teeth, I consider the hybrid ceramic to be a good alternative material to conventional ceramic, even if this has not yet been officially approved by the manufacturer due to the lack of sufficient clinical data.

"VITA ENAMIC is ideally suited to minimally-invasive, delicate constructions."



DV: In your presentations, the topics you discuss also include what is known as a "digital mock-up". What do you mean by that and how do you actually carry this out in your practice?

Dr. Gerhard Werling: For test purposes, we fabricate the planned restoration from VITA ENAMIC using computer technology. If we are performing an additive optimization such as crown lengthening, this mock up can also be used as a permanent non-prep restoration if the patient is happy with it.

DV: Why do you consider the new hybrid ceramic in particular to be especially suited to the "innovative" CAD/CAM-based approaches to restoration that you have mentioned?

Dr. Gerhard Werling: Thanks to the high level of edge stability, the edges of the restoration can be polished so thinly that the transition to the natural tooth substance is almost "invisible", particularly when using VITA ENAMIC polishing instruments.

"The hybrid ceramic provides a perfect fit."



*Dr. Bernhild-Elke
Stammnitz
Langen, Germany*



Fig. 1 Initial situation, inadequate restoration of 21



Fig. 2 Preparation after removal of the original reconstruction



Fig. 3 Final result directly after seating the veneer

DV: Dr. Stammnitz, in a case documentation that you have published you demonstrate the fabrication of what are known as tabletops, i.e. occlusal veneers for the reconstruction of occlusal surfaces. What led you to use VITA ENAMIC for this purpose?

Dr. Bernhild-Elke Stammnitz: The hybrid ceramic provides a perfect fit, optimum shaping of the edges, superb durability as well as elasticity similar to that of dentin. In addition, many of my patients find that a VITA ENAMIC restoration feels like a natural tooth rather than a foreign object, unlike other materials such as monolithic zirconia or lithium disilicate.

DV: What other "innovative" approaches to restoration have you realized using VITA ENAMIC that you have not previously attempted while using the CEREC system, and why?

Dr. Bernhild-Elke Stammnitz: Teeth that have been severely damaged up to gingival level or further can be stabilized using VITA ENAMIC post abutments. In my opinion, the hybrid ceramic is an excellent choice in this case due to its elasticity that is similar to dentin. However, as long-term clinical experience is not yet available, this procedure is still experimental.

DV: Dr. Stammnitz, practice users are impressed by the processing characteristics that VITA ENAMIC offers when using CAM technology, for example such as the short milling times. How has this changed your workflow?

Dr. Bernhild-Elke Stammnitz: The milling process using CEREC MC XL takes longer when using conventional dental ceramics such as lithium disilicate. Moreover, ceramics such as lithium disilicate also require crystallization firing. VITA ENAMIC restorations, on the other hand, can simply be polished after milling in most cases, and seated immediately.



"With its elastic modulus similar to dentin, I believe that VITA ENAMIC has proven itself in this respect to be an excellent alternative solution to the usual options of abutments/posts."

Clinical case study: VITA ENAMIC – a material for endodontic restorations?

Peter Neumann, a dental surgeon from Berlin, Germany, has used the new VITA ENAMIC hybrid ceramic in combination with CEREC (Sirona Dental GmbH, Wals, Austria) to design and fabricate a post abutment upon which a crown can be cemented during the same session. This type of restoration is still at an experimental stage, however, he is already putting it into practice with positive clinical results. In the following article, Mr. Neumann provides a detailed description of his approach when treating this indication.



➔ BEFORE

Fig. 1 Initial situation



➔ AFTER

Fig. 10 Final result

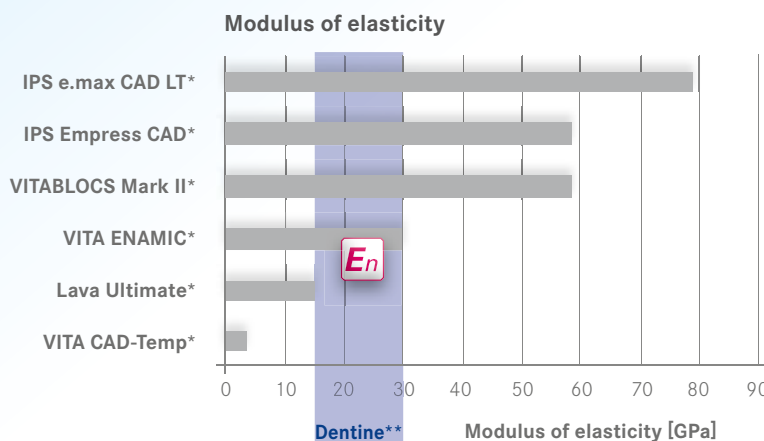


*Peter Neumann, dental surgeon
Berlin, Germany*

1. Initial situation

A fracture as a result of a metal post is a classic emergency case that requires immediate, and where at all possible, permanent treatment. A precarious initial situation of this kind often represents a final attempt to save the tooth. Compared with other, conventional ceramics, I believe that VITA ENAMIC, with its elastic modulus similar to dentin, has proven itself in

this respect to be an excellent alternative solution to the usual options of abutments/ posts. If correct preparation design is observed in this regard and a reliable bond ensured, long-term clinical success can be expected.



*) Source: Internal study, VITA R&D, VITA ENAMIC technical and scientific documentation

**) Note: There are considerable variations concerning the modulus of elasticity of human dentin in literature.

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- 2) Kinney J.H., Marshall S.J., Marshall G.W., The mechanical properties of human dentin: a critical review and re-evaluation of the dental literature. Critical Reviews in Oral Biology & Medicine 2003; 14:13-29.



Fig. 2 Preparation for the post abutment fabricated using VITA ENAMIC



Fig. 4 Milled VITA ENAMIC post abutment



Fig. 3 The virtual model



Fig. 5 Bonding is performed adhesively



The excellent etching pattern of the hybrid ceramic facilitates a good quality bond

2. Preparation

The load-bearing capacity of the root was verified first, prior to carrying out preparation. For circular enclosure of the root, it is crucial that preparation is carried out using a barrel-hoop design (ferrule effect). The internal cavity for initial anchoring of the post material should be generously prepared (3-6 mm). However, for the purposes of stability, effective bond function is more important than achieving a post length of 2/3 of the root depth. The etchable VITA ENAMIC hybrid ceramic with its excellent etching pattern enables a superior quality bond in this case.

3. Design/post construction

The preparation was scanned using the CEREC Omnicam. CEREC 4.2 software (mode: crown – biogeneric) was used to create the design. The crown design was scaled, reduced and smoothed virtually as far as possible until a post construction was created. Milling was then performed using the Sirona CEREC MC XL milling machine. The post construction was then fitted and seated adhesively.



VITABLOCS feldspar ceramic was selected for the crown restoration.



Fig. 6 Gingival retraction using retraction paste



Fig. 8 Virtual model with a newly-constructed stump scenario



Fig. 7 Preparation of the post abutment

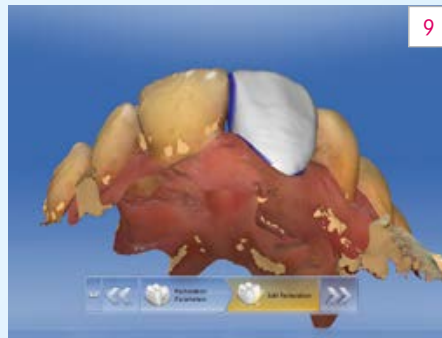


Fig. 9 Crown design

4. Processing/seating

The next step was to prepare the VITA ENAMIC post abutment. In order to prevent fractures, the circumference should not be less than 2 mm. Prior gingival retraction using retraction paste rather than the cord technique is recommended. This is followed by scanning and design.

The crown material can be selected as required, and it is also possible to work with a laboratory, e.g. if the stump is severely discolored. In this case, the patient opted for a chairside solution comprised of polished VITABLOCS TriLuxe feldspar ceramic and was relieved that it was possible to save the tooth.

Post abutments fabricated using VITA ENAMIC are not to be used as standard for all devitalized teeth, however, they are an excellent solution in my opinion in cases of severe substance loss.



Fig. 10 Result

VITA ENAMIC from the perspective of a laboratory user

Since October 2013, VITA ENAMIC has been available for the Ceramill Motion II system (Amann Girrbach AG, Koblach, Austria). Werner Hirler, a master dental technician from Wolfschlugen, Germany, and experienced laboratory user of Ceramill, has already processed VITA ENAMIC and achieved highly successful results. In the following interview he reports on his experience.



Fig. 1 Sample VITA ENAMIC restoration from Werner Hirler, master dental technician

During finishing, I found the material to be comparatively soft, and thanks to good edge stability, fitting is not as complicated as is often the case with conventional ceramics.

DV: What is the feedback like from dentists and their patients regarding restorations fabricated using the hybrid material?

Werner Hirler, master dental technician: As this class of materials is comparatively new, some are still a little hesitant. However, once someone has worked with VITA ENAMIC, they are won over by the benefits of the hybrid ceramic. These include the fact that an excellent fit can be achieved, and that the hybrid material demonstrates better edge stability after milling than conventional CAD/CAM ceramics.

DV: What new opportunities do you think processing the new ceramic has to offer for you?

Werner Hirler, master dental technician: VITA ENAMIC combines the positive characteristics of both acrylic and ceramic. Crucial from my point of view is the fact that it can be processed as efficiently as acrylic, while still allowing high-quality restorations to be achieved that can be billed in the same way as ceramic.

DV: Mr. Hirler, what has your experience been up until now of the new hybrid ceramic?

Werner Hirler, master dental technician: VITA ENAMIC is very pleasant to prepare. I was particularly pleased with the corresponding VITA ENAMIC Polishing Set that comprises pre-polishers and high-gloss polishing instruments. In my opinion, the hybrid ceramic is equally suited to inlays and individual crowns.

DV: What are the concrete benefits of this material for laboratory users?

Werner Hirler, master dental technician: Handling is generally simple, and processing very efficient. As a result, milling times with Ceramill Motion II are shorter than in the case of conventional ceramics, the edges can be milled even more precisely than when using the comparatively brittle conventional ceramics, and there is no need at all for firing.



Fig. 2 Ceramill Motion II, Amman Girrbach AG

Four questions on processing VITA SUPRINITY

Graduate engineer and dental technician Michael Gödiker (section manager at VITA R&D, Bad Säckingen, Germany) answers the four most frequently-asked questions regarding how to process VITA SUPRINITY.



Graduate engineer and dental technician Michael Gödiker Bad Säckingen, Germany

1. Mr. Gödiker, what firing trays are recommended for firing in the case of VITA SUPRINITY?

For crystallization of crowns, honeycomb firing trays with platinum pins are recommended. These guarantee effective through-heating while at the same time preventing the restoration from sticking. In the case of objects such as inlays, onlays and veneers, placing the restoration on the firing tray with a thin layer of fibrous padding underneath has proven useful.

2. What needs to be taken into consideration when using firing paste for a custom firing tray in everyday practice / laboratory routine?

The firing paste can be used for example in order to secure molar crowns onto the pins. Using firing paste also enables ceramic firing trays to be used. In this case the paste prevents direct contact so that adhesion or thermal shock can be avoided. In any case, only a very small amount of firing paste should ever be used.

3. At what stage should the restoration ideally be manually reworked or reduced for individualization?

A cut-back for individualization with VITA VM 11 is ideally already added during virtual design in order to ensure reproducible results and to minimize milling as well as the corresponding development of heat. Minor corrections are also indicated in the precrystallized state – this not only protects the material, it also reduces tool wear and the effort required. Only high-gloss polishing should be performed after crystallization to facilitate better verification.

4. Does the material need to be pre-treated prior to veneering, and if so, how?

Special pretreatment of the VITA SUPRINITY surface is not required. Following crystallization, VITA VM 11 can be directly fired. The excellent coordination between the coefficient of thermal expansion and softening temperature guarantees an outstanding bond. If only staining or glazing are to be carried out, this step can be carried out in combination with crystallization firing.



Fig. 1 VITA SUPRINITY crown reduced on a platinum pin



Fig. 2 VITA SUPRINITY crown, individualized using VITA VM 11



Fig. 3 Model of the final result

Fabricated and photographed by Heike Assmann (master dental technician, Paderborn, Germany)

Guidelines: how to use VITA CAD/CAM materials effectively

VITA CAD/CAM materials are now available for a variety of CAD/CAM systems.

In this section, a selection of VITA system partners will provide information on necessary system requirements as well as tips on processing VITA CAD/CAM materials.

**SYSTEM
REQUIREMENTS?**

**INFORMATION
ON UPDATES?**

**MATERIAL
AVAILABILITY?**



How can VITA SUPRINITY be processed?

Where and how can I obtain the latest updates in order to process VITA materials?

What other materials are available?



CEREC®/inLab®
Sirona Dental GmbH

Ceramill® Motion II,
Amann Girrbach AG

KaVo ARTICA®/Everest®,
KaVo Dental GmbH

Processing is possible using the CEREC and inLab system. CEREC MC X, CEREC MC XL, CEREC MC XL Premium Package or inLab MC XL hardware is required. In motor set 1 or 2, the milling tool combination Cylinder Pointed Bur 12S can be selected on the right, with Step Bur 12S or Step Bur 12 on the left. VITA SUPRINITY is available in CEREC and inLab software version 4.2 or later.

VITA SUPRINITY can be processed using the 4 and 5-axis version of the Ceramik Motion II milling machine. It is also possible to have VITA SUPRINITY fabricated via the Ceramik M-Center production facility. Users require the Ceramik Coolstream add-on for wet processing and the glass ceramic holder for their machines. VITA SUPRINITY is active for all available Ceramik systems since the latest software version of May 2014.

VITA SUPRINITY for KaVo ARCTICA is available in KaVo multiCAD software version 3.0.0 or later and can be processed using the KaVo ARCTICA engine with software version 2.5.9 or later. For the KaVo Everest Engine in combination with Everest CAM² software, VITA SUPRINITY can be processed for KaVo ARCTICA using software version 9.3 or later.

The updates are generally implemented via CEREC and inLab software updates or service packs. Users can obtain information either from their specialist dealer or from the respective download area at www.sirona.de/cerec or www.sirona.de/inlab. Sirona also recommends registering for the CEREC or inLab newsletter at www.sirona.de/newsletter.

Information is provided to users through an update newsletter. The software update can be called up on the Amann Girrbach homepage (m-center area).

The KaVo CSS Update Tool is used to provide the software updates both for the CAD and the CAM software.

There is a wide range of VITA CAD/CAM materials for users of the CEREC and inLab system. These include VITABLOCS Mark II, TriLuxe, TriLuxe forte and RealLife, VITA ENAMIC, VITA SUPRINITY, VITA In-Ceram YZ and VITA CAD-Temp as well as VITA CAD-Waxx. The necessary system requirements in terms of hardware and software must be observed in each case.

In addition to VITA SUPRINITY, VITA ENAMIC and VITABLOCS Mark II and TriLuxe forte can be processed using the Ceramik system.

In addition to VITA SUPRINITY, numerous other VITA materials can be processed using KaVo systems, such as VITA ENAMIC, VITABLOCS Mark II, TriLuxe and RealLife as well as VITA CAD-Temp monoColor and multiColor.

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www.dental-visionist.com

The screenshot displays the website interface for Dental Visionist. At the top, the logo "DENTAL VISIONIST" is prominent. Below it, navigation links for "DENTAL VISIONIST", "ABO & ARCHIV", "KONTAKT", and "LINKS" are visible, along with a language selector for "Spreche: DE | EN". The main content area features the title "2/13 Topics in this issue" followed by the main article "A new generation of glass ceramics". A sub-headline reads "How a high-performance material is setting new standards." Below this, three key points are listed with corresponding images: "VITA SUPRINITY test report" (with a dental crown image), "Simple, fast and reliable" (with a dentist image), and "Exceptional esthetics" (with a dental crown image). A red "Open ePaper" button is positioned to the right of these points. On the right side of the page, a large image of the magazine cover for issue 2/13 is shown, featuring the same title and a dental crown. At the bottom of the page, it says "a publication by VITA" and "DATENSCHUTZ | IMPRESSUM". A mouse cursor is visible at the bottom right of the screenshot.



Videos, images, scientific documentation, links and downloads on the topics covered in the current issue as well as all previous issues are available from DENTAL VISIONIST online at www.dental-visionist.com