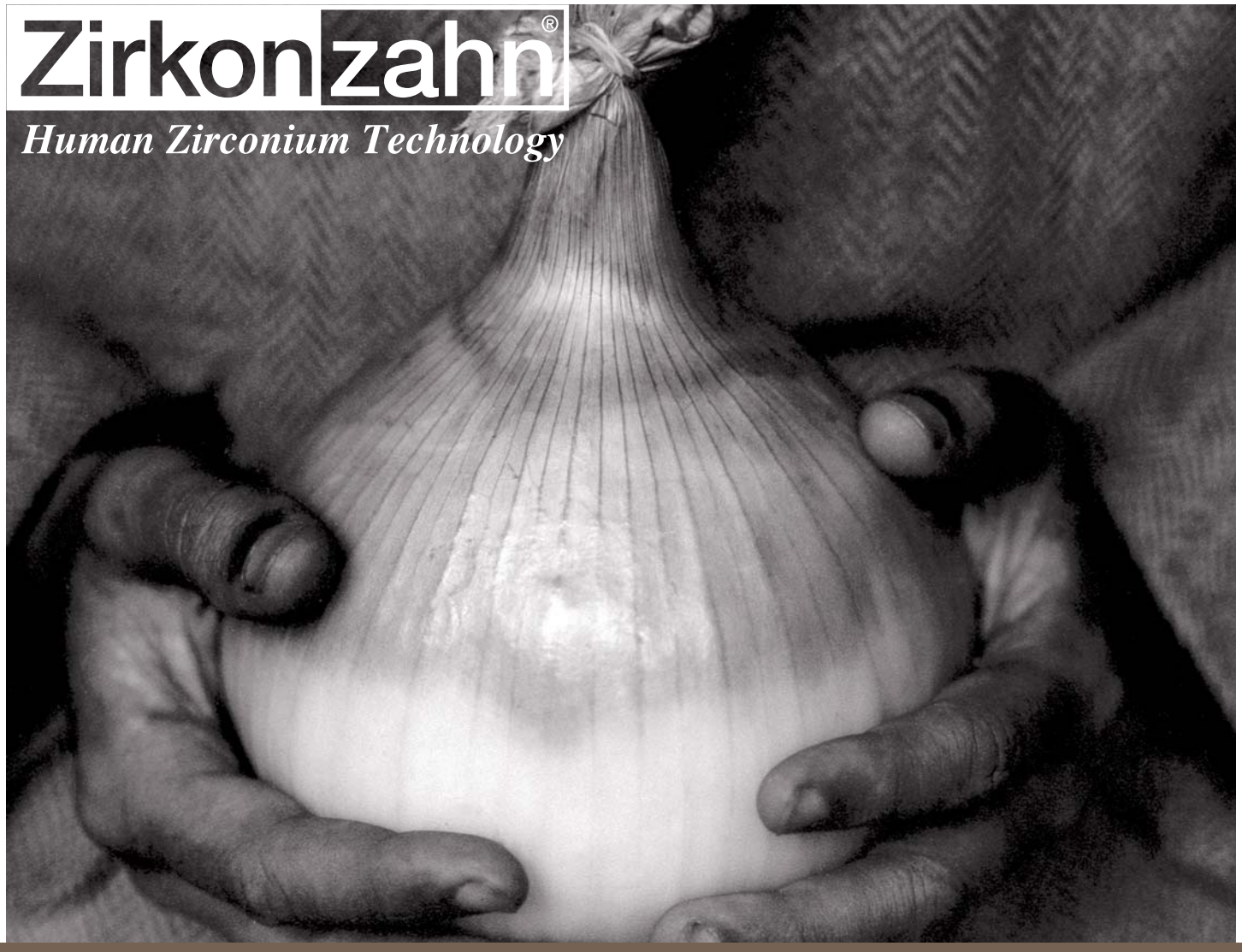
Zirkonzahn®

Human Zirconium Technology



PRETTAU ZIRCONIA

Processing and Colouring of Prettau Zirconia

ENGLISH

Dear Colleagues,

A reoccurring issue in our professional circles is the question whether solid, full-contour zirconia crowns are at all indicated in the view of aesthetics, abrasion characteristics, compatibility and strength. Can we recommend them to our patients?

As far as (full-anatomical-contour) solid Zirconia restorations are concerned we all agree that a special translucent zirconia material is needed first.

For this reason we have developed the highly translucent Prettau Zirconia which is used in conjunction with a specialized colouring technique that eliminates the use of veneer ceramics entirely. In this way aesthetically pleasing full-zirconia (FZ) restorations, i.e. the 'Prettau Bridge' can be realized.

Especially in the field of implant dentistry, in cases of limited available space or restorations with tissue flanges, Prettau Zirconia comes into a world of its own.

One of the many advantages is the complete elimination of posterior occlusal chipping because only the labial or buccal surfaces are porcelain veneered; all functional areas are maintained as solid Prettau zirconia.

A local Tyrolean shire by the name of Prettau lends its name to the Prettau range of products. In the Middle Ages copper was mined in Prettau. As rumor has it, traces of zirconia were found in the Prettau mine at the time. Luckily, nowadays we don't have to venture 'underground' to find out about our zirconia!

In the following I would like to give you an insight into our work experiences with Prettau Zirconia and point you in the right direction when using this material.

Producing a Prettau Bridge may conjure up images of 'hard-core' 10-hour shifts in an underground mine but I promise your results will shine when they surface to the light of day.

In that light: "Let's be of good cheer!"

Is Prettau Zirconia too hard and abrasive?

In dentistry abrasion (Latin: abrasio = to scratch off) means the loss of tooth substance due to friction. Enamel and dentin are part of the so-called ‘hard’ tooth structure. Abrasion in this context translates into wear or attrition.
As we know from nature, elephants starve to death at the age of 50 - 60 years because their dentition at that stage is too abraded to process food.

Sintered Prettau Zirconia, owing to its own special material composition, displays incredible density and smoothness. Therefore the material does not cause any wear on natural dentition.

I illustrate this phenomenon by practical example: Rub wood against a smooth glass pane and nothing will happen but, rub wood against wood and it will splinter. As two materials of the same kind meet (tooth against tooth) natural dentition will inevitably wear also. However, when natural tooth meets smooth zirconia (like wood against glass) no abrasion occurs. The abrasive nature of any material is determined by its degree of surface polish and inherent density. The ”softer” enamel will glide over polished, much harder zirconia without wear.

By contrast veneer porcelain (or even metal) will cause wear on natural dentition due to its highly porous structure which acts like sandpaper.

Veneer porcelain is 1000 times more abrasive compared to polished Prettau Zirconia.

Our experiences with zirconia vindicate our view: Zirconia causes practically no abrasion to natural dentition.

In the past we have observed the facts in our own environment and currently they are being tested scientifically in several universities. In general terms we can say this: The harder and smoother a material the less the wear it causes under friction. Wear results in abrasion.

100% Prettau Zirconia – overlaid with enamel ceramics only

Prettau Zirconia – no extra load on the mandible joints

It would be wrong to assume the positive characteristics mentioned in the previous chapter (no abrasion) should cause negative effects on the joints because of hardness. Ceramic (veneered) restorations, implant borne or cemented, are inherently hard but have never been proven to cause joint problems. The joints' surfaces are "padded" by the disc which acts as a shock absorber. The hardness of a restoration bears no influence on the joint load. Imagine a pair of pliers: It makes no difference to the actual load on the pliers' hinge whether its prongs are coated with rubber, metal, ceramic, or zirconia. The load on the hinge remains the same; just as a load on the mandible joint is stable. The average 'bite force' of the human jaw closing is approx. 5 kg – unlike, and incomparable to, the sudden impact force of a slamming door.

Prettau Zirconia – the application

Design and mill your (full anatomical contour) frame as usual but use the special Prettau Liquids for pre-sinter colouring. A technician's expertise in layering ceramic is helpful in getting a handle on this particular colouring technique. Occlusal surfaces are no longer painstakingly built in veneer porcelain but copy-milled from the full-contour mock-up frame. The frame is then fired in a sinter furnace following a specific program designed for Prettau material. The flexural strength of Prettau Zirconia lays 10% below regular zirconia but this shortfall is more than compensated for by the extra frame dimension (full contour!): No need to maintain space for veneer porcelain! Therefore actual flexural strength increases by up to 200%.

Prettau Zirconia is available in seven blank sizes and two different thicknesses (16 mm and 22 mm).

The zirconia with the EXTRA translucency.

Milling

Prettau Zirconia can be full-anatomical-contour milled or alternatively, be veneered with ceramic. One option is only minimally reducing the frame surface, and then just apply a thin layer of enamel porcelain. The frame is pre-milled with bur 4L and stylus 4LA. Then the only bonding surfaces are evenly reduced by using round bur 2K together with stylus 1L. Any finer detail is touched up with bur 0.5S. Occlusal fissures and interproximal spaces are finished off with bur 0.3C. Upon completion the case is cut from the blank with bur 1XL.

IMPORTANT: Bridges must remain attached to and sintered with a supportive base!

Surface refinement after milling

Refining the surface is done manually with the lab hand-piece. Zirconium oxide stones, sinter diamonds, silicon polishers and tungsten crosscut burs are all suitable tools.

Colouring

After milling Prettau framework, unlike regular zirconia, is not dipped whole into Colour Liquid. Instead, it is individually painted using a small brush. This step in principle is similar to colouring a restoration before glaze firing. A metal-free brush must be used in order to avoid discolourations! (see Brush for Colour Liquid Size 4 - *article No. ZBAA2101).*

Apply Prettau Colour Liquids as follows:

- dip brush into liquid
- briefly dab brush on tissue to remove excess liquid
- paint zirconia framework

Final color intensity is defined by the number of brush strokes applied. This takes a little experience. The end result depends entirely on the way the brush is worked. Pick up fresh Colour Liquid after every 4 - 6 brush strokes. For practice we recommend copying some denture teeth in zirconia.

Run a colouring practice session using those until you learn to gauge desired results on real cases.

Copy mill some natural or denture teeth in zirconia to practice your Prettau colouring technique.

Find details on ‘how to’ on pages 20 - 23.

Colour Liquid Set
Content: 16 x 100 ml
For colouring of zirconia before sintering
Item number: FMAA1701

Set Colour Liquid Intensiv for Prettau
Content: 7 x 20 ml
Intensive set for colouring Prettau zirconia before sintering
Item number: FMAA5703

Fluorescence

If so desired, milled restorations can be infiltrated with a fluorescent Colour Liquid prior to colouring. Though, this is only effective for lighter shades, i.e. A1, B1, and C1.

The fluorescence will be most visible in the incisal area. Cervically, where more Colour Liquid is used or where darker shades are applied (A2, B2, C2) the fluorescence will be lost.

Colour Liquid Fluorescence can be used on its own without additional dentin-shaded Colour Liquids (see picture).

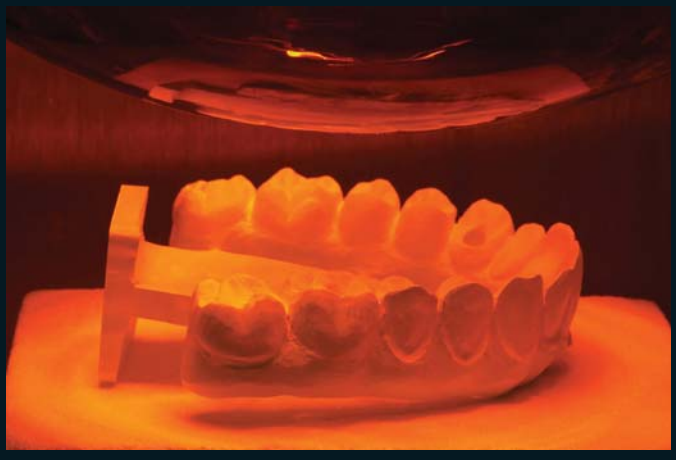
ALTERNATIVE: Increase the fluorescent effect in cervical areas by application of a very thin layer of Dentin Opak (very high fluorescence) or a mix thereof (with darker dentin).

(Mix: 80% A4 : 20% Dentin Opak)

Coloured with Colour Liquid Fluorescence

Drying

The framework is dried under infrared lamp “Zirkonlampe 250” *(article No: SY0070)* for at least one hour.



Sintering

Prettau framework is best sintered on a piece of already sintered zirconia, a firing tray *(article No. ZBAA4591)* or best, an aluminium oxide plate *(article No. ZBAA9401)* in order to avoid white spotting. When sintering on a normal firing tray, a support leg must be used on the sinter object. Best colour results can only be guaranteed by using a sinter cover *(article No. ZBAA4631 or ZBAA4621).*

Framework is sintered under program No.5 (a Prettau Zirconia specific program) firing at 1600 degrees C.

CERAMIC PLATE: Used for sintering – recommended for avoiding white spots on sinter objects.

Sandblasting

After sintering and prior to application of surface stains framework is treated with aluminium oxide (50 - 100 micron) at 4 - 5 bar. This creates a suitable surface for staining and stops the stain from running or forming puddles. Areas to be veneered with ceramic should be kept smooth – blasting is not required.

Georg Walcher, Zirkonzahn

Sandblast frame with aluminium oxide

Stain (“freeze fire”) then add glaze paste (fire once or twice)

ICE Zirconia Ceramic Dynamik Dentin

Salvatore Conte, Italy

Wash Bake (Veneering Prettau Zirconia)

For chroma enhancement it is recommended to apply a thin wash bake of various dentin shades from the ICE Dynamik Dentin selection to the Prettau frame.

The wash bake must be 100 C degrees above the regular firing temperature for veneer porcelain.

Large framework conducts heat very slowly: Generally, a minimum hold time of 2 minutes must be observed to reach desired temperatures.

Only a thin layer of enamel (thickness 0.3 - 0.5mm) is applied over the equally thin Dynamik Dentin cover. Use different enamels for individual characterization.

Surface Stains

Colour fine tuning is carried out with Prettau surface stains before glaze (paste) firing. In addition ICE Zirconia surface stains can also be used for individual characterization.

Firstly fix the stains with a 'freeze fire' at 730 C degrees, and then cover the entire construction with fluorescent paste Glaze Plus *(article No.MFAA2091).*

Attention: Pre-dry thoroughly before firing. True colours will only show after the glaze bake! Prior to staining treat surfaces with aluminium oxide (50 -100 micron at 4 - 5 bar).

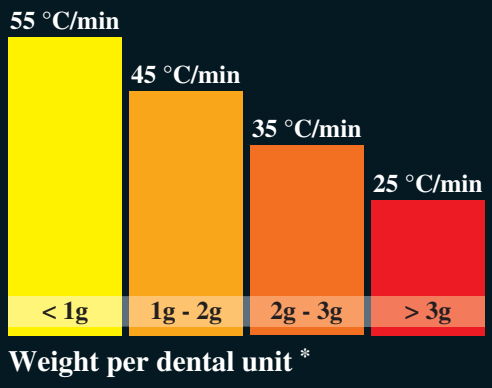
This will assist the stain application. Cervical fluorescence can be achieved by using the fluorescent glaze paste Glaze Plus.

Georg Walcher, Zirkonzahn

Veneering zirconia

Firing instructions for veneering zirconia

Zirconia conducts heat poorly – therefore a specific firing regime is required. Framework with thin walls and without bulky pontics can be fired at the normal heat rise rate of 55 C degrees/min.
With increasing pontic volume the rise rate has to be slowed. Bulky zirconia frames, i.e. bridge pontics are much more difficult to fire than normal copings. Differences in heat distribution between copings and pontics can be compensated for by increasing the holding time up to 2 minutes. For some cases, especially large implant bridges, it is recommended increasing the holding time to 3 minutes while lowering the final temperature by 10 - 15 C degrees to avoid over-firing the veneer ceramic.



*** The dental unit with the highest mass determines the times for the complete structure.**

The lower temperature combined with a longer holding time ensures the ceramic is fired right through without loosing shape. Generally speaking, a two-minute hold time on final temperature under vacuum is recommended for ceramic-veneered zirconia restorations.

Even the glaze fire should be carried out under vacuum since there is no risk of bubbling on zirconia.

Attention: Large zirconia bridges must be heated slowly. Slow cooling is also essential. Otherwise cracks can result! Take the manufacture of large optical lenses as an example: After casting they are slow cooled over several weeks in order to avoid cracking.

Hints

- When separating bridges from their support base after sintering use a thin diamond disc at slow revs to avoid spot heating.
- Aluminium oxide blast the interproximal areas only (50 -100 micron at 4 - 5 bar) to roughen the surface slightly and clean it from possible residue.
- Avoid any spot heating when steam cleaning, blasting or high-shine polishing.
- For optimal bond carry out a wash bake with dentin ceramic (fire 100 C degrees above regular dentin fire temp).
- Decrease heat rise rate with increasing frame volume.
- Holding time on final temperature must be at least 2 minutes regardless of frame size.
- Slow cool (minimum 3 minutes)
- Avoid temperature shock during firing (massive framework especially): Heat slowly - cool slowly. Only remove framework from furnace below 200 C degrees.
- Never place hot framework onto cold surfaces (like bench top) – danger of cracking!
- Polish tissue fitting surfaces as last step.

Aldo Zilio, Italy

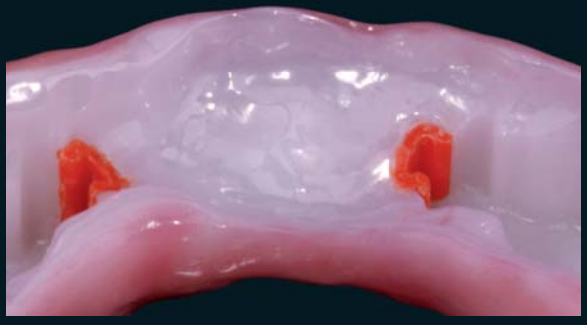
Firing table for ICE Zirconia Ceramics

Start temp	**300 °C**
Drying time	**2 min**
Heating time	**6 min**
Heat rise	**25 - 55 °C/min**
Wash fire (with dentine)	**920 °C**
Biscuit (1st) fire	**820 °C (+/- 10 °C)**
Second fire and further fires	**0°C - 15°C less (end temperature)**
Stain fire	**730°C, 1 min holding time**
Glaze fire	**780 - 800 °C, 1 min holding time**
Holding time	**2 - 3 min**
Vacuum on	**400 - 500 °C**
Vacuum off	**820 °C (+/- 10 °C)**
Vacuum level	**max**
Cooling	**3 - 10 min, depending on mass**

A lower patient-removable full denture – guaranteed to last

The idea was to produce a bar-born removable lower restoration made entirely from ceramic material. Two zirconia bars were milled; both fitted with slide-attachments, one at each end. Through Teflon-sleeve matrixes over the attachments sufficient friction is achieved to hold the denture in place and give the desired stability. Such longevity is guaranteed. The bars are milled by reducing a full-anatomical-contour mock-up frame; in this way optimal bar position within the restoration is ensured. The entire prosthesis is made from 100% full zirconia. Only the pink tissue was layered with veneer porcelain. The result is a Prettau Bridge, worn over bars and entirely patient-removable.

Create best retention for Teflon inserts (red): Blast seat recess, apply thin layer of glaze paste, sprinkle with aluminium oxide and fire. This creates excellent friction for the Teflon parts.



Georg Walcher, Zirkonzahn Italy
Clinic for Reconstructive Dentistry – University Basel/Switzerland

The Prettau Bridge

Implant-borne prostheses are exposed to much higher occlusal loads than conventional bridges due to the lack of periodontal load receptors. This may lead to occlusal veneer porcelain chipping. The so-called Prettau-Bridge provides a new way dealing with such situations. In the process of making a bridge of this kind a full set-up is produced first. This is tried in situ and checked for aesthetic appearance and function. Following, the set-up is copied in zirconia with our manual milling system. We use the extra-translucent Prettau zirconia for such cases. The final restoration is made from 100% zirconia. Only the 'soft-tissue' flange is veneered with pink porcelains of various shades. Full zirconia bridges display tremendous flexural strength which guarantees absolute solidity provided all manufacturing parameters (i.e. adequate connector dimensions and slow cool cycles) are adhered to.

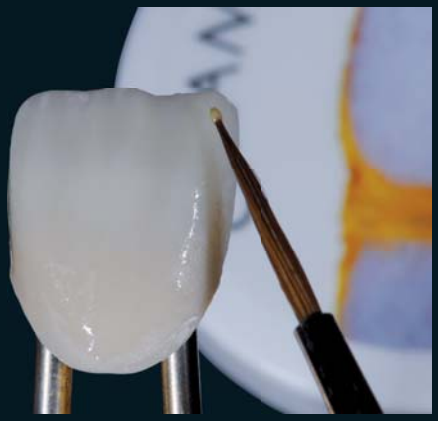
Luca Nelli, Italy

Veneer ceramic is much more abrasive on the opposing dentition than unveneered zirconia (find more detail about abrasion characteristics on page 3).

Buccally Veneered Prettau

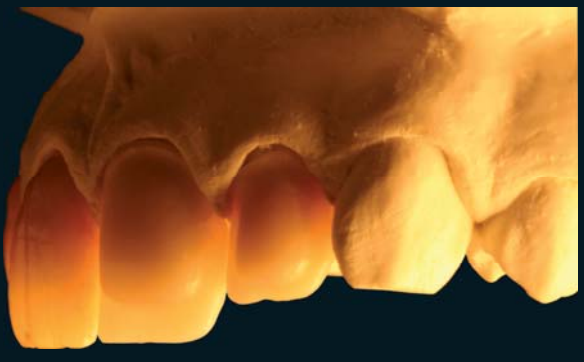
The use of Prettau zirconia offers many great advantages. One is clearly demonstrated in the following case where lingual free space was very limited. For this reason the whole lingual area had to be built in zirconia entirely. Mirror-finish polished zirconia surfaces cause 10,000 times less abrasion to the opposing dentition than metal or regular veneer porcelain. It is also recommended to try the mock-up resin framework in situ prior to milling in order to adjust possible functional interferences and fine tune the bite. This is much easier and safer than adjusting the already sintered framework. Most new crowns need to be adjusted occlusally as a rule. This is quite normal as new restorations often have the tendency to be a touch too high, a phenomenon caused by temporary crowns being slightly out of occlusion which causes the opposing teeth to shift and close the gap in a very short time.

The finish is easy: Only the labial aspect of the framework needs to be veneered with porcelain using Dynamik Dentin, Dentin+ or regular Zirkon Keramik Dentin plus Enamel.



Salvatore Conte, Italy

Thanks to the high translucency of Prettau zirconia no border is visible between zirconia frame and veneer porcelain.



Colouration of Prettau zirconia: Incisors

Dip the metal-free brush into the colour liquid.

IMPORTANT ADVICE

STEP 1

STEP 2 **7 – 9 x**

STEP 3 **5 – 7 x**

STEP 4 **2 – 3 x**

ATTENTION change of colour

Before every change of colour, you need to wash the brush with Colour Liquid Thinner and dry it (with a napkin).

STEP 5 **1 – 2 x**

Before every change of colour, you need to wash the brush with Colour Liquid Thinner and dry it (with a napkin).

STEP 6 **1 x**

Before every change of colour, you need to wash the brush with Colour Liquid Thinner and dry it (with a napkin).

STEP 7 **1 x**

Zirkonzahn A3 Prettau Colour Liquid

STEP 8

Before every change of colour, you need to wash the brush with Colour Liquid Thinner and dry it (with a napkin).

7 – 9 x

Zirkonzahn A3 Prettau Colour Liquid

STEP 9

5 – 7 x

Zirkonzahn A1 Prettau Colour Liquid

ATTENTION change of colour

STEP 10

Before every change of colour, you need to wash the brush with Colour Liquid Thinner and dry it (with a napkin).

1 – 2 x

Zirkonzahn Incisal grey Colour Liquid for Prettau

STEP 11

Before every change of colour, you need to wash the brush with Colour Liquid Thinner and dry it (with a napkin).

1 x

Zirkonzahn Orange 1 Colour Liquid for Prettau

or

Zirkonzahn Brown 2 Colour Liquid for Prettau

STEP 12

Before every change of colour, you need to wash the brush with Colour Liquid Thinner and dry it (with a napkin).

2 – 3 x

Zirkonlampe 250

STEP 13

Drying

Zirkonofen 600
Zirkonofen 600/V2

STEP 14

Sintering

Colouration of Prettau zirconia: Molars

Dip the metal-free brush into the colour liquid.

ATTENTION
metal free brush

STEP 1

Zirkonzahn **A3** Prettau Colour Liquid

STEP 2 **7 – 9 x**

Zirkonzahn **A3** Prettau Colour Liquid

STEP 3 **5 – 7 x**

Zirkonzahn **A3** Prettau Colour Liquid

STEP 4 **2 – 3 x**

Zirkonzahn **A1** Prettau Colour Liquid

ATTENTION
change of colour

Before every change of colour, you need to wash the brush with Colour Liquid Thinner and dry it (with a napkin).

STEP 5 **1 – 2 x**

Zirkonzahn **Orange 1** Colour Liquid for Prettau

or

Zirkonzahn **Brown 2** Colour Liquid for Prettau

Before every change of colour, you need to wash the brush with Colour Liquid Thinner and dry it (with a napkin).

STEP 6 **2 – 3 x**

Zirkonzahn **Incisal violet** Colour Liquid for Prettau

Before every change of colour, you need to wash the brush with Colour Liquid Thinner and dry it (with a napkin).

STEP 7 **1 x**

Before every change of colour, you need to wash the brush with Colour Liquid Thinner and dry it (with a napkin).

STEP 8

1 – 2 x

Zirkonlampe 250

STEP 9

Drying

Zirkonofen 600
Zirkonofen 600/V2

STEP 10

Sintering

Information about all the colours: www.zirkonzahn.com

Zirkonzahn®

PRETTAU ZIRCONIA

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ENGLISH

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