

REINFORCED COMPOSITE BLOC FOR PERMANENT RESTORATION

# BRILLIANT Crios

## Product Guideline



This document provides scientific product information and answers to potential questions. The information is provided to COLTENE partners and customers free of charge and is intended for their internal use only. Although we confirm that the information is up to date and correct to our best knowledge we do not take any liability for the use of this information.

\* VITA Enamic, IPS Empress CAD, IPS e.max CAD, Cerasmart, Lava Ultimate, Shofu Block HC, RelyX Ultimate, Multilink, Nexus NX3, RelyX Unicem and Maxcem Elite are not registered trademarks of COLTENE.

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# BRILLIANT CRIOS

## HIGH PERFORMANCE – MADE BRILLIANT

BRILLIANT Crios is a reinforced composite bloc for the fabrication of permanent, indirect restorations using a CAD/CAM grinding process. Two translucencies with a total of 13 shades offer a broad spectrum for aesthetic single-tooth restorations, both in the anterior and posterior regions. The shock-absorbing effect of BRILLIANT Crios reduces the stress transmission and therefore the material is well suited for implant restorations.

## REINFORCED COMPOSITE

- High flexural strength supports permanent restorations
- Shock-absorbing effect reduces stress transmission
- Blends in well to provide natural aesthetics
- Comparable wear resistance to glass-ceramic with less wear on human antagonist

## EFFICIENT HANDLING

- No firing process required
- Can be modified and repaired
- Highly accurate grinding precision
- Effortless polishing for fast gloss\*

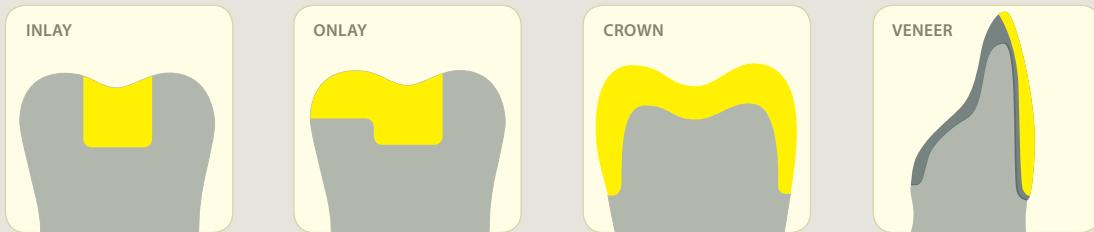
## RELIABLE LUTING SYSTEM

- Secure bonding with ONE COAT 7 UNIVERSAL
- Compatible luting materials for all stated indications



## INDICATIONS

BRILLIANT Crios is the ideal choice for single-tooth restorations, both in the anterior and the posterior region. This includes all conventional indications such as inlays, onlays, crowns and veneers. The shock-absorbing effect due to the dentin-like modulus of elasticity makes BRILLIANT Crios well suited for implant restorations.



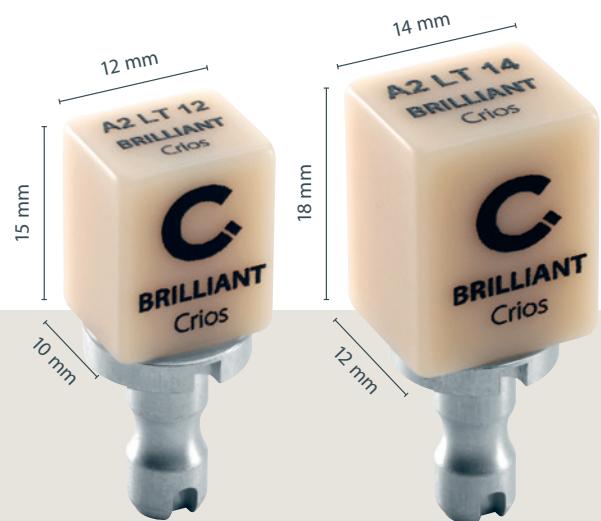
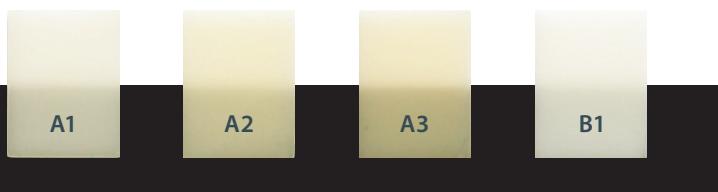
## SHADES

With 13 shades in two translucencies, BRILLIANT Crios offers a broad spectrum of color shades.

### Low Translucent



### High Translucent



## SIZES

BRILLIANT Crios is available in two sizes.

# PRODUCT COMPOSITION

The outstanding mechanical properties of BRILLIANT Crios are the result of controlled, stress-free, thermal curing. The multimodal composition of dental glass and amorphous silica in combination with a reinforcing resin matrix, make BRILLIANT Crios the ideal material for permanent single-tooth restorations.



## 1. Dental glass

Barium glass  
Size < 1.0  $\mu\text{m}$

## 2. Amorphous silica

$\text{SiO}_2$   
Size < 20 nm

## 3. Resin matrix

Cross-linked methacrylates

## 4. Pigments

Inorganic pigments such as  
ferrous oxide or titanium dioxide

# TECHNICAL DATA

Criteria	Unit	Method	Value
Filler weight	w-%	Internal method	70.7
Filler volume	vol-%	Internal method	51.5
Average filler size	µm	Calculation	< 1
Modulus of elasticity	GPa	Internal method	10.3
Three-point flexural strength	MPa	Internal method	198
Biaxial flexural strength	MPa	Internal method	262
Compressive strength	MPa	Internal method	426
Gloss retention after toothbrush abrasion	GU at 60°	Internal method	77.7
Water sorption	µg mm <sup>-3</sup>	ISO 4049	19.5
Water solubility	µg mm <sup>-3</sup>	ISO 4049	0.5
Radiopacity, reference aluminum		ISO 4049	1.8
Fluorescence		Visual	Natural tooth
Translucency		Internal method	20 – 26
Color stability		ISO 4049	Passed



# MORPHOLOGY

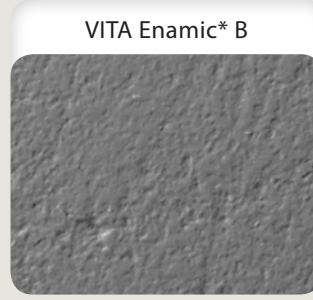
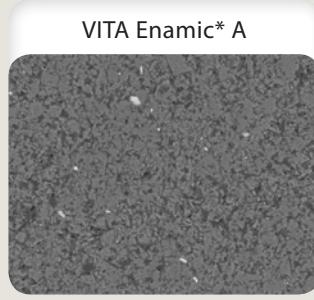
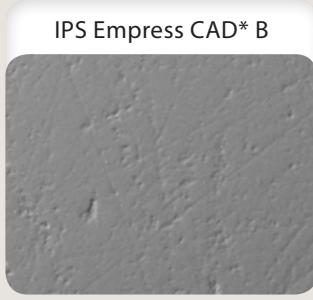
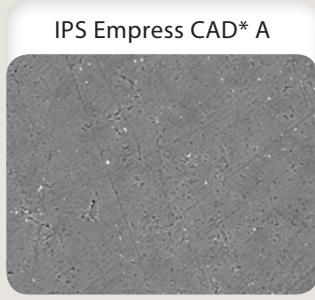
## Method:

The samples were pretreated with 1000 grain abrasive paper. Scanning electron microscope (SEM) images were performed with and without metal vaporization to display both the filler as well as the surface structure. The score marks facilitate the comparison of the same areas before and after metal vaporization. The images of the non-metallized materials (A) give insights on the material, whereas the images of the metallized samples (B) reflect the surface structure.

## Conclusion:

Porosities can be detected in the case of IPS Empress CAD (IPS Empress CAD A). These porosities also exist on the surface (IPS Empress CAD B). Such porosities can be the starting point of fractures and lead to a reduction in flexural strength. In the case of Vita Enamic (Vita Enamic A), the porous ceramic (grey) can be observed infiltrated with polymer (dark spots). This clear differentiation between hard ceramic and polymer can lead to different rates of ablation for ceramic and polymer during the grinding or polishing process. This results in a rough surface (Vita Enamic B) which later on appears matte and leads to a lackluster appearance of the restoration. In comparison, BRILLIANT Crios shows only small porosities. The surface structure (BRILLIANT Crios B) confirms this impression. This reduces the risk of fracture and makes the restoration more resistant.

## MATERIAL STRUCTURE UNDER THE SCANNING ELECTRON MICROSCOPE



\*Not a trademark of COLTENE  
Source: C. Kopfmann et al., Eur. J. Prosthodont. Rest. Dent., EMDC Special, P21, 2015, Nuremberg

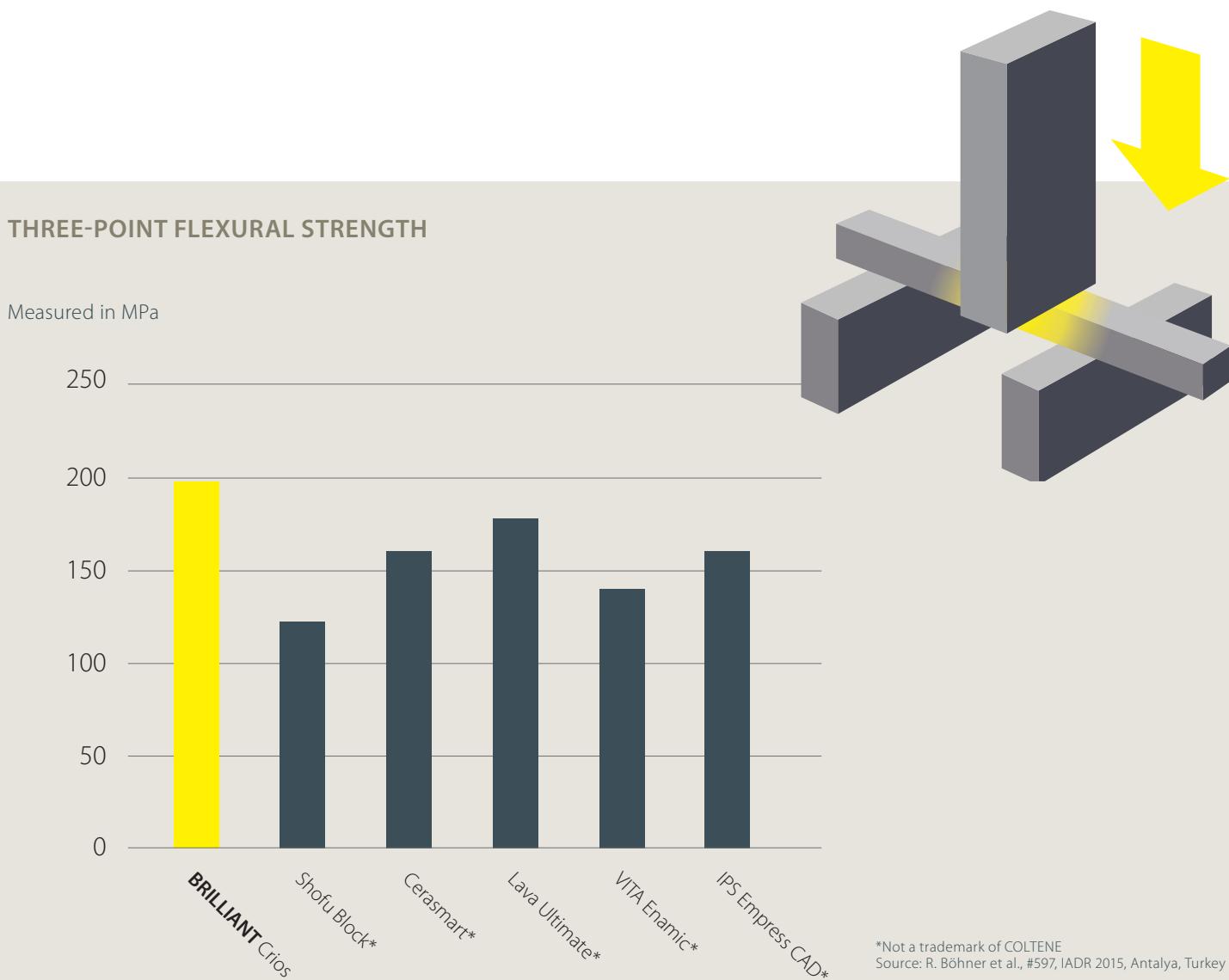
# THREE-POINT FLEXURAL STRENGTH

## Method:

Measuring flexural strength with the three-point method is the conventional method in the field of light-curing composites. The samples ( $1 \times 1 \times 18$  mm) were cut wet with a diamond saw. The trimmed rods were then stored for 24 h at  $37^\circ\text{C}$  in water. Measurement of flexural strength was performed after storage in water.

## Conclusion:

The values measured for the three-point flexural strength correspond more or less to the values quoted in the literature and documentation. The high value for BRILLIANT Crios differs significantly from the other measured values. Based on this toughness, this suggests a material with very few faults. If a material has fewer faults this reduces the risk of fracture as faults may often be the starting point of fractures.



# BIAXIAL FLEXURAL STRENGTH

## Method:

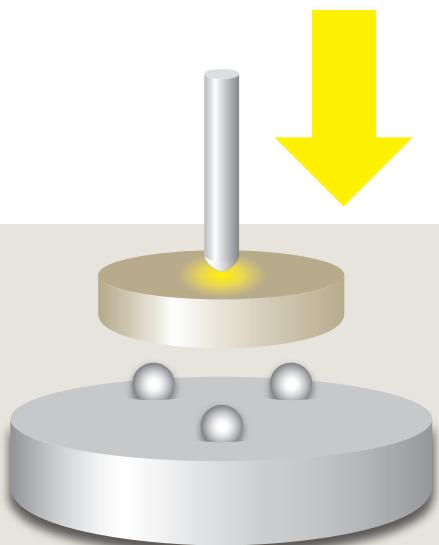
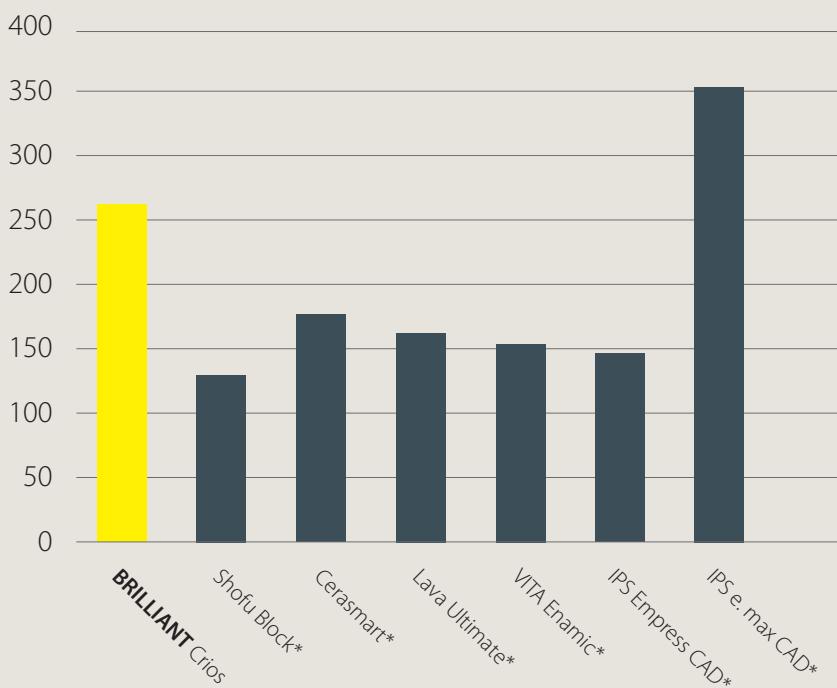
Rectangular platelets (thickness 1 mm) were sawn from the respective CAD/CAM blocs using a diamond saw. These were then converted to round specimens using a rotating diamond instrument. In the case of IPS e.max CAD, the specimens were fired according to the manufacturer's instructions. Prior to measurement (radius three-point base 3.9 mm) the samples were stored in water for 24 h at 37 °C.

## Conclusion:

Compared with most materials, BRILLIANT Crios demonstrated a significantly higher biaxial flexural strength. Only lithium disilicate displays an even greater biaxial flexural strength. As with the three-point measurement, one can assume fewer faults here, which in turn reduces the risk of fracture.

## BIAXIAL FLEXURAL STRENGTH

Measured in MPa



\*Not a trademark of COLTENE  
Source: internal data

# MODULUS OF ELASTICITY

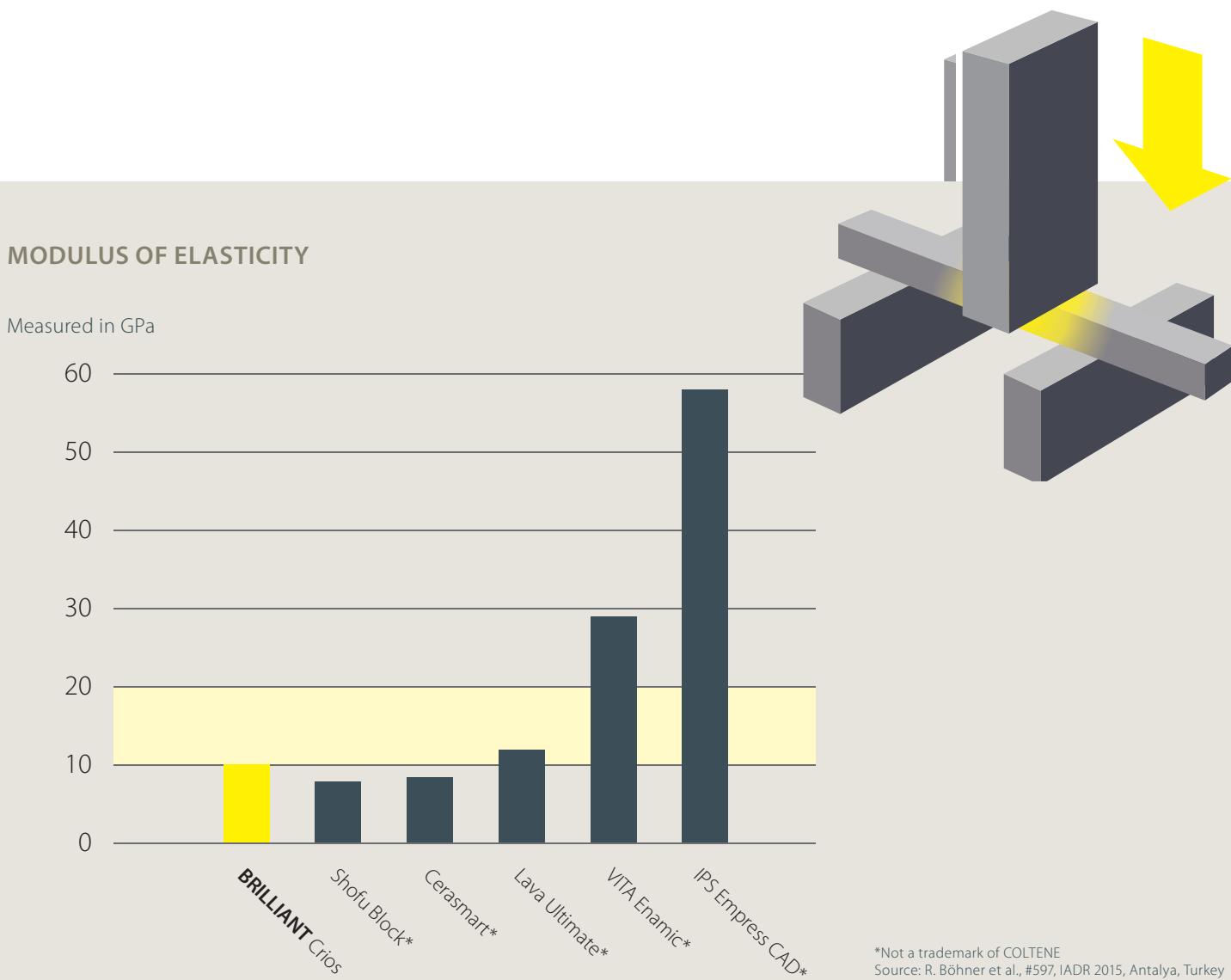
## Method:

Measurement of the modulus of elasticity was performed using the three-point method. The samples ( $1 \times 1 \times 18$  mm) were cut wet with a diamond saw. The trimmed rods were then stored for 24 h at  $37^\circ\text{C}$  in water. Measurement of flexural strength was performed after storage in water.

## Conclusion:

The value of the modulus of elasticity is greater the more resistance the material shows to deformation. A material with a high modulus of elasticity therefore possesses greater stiffness than a material of identical geometric dimensions with a lower modulus of elasticity. The E-modulus of dentin lies in the range of 10-20 GPa. If the E-modulus of the restoration is greater than that of the tooth substance, then this could lead to cracks in the restoration in case of deformation of the tooth substance.

Purely ceramic materials such as IPS Empress CAD demonstrate a considerably higher E-modulus in comparison to dentin. As a consequence of the lower modulus of elasticity of BRILLIANT Crios compared with ceramic, this affords better shock absorption of the masticatory pressure in comparison to materials with a greater E-modulus. On crowns on implant abutments, BRILLIANT Crios can absorb occurring peak loads better than ceramics with a very high modulus of elasticity.



# WEAR RESISTANCE

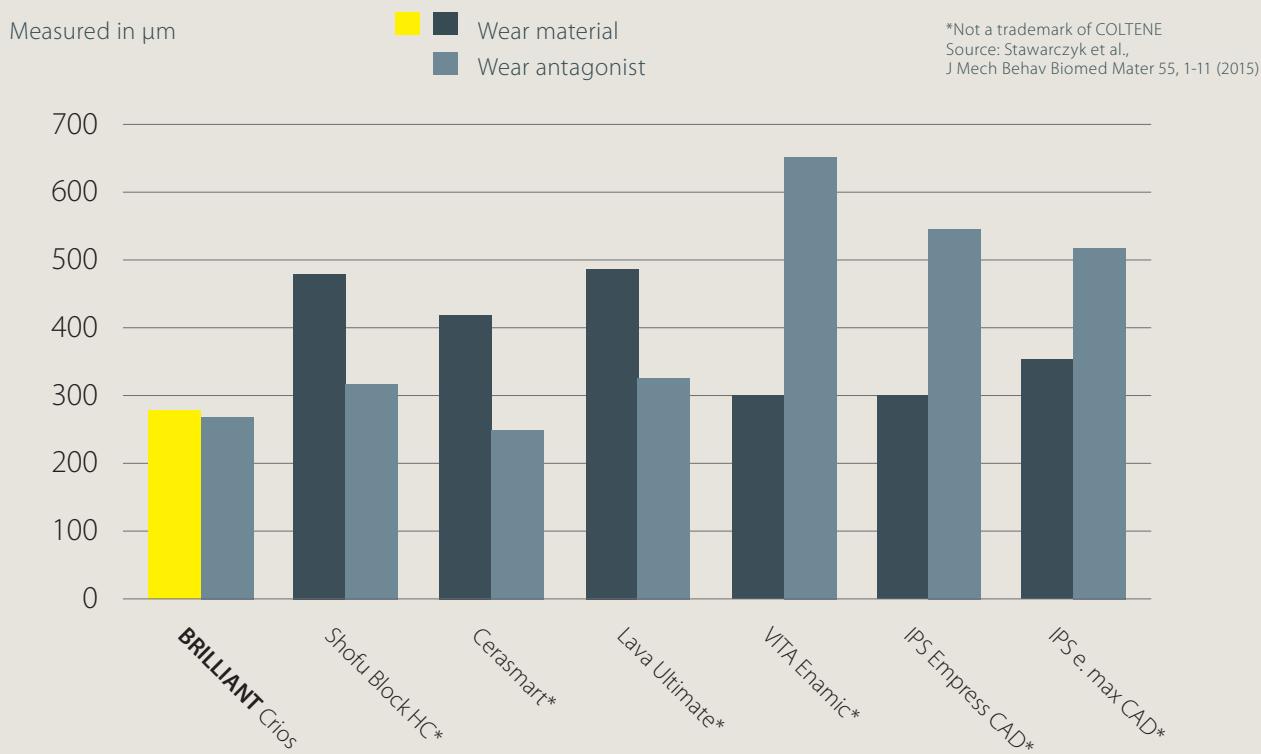
## Method:

The CAD/CAM materials were polished in ascending order with SiC abrasive paper up to P4000. Mesio-buccal cusps of maxillary molars served as opposite teeth. The samples and opposite teeth were fixated in a computer-supported chewing simulator. The samples were loaded at a vertical load of 50 N as well as a lateral movement of 0.7 mm and 1.2 million chewing cycles. Simulation was performed at simultaneous thermal load in distilled water and alternating temperatures of 5 °C and 55 °C (60 s per cycle). Then all data sets prior to and after abrasion simulation were compared with 3D images.

## Conclusion:

The high rate of abrasion of the opposite tooth is clearly visible for the purely ceramic material. Together with Lava Ultimate, Cerasmart and Shofu Block HC, BRILLIANT Crios proved to be very gentle on the opposite tooth. In terms of wear of the restoration material BRILLIANT Crios demonstrates a lower abrasion value, similar to that of ceramics. This means that the restoration is preserved for a long period and that existing tooth substance is protected as best as possible.

## TWO-BODY WEAR



# GRINDING PRECISION – WEDGE

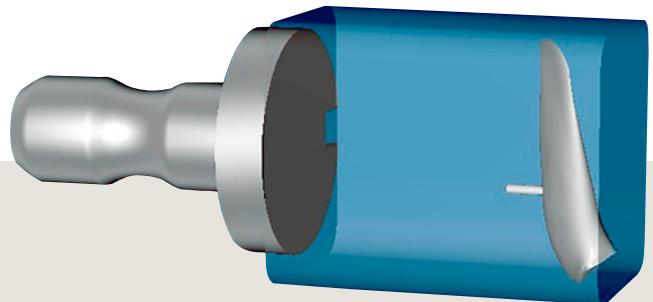
## Method:

Wedges with a tapered tip up to 0.1 mm were ground wet in a Sirona inLab MC XL.

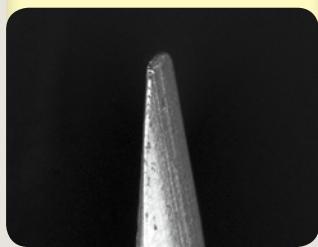
## Conclusion:

Grinding without chipping is possible with BRILLIANT Crios. This enables improved marginal adaptation and a restoration more true in detail. This increases the final accuracy of fit.

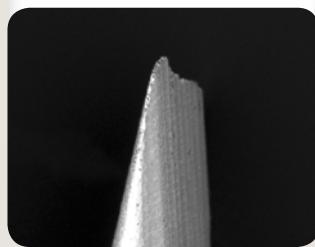
GROUND WEDGES WITH TAPERED TIP



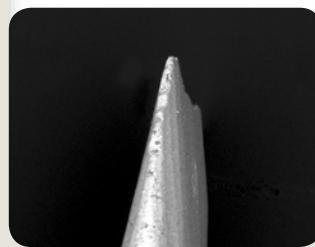
BRILLIANT Crios



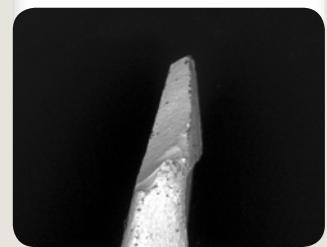
Lava Ultimate\*



VITA Enamic\*



IPS Empress CAD\*



\*Not a trademark of COLTENE

Source: C. Kopfmann et al., Eur. J. Prosthodont. Rest. Dent., EMDC Special, P21, 2015, Nuremberg

# GRINDING PRECISION – MICROSCOPIC IMAGE

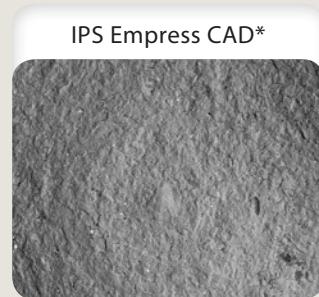
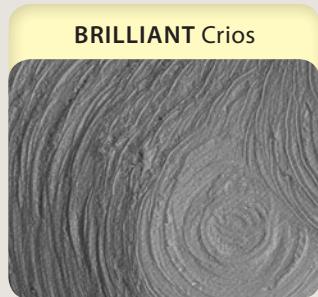
## Method:

Posterior crowns were ground wet in a Sirona inLab MC XL grinding unit with a diamond step bur. Then the SEM images were taken without metallization.

## Conclusion:

Ceramic and non-ceramic materials display different microsections for the stages. The composite materials Lava Ultimate and BRILLIANT Crios display the exact grinding stages. This suggests less brittleness of these materials compared to ceramic.

## MICROSECTIONS



\*Not a trademark of COLTENE  
Source: C. Kopfmann et al., Eur. J. Prosthodont. Rest. Dent., EMDC Special, P21, 2015, Nuremberg

# WATER SORPTION

## Method:

Water sorption was determined according to ISO standard 4049:

The samples were dried to a constant weight. Then the samples were stored in water, again to a constant weight. Water sorption is the difference in weight between the dried sample and the sample stored in water. The difference in weight is represented relative to the volume of the sample. Measurement of ceramic blocs was dispensed with, as it is not expected that purely ceramic materials can absorb water.

## Conclusion:

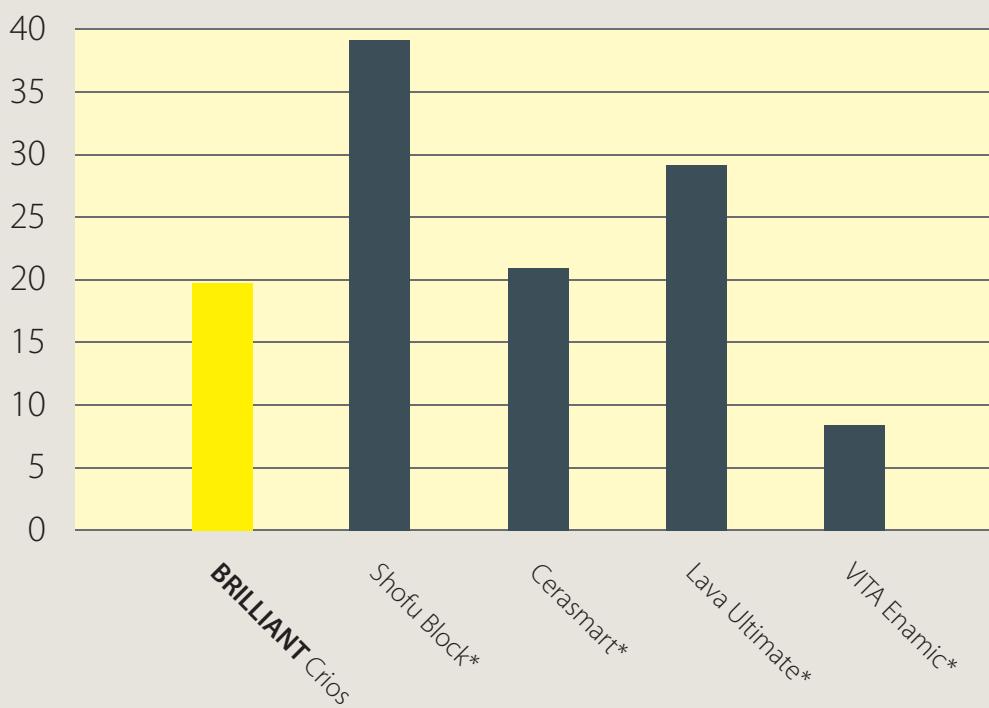
BRILLIANT Crios and Cerasmart lie in the range of conventional composites such as, for example, BRILLIANT EverGlow. Due to its low polymer content, VITA Enamic shows low absorption of water.

The absorbed water can either fill porosities or be absorbed in the polymer matrix itself. If the polymer matrix absorbs water, this leads to an expansion of the material. If the expansion due to absorption of water is too high, particularly in the case of an inlay, this can exert considerable forces on the surrounding tooth substance. In the worst case, this can lead to cracks or complete fracture within the tooth substance.

## WATER SORPTION

Measured in  $\mu\text{g mm}^{-3}$

ISO standard



\*Not a trademark of COLTENE  
Source: R. Böhner et al., #597, IADR 2015, Antalya, Turkey

# DISCOLORATION

## Method:

The discoloration rate was investigated after 14 days of storage in cress, curry, red wine and distilled water. The materials were measured with a spectrophotometer (wavelength 400-700 nm). Then the  $\Delta E$  value was calculated.  $\Delta E$  values greater than 3.3 are regarded as being clinically noticeable.

## Conclusion:

The lower the discoloration rate, the better and longer the overall aesthetic appearance will remain. The tendency to surface discoloration for BRILLIANT Crios is comparable to the values for Lava Ultimate, Cerasmart or Shofu Block HC. Clinically relevant discoloration can only be observed for curry and red wine. This is generally superficial discoloration. Many of the superficial deposits can be removed by caring for teeth with a toothbrush.

## RATE OF DISCOLORATION

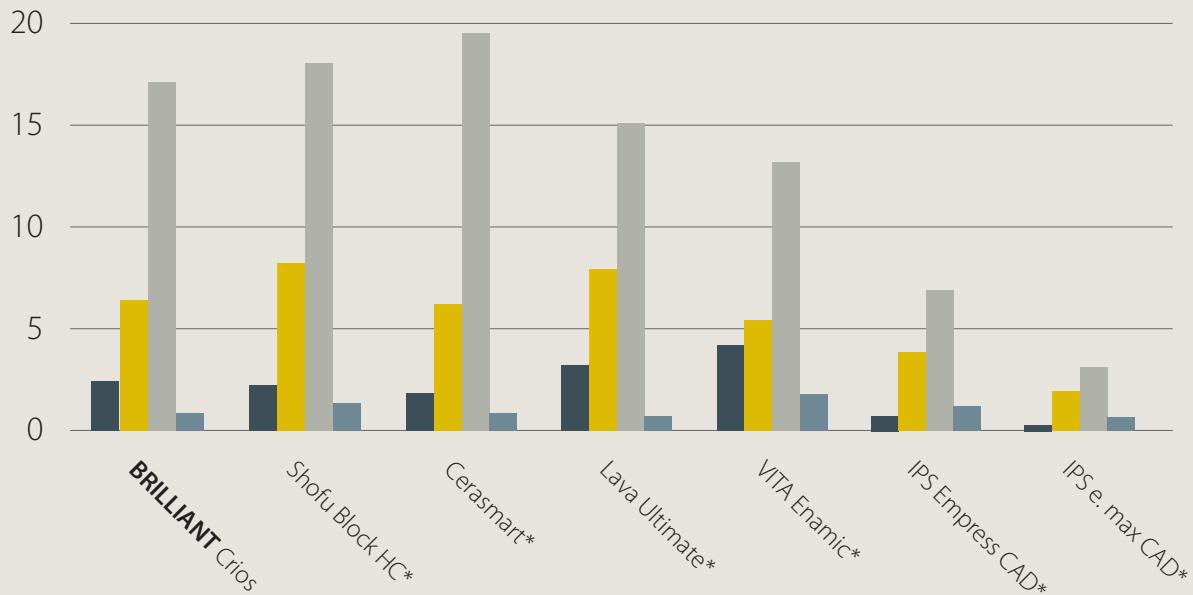
Rate of discoloration /  
 $\Delta E$  value

Cress  
Curry

Red wine  
Distilled water

\*Not a trademark of COLTENE

Source: Stawarczyk et al., J Mech Behav Biomed Mater 55, 1-11 (2015)



# SHEAR BOND STRENGTH

## Method:

The adhesive bond between BRILLIANT Crios and resin based materials was tested using the Watanabe method. ONE COAT 7 UNIVERSAL was used as the bonding agent.

## Conclusion:

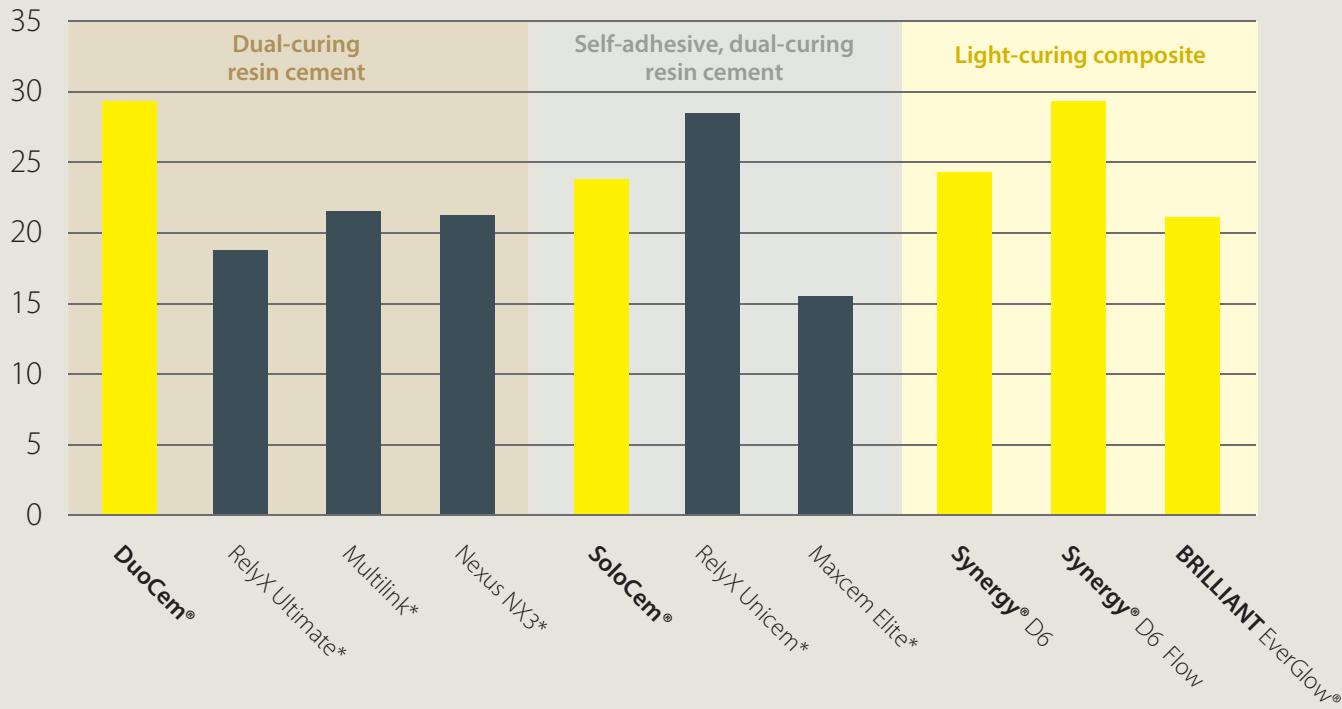
The better the bond, the lower the risk of debonding. The COLTENE luting materials demonstrate excellent bonding values in conjunction with BRILLIANT Crios and ONE COAT 7 UNIVERSAL.

A cohesive fracture image was observed in all cases of COLTENE materials. This indicates a stable bond between the restoration material and the luting material as the fracture occurs over both materials. In contrast, an adhesive fracture image that displays a fracture in the border region between restoration and luting material, indicates a poorer bond.

## SHEAR BOND STRENGTH

Measured in MPa

\*Not a trademark of COLTENE  
Source: internal data



# ADHESIVE LUTING

## LUTING STRATEGY

In contrast to pure ceramic materials, CAD/CAM composites must always be luted adhesively. This implies an adhesive bond between composite restoration and luting material as well as between luting material and tooth substance.

Depending on the indication, light-curing composites (stackable or flowable) or dual-curing resin cements (also referred to as "adhesive resin cement") are suitable. In the case of metallic or ceramic materials (abutments), self-adhesive resin cements are also suitable.

The term cement is often used in this context. Cement also includes materials such as zinc phosphate and glass ionomer cements or resin-reinforced glass ionomer cements. These cements are unsuitable for ensuring a permanent bond for a CAD/CAM composite restoration.

## TREATMENT FOLLOWING THE GRINDING PROCESS

After fabrication of the restoration, the luting area to be bonded is sandblasted to enlarge the surface and to create mechanical retention. As sandblasting is a very abrasive process, care should be taken not to remove too much substance. Corundum (aluminum oxide) is used as blasting medium. Other blasting media such as sodium bicarbonate and glycine are not suited. The effect of the sandblasting procedure is comparable to pre-treatment through sandblasting for zirconia or etching with hydrofluoric acid for silicate ceramics. Depending on the material, both procedures lead to an enlarged surface and mechanical retention.

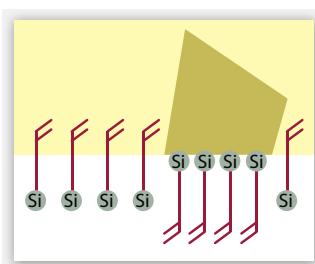
The sandblasted surface now contains particles of dental glass and polymerized resin matrix. The ratio is approximately 1:1. To ensure a permanent bond it is therefore important to achieve adhesion to both the glass as well as the resin matrix.

## BONDING TO CAD/CAM COMPOSITE BRILLIANT CRIOS

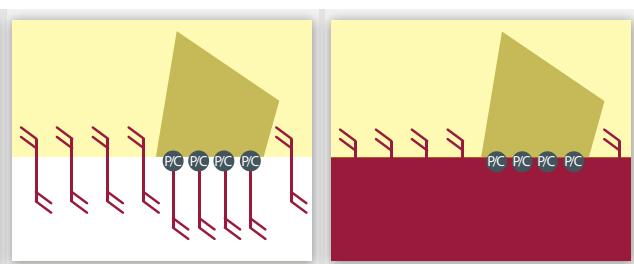
**A:** Silane (Si) is often used to provide adhesion to the dental glass filler (dark yellow). However, it has been shown that the use of silane does not result in optimal bonding across the entire surface in the case of BRILLIANT Crios, as the silane also wets the resin matrix (bright yellow) where it leads to impaired bonding.

**B:** Carboxylic acid groups or MDP (P/C) create a very good bond to the fillers. If these are combined with difunctional monomers, as in the case of ONE COAT 7 UNIVERSAL, a good bond to the resin matrix is generated.

**A: Silane and luting material**



**B: ONE COAT 7 UNIVERSAL and luting material**



Adhesion to the polymer matrix of the restoration can be divided into three types:

### 1. Hydrogen bonds

The resin matrix of the CAD/CAM composite contains NH or OH groups. ONE COAT 7 UNIVERSAL also contains NO or OH groups. This allows the formation of hydrogen bonds between the resin matrix and adhesive, which leads to an improved bond between the CAD/CAM restoration and the adhesive.



### 2. Interlooping

The bond is also improved by interlooping. Here, the monomers of ONE COAT 7 UNIVERSAL penetrate into the polymerized resin matrix of the restoration material. If these are polymerized, this leads to the formation of chains within the resin matrix of the restoration material which ideally leads to "interlooping". The result is a mechanical bond.



### 3. Chemical bonding

The most important bond to the resin matrix is generated by chemical bonding to the polymerized resin matrix. The polymerized resin matrix of BRILLIANT Crios contains non-polymerized double bonds. Monomers of ONE COAT 7 UNIVERSAL penetrating the resin matrix link to these double bonds during polymerization. This results in a polymer chain (chemical bond) which involves the molecules of the resin matrix of BRILLIANT Crios and ONE COAT 7 UNIVERSAL.

## BONDING TO TOOTH SUBSTANCE, METAL OR CERAMIC

To ensure bonding to the tooth substance, a suitable bond has to be used, e.g. ONE COAT 7 UNIVERSAL. In the case of a light-curing bond, it is obligatory to light-cure according to the instructions for use after application, analogue to conventional filling therapy. Care should be taken that the luting material used is not too opaque, as not enough light may otherwise penetrate through the restoration to the uncured inhibition layer of the bond during final light-curing. In such cases, dual-curing or chemically curing bonds should be used.

Only resin-based luting materials may be used for the adhesive luting of BRILLIANT Crios CAD/CAM composite restorations. This is the only way to guarantee an adhesive bond. Light-curing composites (e.g. BRILLIANT EverGlow), flows or veneer luting materials can be used as resin-based luting materials. In this case care should be taken that sufficient light penetrates through the restoration to the luting material during the final curing process. The wall thicknesses of the restoration may therefore not exceed 3 mm.

If the wall thickness of the BRILLIANT Crios restoration exceeds 3 mm, dual-curing, resin-based luting materials (e.g. DuoCem) must be used. These allow wall thicknesses up to a maximum of 5 mm.

If crowns are to be luted on titanium or ceramic abutments, self-adhesive luting materials (e.g. SoloCem) are suitable. Here too, the bond to the BRILLIANT Crios restoration must be generated with ONE COAT 7 UNIVERSAL.

Once the restoration is placed, final light-curing is performed. This cures ONE COAT 7 UNIVERSAL and the light-curing luting material. To achieve an optimal result, it is important to comply with curing times and light intensity.

Source: R. Böhner: Moderne CAD/CAM-Kompositmaterialien – deren Materialeigenschaften und Befestigungsstrategien.  
In: ZMK (32)3 2016, p. 112–118.

# QUESTIONS AND ANSWERS

## **1. What is BRILLIANT Crios?**

BRILLIANT Crios is a reinforced composite for the fabrication of permanent, indirect restorations using a CAD/CAM grinding process. BRILLIANT Crios is available in 13 different shades in Low Translucent and High Translucent, as well as in sizes 12 and 14.

## **2. Which clinical situations is BRILLIANT Crios indicated for?**

BRILLIANT Crios can be used for inlays, onlays, crowns and veneers. Due to its shock-absorbing effect, BRILLIANT Crios is particularly suited for implant-supported crowns.

## **3. Can BRILLIANT Crios be ground both wet and dry?**

The choice between wet and dry is only available for milling. Materials which are ground, must always be processed wet. BRILLIANT Crios is ground on Sirona machines which is why processing must always be wet.

## **4. Which shades are available for BRILLIANT Crios?**

The shades of BRILLIANT Crios are VITA-based. Two translucencies with a total of 13 shades are available.

Low Translucent

BL | A1 | A2 | A3 | A3.5 | B1 | B2 | B3 | C2

High Translucent

A1 | A2 | A3 | B1

## **5. When can Low Translucent and when can High Translucent be used?**

Low Translucent shades are more opaque than High Translucent shades. They are therefore better suited for covering discolouration or on older patients with a reduced enamel content. In contrast, High Translucent shades tend to adapt better to their surroundings due to increased light transluсence. This leads to a better blend in effect, which is desirable for highly aesthetic outcomes.

## **6. With which bonding system must BRILLIANT Crios be used?**

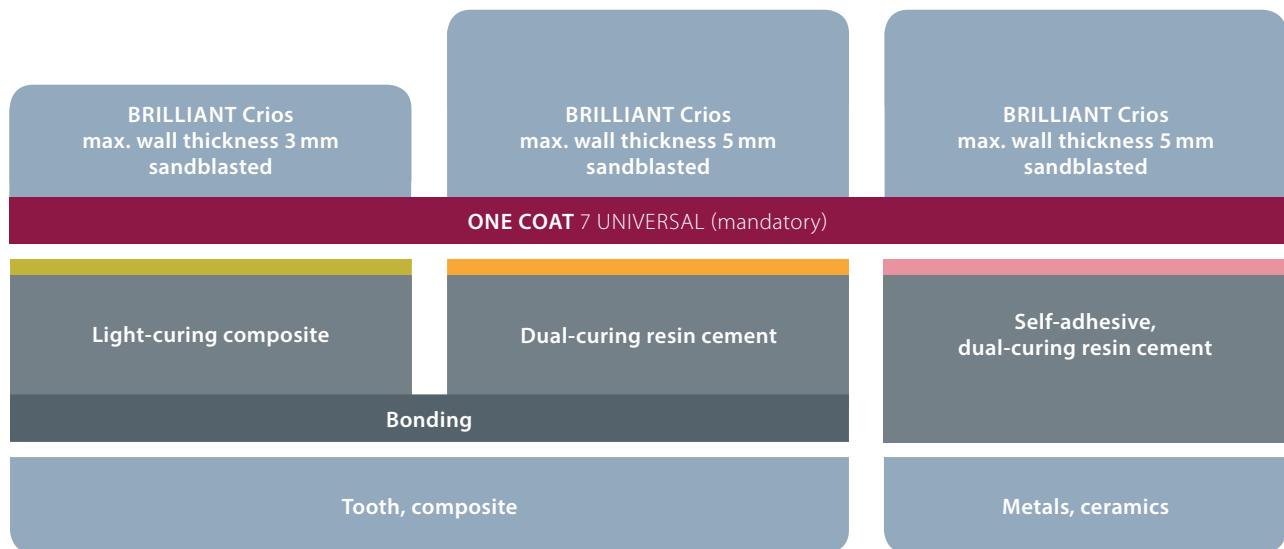
ONE COAT 7 UNIVERSAL adhesive is matched perfectly to the BRILLIANT Crios components. This results in strong anchorage and a reliable bond to the restoration. This is why ONE COAT 7 UNIVERSAL adhesive is to be used in conjunction with BRILLIANT Crios. The adhesive to the tooth substance can be chosen freely and can be performed with any suitable bond. (For further information, please see Product Guideline, Section on Adhesive Luting)

## **7. How must BRILLIANT Crios be pretreated?**

As BRILLIANT Crios is a composite material, sandblasting with 25-50 µm aluminum oxide must be performed beforehand to give reliable retention. BRILLIANT Crios does not require a firing process. The restoration is not to be etched with hydrofluoric acid. Silane should also not be used as this reduces bonding to the resin matrix.

## **8. How must BRILLIANT Crios be luted?**

The BRILLIANT Crios restoration is luted in the patient's mouth adhesively. The maximum wall thickness of the restoration is 5 mm for chemically curing luting materials and 3 mm for light-curing luting materials. Luting on tooth substance or composite can be performed with either light-curing composites as well as dual-curing resin cements. If the restoration is luted on metal or ceramic, a self-adhesive, dual-curing resin cement (e.g. SoloCem) is recommended. The luting surface of the BRILLIANT Crios restoration must always be bonded with ONE COAT 7 UNIVERSAL.



## **9. Can BRILLIANT Crios be luted conventionally?**

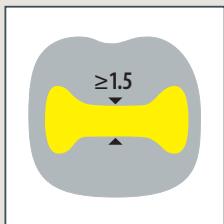
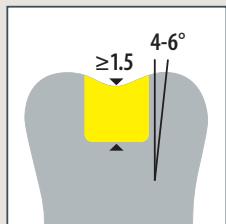
To ensure a reliable bond, BRILLIANT Crios may not be luted conventionally. BRILLIANT Crios may only be luted adhesively. Only ONE COAT 7 UNIVERSAL may be used as adhesive to the restoration.

## **10. Which polishing systems can be recommended?**

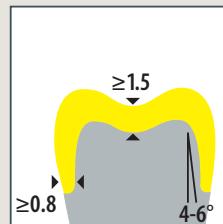
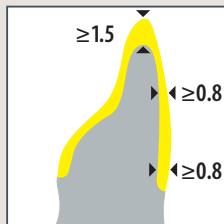
The two-step Alpen diamond impregnated polishing system (Composite Plus, especially Alpen ShapeGuard in conjunction with brushes) is recommended for polishing.

## **11. Which preparation guidelines need to be observed?**

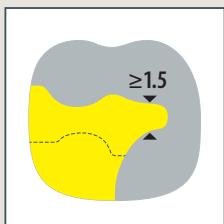
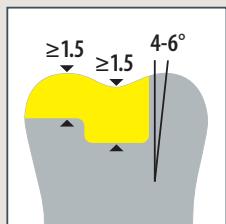
### **INLAY**



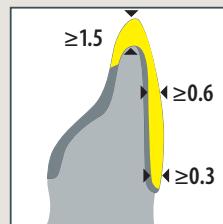
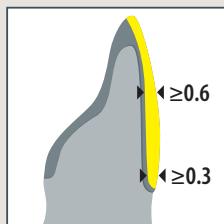
### **CROWN**



### **ONLAY**



### **VENEER**



## **12. How is BRILLIANT Crios to be stored?**

Please observe that BRILLIANT Crios is not subjected to direct sunlight or other sources of heat. The ideal storage temperature is 4-23 °C / 39-73 °F.

## **13. Can BRILLIANT Crios be modified and repaired?**

BRILLIANT Crios can be modified, characterized or repaired at any time. To this purpose, roughen the surface of the restoration using a diamond-coated rotary instrument. Bonding can be carried out using an adhesive suitable for this purpose (e.g. ONE COAT 7 UNIVERSAL). Then apply the shades for characterization or composite (e.g. BRILLIANT EverGlow).

## **14. Which hardware and software conditions are required for processing BRILLIANT Crios?**

BRILLIANT Crios can be ground on Sirona devices. The following software versions are minimum requirements and can be downloaded from the Sirona website:

- CEREC 4.4.2
- CEREC Premium 4.4.2
- inLab 15.0 (material pack)
- inLab CAM 15.1 (material pack)

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