VITA SUPRINITY® PC

The Concept

VITA shade determination | VITA shade communication | VITA shade reproduction | VITA shade control

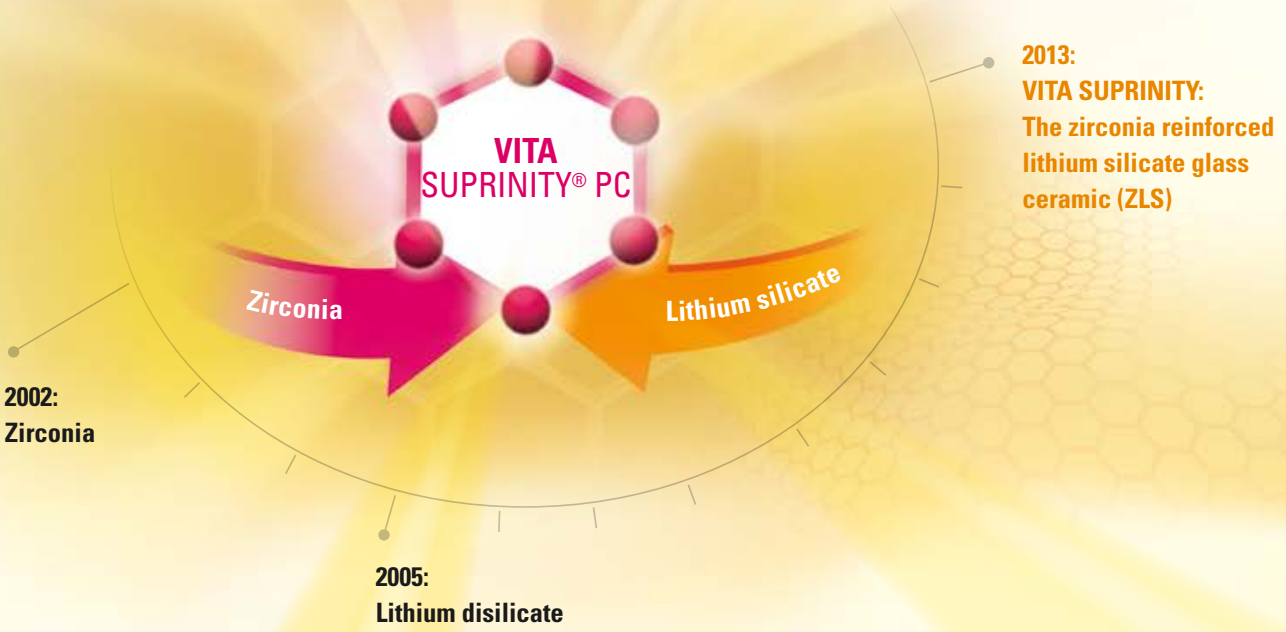
Date of issue: 01.19

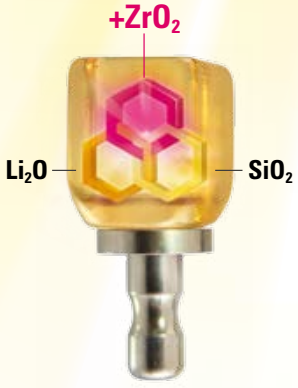
VITA – perfect match.

VITA

The zirconia reinforced, high-performance glass ceramic

DEVELOPMENT STAGES OF CAD/CAM MATERIALS





An element for excellent load capacity:
VITA SUPRINITY PC has a zirconia content that is approx. 10 times higher than that of lithium disilicate ceramic.

VITA SUPRINITY PC components	Wt%
ZrO_2 (zirconia)	8 – 12
SiO_2 (silicon dioxide)	56 – 64
Li_2O (lithium oxide)	15 – 21
Various	> 10

Source: Internal study, VITA R&D, (1)

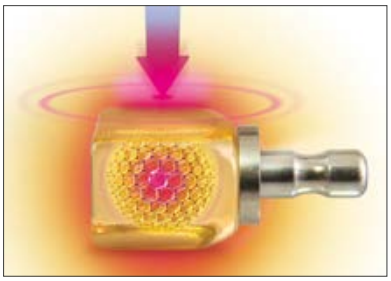
"Excellent load capacity thanks to a special structure"
VITA Zahnfabrik has been offering VITA SUPRINITY PC, a generation of glass ceramic material products, since May 2016. With the aid of an innovative manufacturing process, the glass ceramic is enriched with zirconia (approx. 10 % by weight). The results is the world's first zirconia reinforced lithium silicate ceramic (ZLS)*.

This glass ceramic features a particularly fine-grained and homogeneous structure, which guarantees excellent material quality and consistent high load capacity, as well as long-term reliability. In addition, the material also offers outstanding processing characteristics, such as easy milling and polishing.

Thanks to the high translucency, fluorescence and opalescence of this new glass ceramic material, esthetically pleasing results can be achieved with VITA SUPRINITY PC. VITA SUPRINITY PC covers a wide range of indications that include anterior and posterior crowns, suprastructures on implant abutments, veneers, inlays and onlays.

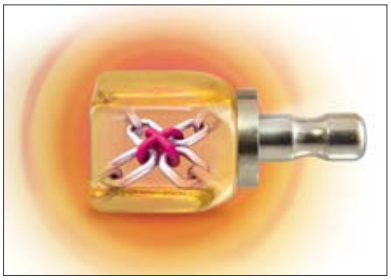
* This class of materials is a joint development of VITA Zahnfabrik, DeguDent GmbH and Fraunhofer-Institute for Silicate Research ISC.

VITA SUPRINITY® PC Overview of benefits



The new glass ceramic for excellent load capacity.

Excellent load capacity:
Thanks to excellent mechanical load capacity, VITA SUPRINITY PC promises high reliability and long-term clinical success.



Added reliability thanks to zirconia reinforcement.

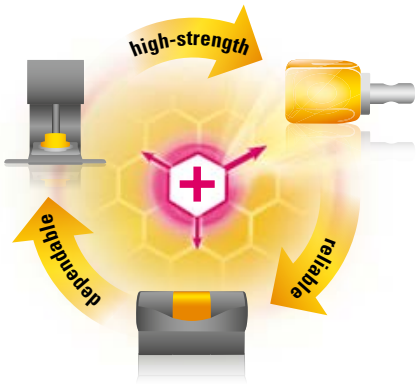
Particular reliability:
The results of continuous load tests and the Weibull modulus show that VITA SUPRINITY offers durable restorations and a maximum level of reliability.

Processing made easy

Simple processing:
This new glass ceramic features particularly good firing stability and can be crystallized without using an auxiliary firing paste. In addition, the material can be easily reworked manually and polished. After polishing, VITA SUPRINITY PC exhibits an excellent surface quality.

Precise restorations with Sirona's MC XL system.

Optimal precision:
Compared to lithium disilicate ceramics, VITA SUPRINITY PC reveals improved edge stability after milling with Sirona's MC XL system. The result is restorations with accurate fit.



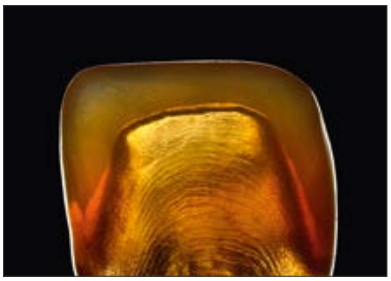
Reliable and user-friendly: milling, firing and processing.

High process reliability:
VITA SUPRINITY PC provides particularly high processing reliability. As a result, temperatures during the crystallization process that are slightly below or above the standard temperature do not have a significant influence on dimensional stability or mechanical properties.

VITA SUPRINITY PC restorations impress with a natural play of colors.

Excellent esthetics:
Thanks to the high translucency, fluorescence and opalescence, esthetically pleasing results can be achieved with VITA SUPRINITY PC. Plus, the natural play of colors can be perfectly reproduced with VITA VM 11 veneering material.

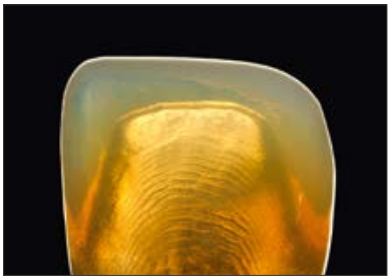
VITA SUPRINITY® PC Esthetics



Natural play of colors.

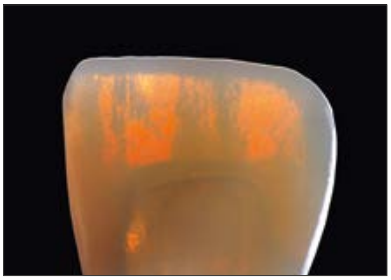
Natural play of colors in all shade nuances:
VITA SUPRINITY PC glass ceramics demonstrate a variety of shade nuances, which are achieved by a special preparation process of coloring components and the unique manufacturing process of VITA SUPRINITY PC.

Excellent translucency and opalescence:
VITA SUPRINITY PC features natural translucency with an opalescent play of colors. Since zirconia is finely distributed in the glass phase, crystallization of the zirconia particles is eliminated. As a result, the zirconia does not have any opaque effect.



Natural translucency.

Integrated fluorescence:
Due to the unique material structure and the addition of rare earth elements, the new generation of glass ceramic products reveals increased and natural fluorescence for all tooth shades.



Excellent opalescence.

Integrated fluorescence.

VITA SUPRINITY® PC Indications, variations, geometries, shades

Ideal for a variety of indications.

The glass ceramic in the precrystallized state as VITA SUPRINITY PC (transparent)

VITA SUPRINITY PC offers great versatility

Range of indications:
VITA SUPRINITY PC can be used for a wide range of indications, including anterior and posterior crowns, suprastructures on implant abutments, veneers, inlays and onlays.

Variations:
VITA SUPRINITY PC is the zirconia reinforced lithium silicate ceramic in the precrystallized state (**P**artially **C**rystallized).

Geometry sizes:
VITA SUPRINITY PC is available in the geometry PC-14 (18 x 14 x 12 mm).

Range of shades:
VITA SUPRINITY PC is available in the VITA SYSTEM 3D-MASTER shades 0M1, 1M1, 1M2, 2M2, 3M2, 4M2 and in the VITA classical A1-D4 shades A1, A2, A3, A3.5, B2, C2 and D2. All block shades are available in two translucency levels (T = Translucent and HT = High Translucent).

VITA SUPRINITY® PC A system with matched components

Perfect combination
Complementary products for polishing, characterizing and veneering for VITA SUPRINITY PC are specifically matched with the new generation of glass ceramic products.

VITA SUPRINITY® Polishing Set

VITA VM 11 veneering material is available for veneering restorations made of VITA SUPRINITY PC. The VITA SUPRINITY Polishing Sets are used to achieve top-quality, high-gloss surfaces. VITA AKZENT Plus is suitable for simple and esthetically convincing characterization, providing **an all-around solution with excellent results** for practices and laboratories.

VITA SUPRINITY® Polishing Set (clinical / technical)

Instruments for pre- and high-gloss polishing
The VITA SUPRINITY Polishing Sets were developed for reliable, efficient and material-specific surface treatment of zirconia reinforced lithium silicate ceramic (ZLS) restorations in dental practices and laboratories. The sets include various polishing instruments for pre- and high-gloss polishing.

These instruments are suitable for careful and gentle polishing of occlusal surfaces, cusps, fissures and restoration contact points. They ensure an excellent surface glaze of the finished restoration.

The easy and fast way to an excellent shine.

Easy to use and consistently good results

Excellent final results:
Highly esthetic surfaces can be produced with these instruments. Accurate concentricity, matched grit sizes and the individual geometries of the instruments guarantee highly precise results.

Simple and safe handling:
The instruments provide removal capacity that can be easily controlled and show low wear. Good handling and the ability to use without polishing paste enables simple and fast processing. Safe use of these clinical instruments is guaranteed through sterilization.

Gentle and careful processing:
These instruments, which were developed especially for VITA SUPRINITY PC, ensure gentle and careful processing. As a result, for example, the risk of possible formation of microcracks is reduced.

VITA SUPRINITY® PC – Characterization with VITA AKZENT® **Plus**

Impressive options for shade characterization
With the 19 VITA AKZENT Plus stains, practices and laboratories can characterize the shade of any dental ceramic material easily and efficiently, regardless of the restoration's CTE. These new fluorescent stains allow internal staining of restorations during layering, as well as staining and glazing of external surfaces.

Depending on the user's preferred method of processing and the relevant area of application, VITA AKZENT Plus stains are available as powders and ready-to-use pastes. The glazing Body Stains and Glaze materials are also available as sprays.

Three different application forms are available:

POWDER:
for unlimited flexibility and cost-effectiveness

PASTE:
ready-to-use pastes with uniform consistency and homogeneous pigmentation

SPRAY:
ready-to-use, easy-to-apply glaze and finishing agent stains

The stains enable outstanding shade characterization.

What practices and laboratories benefit from

Versatile:
With 19 shades and three application forms, VITA AKZENT Plus offers dental practices and laboratories a complete range of products for numerous characterization options.

User-friendly:
Whether you're working on internal coloring, surface characterization or fine glazing, with VITA AKZENT Plus fluorescent stains, you can adapt your restoration easily and efficiently.

Cost-effective:
In addition to characterizing VITA SUPRINITY PC restorations, VITA AKZENT Plus stains are also suitable for all other dental ceramic materials, regardless of the restoration's CTE.

VITA SUPRINITY® PC – Individualization with VITA**VM**®**11**

Perfectly matched veneering material
VITA VM 11 is a low fusing fine-structure feldspar ceramic that has been developed especially for individualizing crown substructures made of zirconia reinforced lithium silicate ceramic (ZLS).

Due to its individual CTE, a separate veneering material is required for this generation of glass ceramic. The perfectly matched CTE values of substructure and veneering materials help minimize stress to ensure superior bonding and veneering reliability that is free of warping.

The benefits of VITA VM 11 for the user

Highly esthetic restorations:
The high translucency and warm shades of VITA VM 11, in combination with the opalescent effect of VITA SUPRINITY PC, create highly esthetic restorations with a vivid play of colors.

Reliable bonding:
Stress-free and reliable bonding is ensured through a perfect match of both CTE ranges.

Simple processing:
Excellent stability, minimal shrinkage and high edge stability are distinctive features of VITA VM 11. Thanks to the excellent surface wettability of the new glass ceramic VITA SUPRINITY PC, multiple layering without liner firing or washbake is possible.

Superb firing stability:
The outstanding firing properties of VITA VM 11 result in very high dimensional stability, even after several firings.

Excellent grinding and polishing properties:
Thanks to the proven fine structure of VITA VM 11, its smooth and densely sealed surface can be easily and quickly polished.

VITA SUPRINITY® PC Findings of materials science

Zirconia reinforced glass ceramics: VITA SUPRINITY PC.

Zirconia-reinforced glass ceramic

At the the beginning of the new millennium, the use of zirconia in the dental sector was an important milestone; the material enabled the fabrication of multi-unit, all-ceramic bridges for the first time. Lithium disilicate-based glass ceramic has been available to dental users all over the world since 2005.

VITA SUPRINITY PC reflects the systematic advancement in this field. This advanced generation of glass ceramic materials combines the positive material characteristics of zirconia (ZrO_2) and glass ceramic.

A zirconia reinforced lithium silicate glass ceramic material (ZLS) was developed in cooperation with Degudent GmbH and the Fraunhofer Institute for Silicate Research (ISC). Due to a ZrO_2 proportion that is approx. 10 wt%, a structure is created after crystallization, which provides both excellent mechanical properties and meets high esthetic requirements. From May 2016, the ZLS glass ceramic was enriched with 0.1 wt% lanthanum oxide and precrystallization of the various shade and translucency levels was also optimized to ensure consistent processibility. As a result, the glass-ceramic blocks in the pre-crystallized state sometimes have a different appearance. The esthetic appearance and the mechanical properties of the final products, however, are identical. Therefore the values determined with VITA SUPRINITY can also be transferred to VITA SUPRINITY PC.

The following test results demonstrate the effects of these material properties and how VITA SUPRINITY PC differs from current CAD/CAM materials.

Short overview - physical/mechanical properties

Test	VITA SUPRINITY
3-point flexural strength	approx. 420 MPa*1
3-point flexural strength, precrystallized	approx. 180 MPa
Biaxial strength	approx. 540 MPa*2
Modulus of elasticity	approx. 70 GPa
Weibull modulus	approx. 8.9
CTE	approx. 11.9–12.3 · 10^{-6}/K

*1) The 3-point flexural strength value indicated is the average of numerous lot tests performed by VITA's Quality Control with partially automated preparation of specimens, which resulted in lower strength values than those obtained for careful manual preparation of specimens.

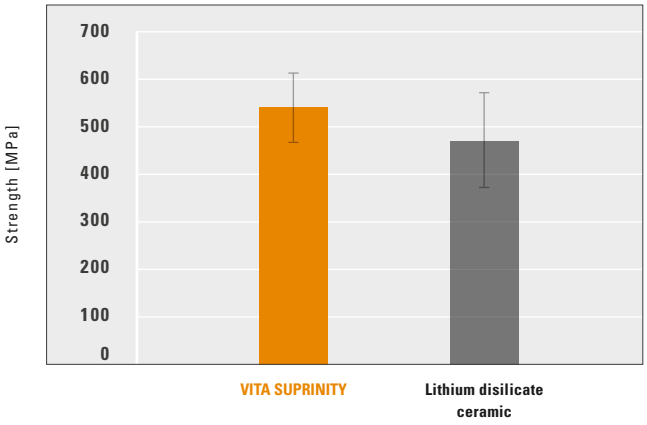
*2) Based on ISO 6872 with modified geometry of specimens.

From May 2016, the ZLS glass ceramic was enriched with 0.1 wt% lanthanum oxide. The mechanical properties of the final products, however, are identical. Therefore the values determined with VITA SUPRINITY can also be transferred to VITA SUPRINITY PC.

VITA SUPRINITY® PC Findings of materials science

Excellent load capacity ensures reliability

Biaxial strength*



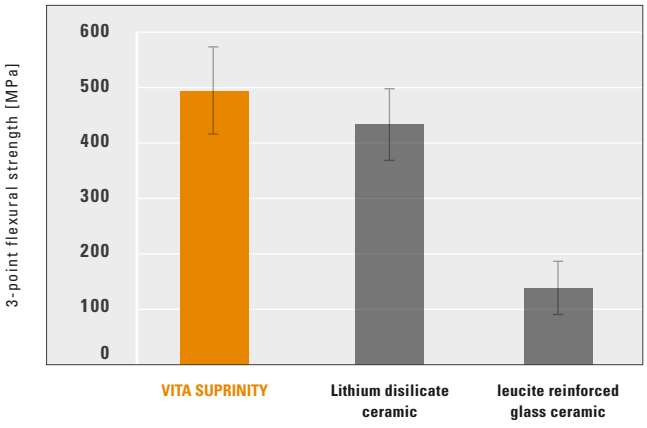
Source: Internal study, VITA R&D (Gödiker, 01/2012 [1] cf. back page)

Test method:

- Test was carried out based on ISO 6872 with a modified geometry of specimens.
- To reduce defects of margins, the blocks were not turned first, but rectangular discs were prepared from the blocks with comparable geometries using a diamond wire saw.
- Then a uniform layer of thickness of approx. 1.2 mm was milled using a lapping machine and final crystallization was carried out according to the manufacturer's instructions.
- 20 specimens of each material were loaded until fracturing occurred (Zwick universal testing machine) and the strength was determined.
- To calculate the stress, the diameter used in the formula was replaced by the length of the shorter side of the rectangle.

Conclusion: With a value of 541 MPa, VITA SUPRINITY features higher average strength and lower standard deviation than lithium disilicate ceramic in this test.

3-point flexural strength after milling*



Source: Internal study, VITA R&D (Gödiker, 08/2012 [1] cf. back page)

Test method:

- The test was carried out in accordance with ISO 6872.
- A diamond saw was used to prepare bending rods from the blocks.
- Using a SiC suspension (grain size 1,200), the specimens were milled manually to a uniform layer thickness of approx. 1.2 mm, a chamfer was added and crystallization was carried out according to the manufacturer's instructions. No additional tempering process was completed for the leucite reinforced glass ceramic.
- 10 specimens of each material were loaded until fracturing occurred (Zwick universal testing machine) and the 3-point flexural strength was determined.

Conclusion: In this test series, VITA SUPRINITY produced an average flexural strength of 494.5 MPa. This value is more than three times higher than the value determined for traditional leucite reinforced glass ceramic (138.7 MPa). The result for the lithium disilicate ceramic in this test is 435.0 MPa.

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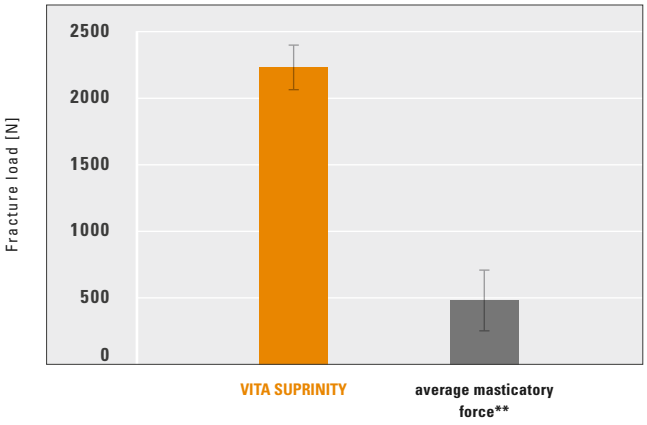
Static fracture load*



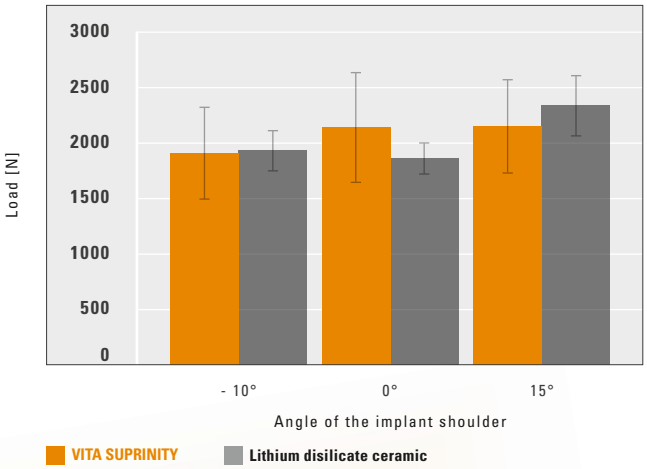
Source: Internal study, VITA R&D (Gödiker, 06/2011 [1] cf. back page)

Test method:

- Molar crowns made of VITA SUPRINITY were milled using the MC XL system and then polished and crystallized.
- The crowns were bonded to hybrid ceramic dies (modulus of elasticity: 23 GPa) using RelyX Unicem (self-adhesive, 3M ESPE) and then immersed for accelerated aging in warm water (37°C) for one week.
- In a testing machine, static load was applied to the crowns until fracturing occurred.
- The bars represent the average value obtained based on six crowns.

Conclusion: In this test setup, VITA SUPRINITY withstands a load of approx. 2,262 N. The average maximum masticatory force, however, ranges from approx. 490 N to 725 N(**[2]). Accordingly, the molar crowns that were used withstood significantly higher loads.

Fracture load of implant crowns*



Source: Internal study, VITA R&D (Gödiker, 10/2012 [1] cf. back page)

Test method:

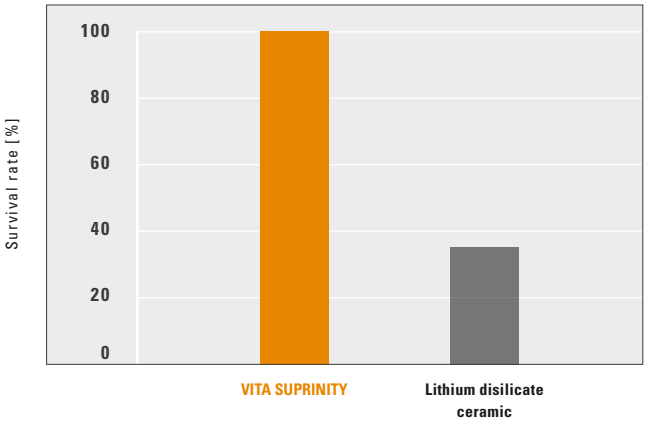
- Initially, implant bodies were fabricated (non-precious metal) which only had different shoulder angles.
- Angles of -10°, 0° and 15° were used for this test setup.
- The implants were embedded in a resin with a modulus of elasticity similar to bone (Ren Cast CW20/Ren HY49, Huntsman). Then the milled crowns (Sirona MC XL-System) were cemented to the implants using Multilink Implant (Ivoclar Vivadent).
- A series of five crowns of each material were tested for each angle.
- In a testing machine, static load was applied to the crowns until fracturing occurred.

Conclusion: With values of approximately 2000 N, the static tests on implants for VITA SUPRINITY produced a result that was similar to the one for dies made of a hybrid material.

* From May 2016 the ZLS glass ceramic was enriched with 0.1 wt% lanthanum oxide. The mechanical properties of the final products, however, are identical. Therefore the values determined with VITA SUPRINITY can also be transferred to VITA SUPRINITY PC.

VITA SUPRINITY PC stands for special reliability

Dynamic load test*



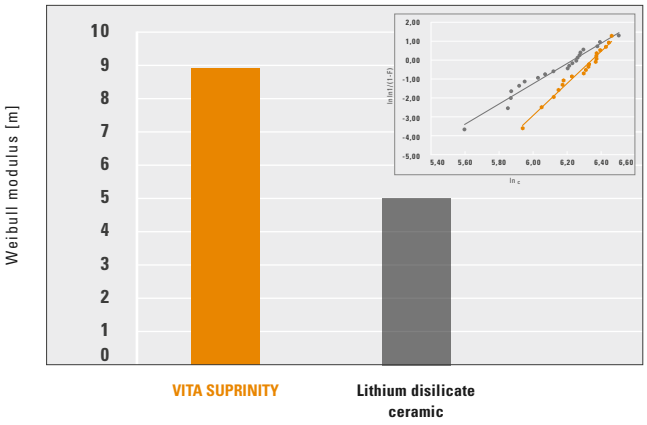
Source: Internal study, VITA R&D (Gödiker, 06/2011 [1] cf. back page)

Test method:

- Six crowns of each material (VITA SUPRINITY, lithium disilicate ceramic) were tested in the Dynamess machine.
- Following etching, the crowns were cemented to dies made of a hybrid material (modulus of elasticity approx. 23 GPa) using RelyX Unicem (3M ESPE).
- The specimens were embedded in Technovit 4000 (Heraeus Kulzer) and immersed in warm water (37 °C) for at least one week.
- Following accelerated aging, the crowns were subjected to a cyclic load : 1,200 N for 1.2 million cycles, 2.0 Hz, 5 mm steel beads as the antagonist, temperature: 37 °C.

Conclusion: The survival rate of the VITA SUPRINITY crowns in this test was 100%. The masticatory force used in the test was 1,200 N, far exceeding the maximum force of human jaw muscles.

Weibull modulus*



Source: Internal study, VITA R&D (Gödiker, 01/2012 [1] cf. back page)

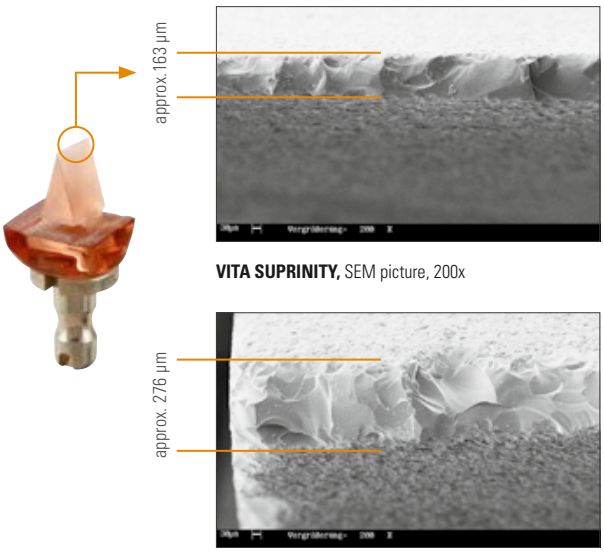
Test method:

- The Weibull modulus was determined based on the flexural strength of 20 bending bars.
- Using a theory developed by Weibull, based on the concept of failure of the weakest link, the strength distribution of ceramic materials can be described effectively in mathematical terms. (3).
- A high Weibull modulus indicates uniform material quality, which, in addition to the high load capacity values, is an indicator for the reliability of a material.

Conclusion: In this test VITA SUPRINITY exhibits the highest Weibull modulus in this class of materials.

* From May 2016 the ZLS glass ceramic was enriched with 0.1 wt% lanthanum oxide. The mechanical properties of the final products, however, are identical. Therefore the values determined with VITA SUPRINITY can also be transferred to VITA SUPRINITY PC.

Simple processing and optimized precision*



VITA SUPRINITY, SEM picture, 200x

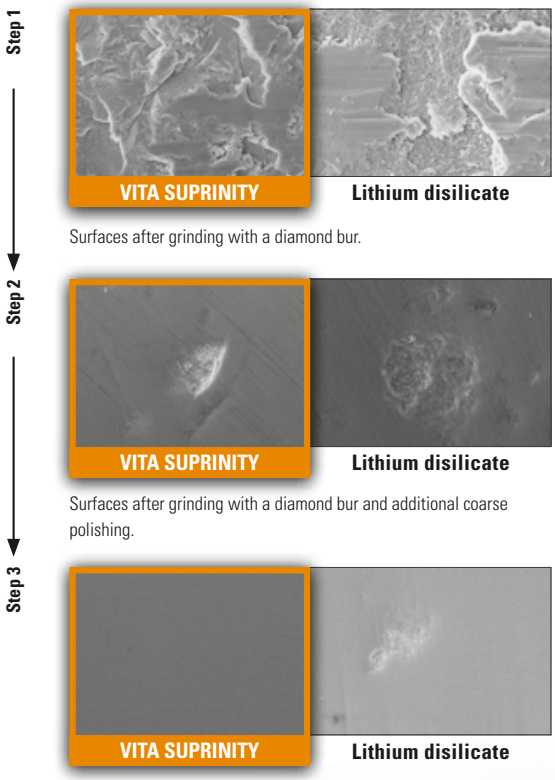
Lithium disilicate ceramic, SEM picture, 200 x

Test method:

- Using Sirona's MC XL system, wedge-shaped 30° test specimens made of two glass ceramic materials (VITA SUPRINITY and lithium disilicate) were milled from blocks in normal milling mode.
- To evaluate the edge stability, the width of the wedge tips were measured under the scanning electron microscope.

Conclusion: When using the default milling programs (normal mode), VITA SUPRINITY exhibits higher marginal accuracy then the lithium disilicate ceramic.

Source: Internal study, VITA R&D (Gödiker, 12/2011 [1] cf. p. 20)



Surfaces after grinding with a diamond bur.

Surfaces after grinding with a diamond bur and additional coarse polishing.

Surfaces following grinding with a diamond bur and additional coarse and fine polishing.

Test method:

- Plates with an area of 20 x 20 mm were prepared; manual polishing was carried out.
- Three tools were used for reworking: fine diamond, prepolisher and fine polisher.
- The processing time for each stage was 30 seconds.

Conclusion: In the case of VITA SUPRINITY, the test geometry can be polished to high gloss within 90 seconds, using the instruments recommended.

Source: Internal study, VITA R&D (Gödiker, 09/2012 [1] cf. back page)

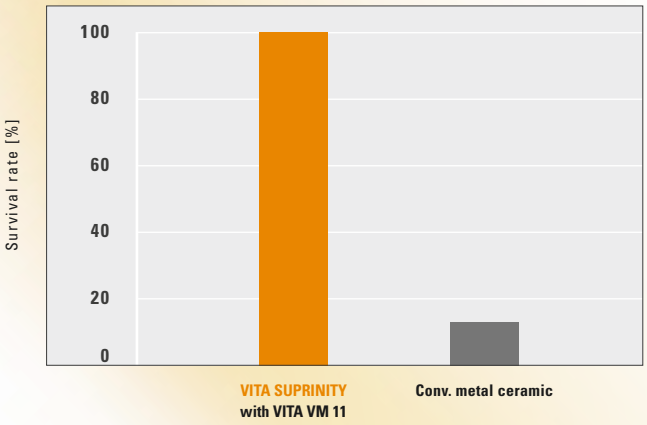
* From May 2016 the ZLS glass ceramic was enriched with 0.1 wt% lanthanum oxide. The mechanical properties of the final products, however, are identical. Therefore the values determined with VITA SUPRINITY can also be transferred to VITA SUPRINITY PC.

VITA SUPRINITY PC and VITA VM 11 veneering material: matched perfectly!

Physical/mechanical properties

VITA VM 11	Unit of measure	Value
CTE (coefficient of thermal expansion)	10^{-6}/K	approx. 11.2 – 11.6
Softening temperature	°C	approx. 600
Transformation temperature (TG)	°C	approx. 540
3-point flexural strength	MPa	approx. 100

Survival rate Thermal shock resistance*



Source: Internal study, VITA R&D (Gödiker, 11/2011 [1] cf. back page)

Test method:

- Six crowns were fabricated using VITA SUPRINITY in accordance with the working instructions, then they were veneered with VITA VM 11.
- Afterwards, the crowns were heated to 105 °C in a furnace, left in the furnace for 30 minutes and quenched subsequently in ice water.
- After the crowns had been checked for cracks and flaking, the undamaged specimens were heated up to 120 °C.
- This process was completed using steps of 15 °C until a temperature of 165 °C was reached. The higher the survival rate, the lower the risk of cracks or flaking of the veneering material, based on long-term experience in daily use.
- The values were compared with the average values of a series of tests over numerous years of VMK generations in combination with non-precious metal alloys.

Conclusion: In combination with VITA VM 11, VITA SUPRINITY reveals perfect thermal shock resistance. When using conventional metal ceramics, in most cases, the first cracks are formed at temperatures starting at 135 °C.

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VITA SUPRINITY® PC Material and accessories

VITA SUPRINITY PC

The zirconia reinforced VITA SUPRINITY PC glass ceramic features a special fine-grained and homogeneous structure which guarantees excellent material quality and consistent high load capacity, as well as long-term reliability.

- Excellent load capacity and high reliability
- Simple processing and optimized precision
- High process reliability
- Exceptional esthetics

VITA SUPRINITY Polishing Set clinical/technical

The VITA SUPRINITY Polishing Sets were developed for reliable, efficient and material-specific surface treatment of zirconia reinforced lithium silicate ceramic (ZLS) restorations in dental practices and laboratories. The sets include various polishing instruments for pre- and high-gloss polishing.

- These instruments are suitable for careful and gentle polishing of occlusal surfaces, cusps, fissures and restoration contact points.
- They ensure an excellent surface glaze of the finished restoration.

VITA AKZENT Plus

The 19 VITA AKZENT Plus stains are used to characterize the shade of any dental ceramic material easily and efficiently, regardless of the restoration's CTE.

- These new fluorescent stains allow staining and glazing of restorations.
- VITA AKZENT Plus stains are available as powders and ready-to-use pastes.
- The glazing Body Stains and Glaze materials are also available as sprays.

VITA VM 11

VITA VM 11 is a low fusing fine-structure feldspar ceramic that has been developed especially for individualizing crown substructures made of zirconia reinforced lithium silicate ceramic (ZLS).

- Highly esthetic restorations
- Reliable bonding
- Simple processing
- Superb firing stability
- Excellent grinding and polishing properties

Referenzen

1. Internal studies, VITA R&D:

   VITA Zahnfabrik H. Rauter GmbH & Co. KG
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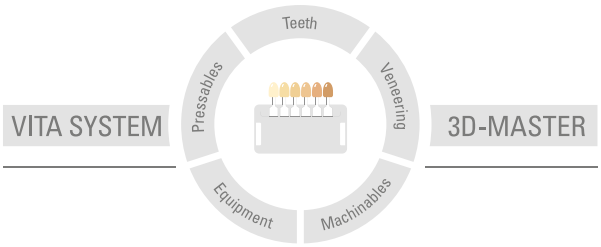
2. Körber K., Ludwig K. (1983). Maximale Kaukraft als Berechnungsfaktor zahntechnischer Konstruktionen. Dent-Labor XXXI, Heft 1/83, 55 – 60.

3. Brevier Technische Keramik (2003). Verband der Keramischen Industrie e.V.

More information about VITA SUPRINITY PC is available at:
www.vita-suprinity.de / www.vita-suprinity.com



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