SPECIAL REPRINT

Nature-like restoration with a newly developed ceramic

Hands-on with Kulzer's HeraCeram Saphir

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Summary
Porcelain-fused-to-metal (PFM) ceramic materials are nowadays the most used dental materials for esthetic veneering. Their potential should be enough of an incentive for customizing them to modern fabrication possibilities to achieve improved esthetic results in an easy, reproducible way. According to Kulzer, these goals have been achieved with the newly developed HeraCeram Saphir ceramic material.

Keywords
ceramic veneering, layering technique, porcelain-fused-to-metal (PFM), Triple Layering Technique (TLT)

Introduction

Ceramic veneering materials have been developed and used for quite some time and the wide experience acquired with them thus far is key to future dental materials development. The requirements imposed on PFM ceramic materials are considerably higher than those imposed on translucent framework materials, which are already colored with dental shade to be covered with full ceramic veneers.

PFM ceramic materials should be able to achieve a result identical to natural teeth just through the thickness of the layering. These requirements have been completely fulfilled by Kulzer through the newly developed PFM HeraCeram Saphir ceramic.

This veneering material combines the technology of the past with modern fabrication methods. The result is an all-purpose, resistant, and stable leucite structure – a veneering ceramic that is easy to work with that fulfills the esthetic requirements in an easily understandable and reproducible way (Figs 1 to 5).

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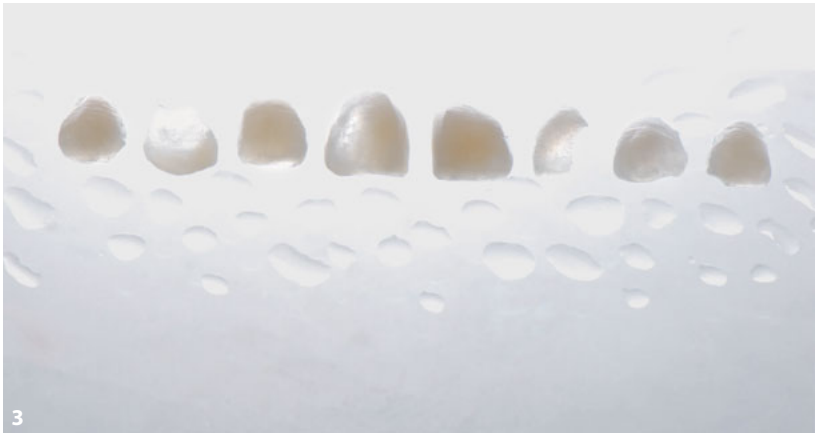
Fig 1 Ceramic layering (wet ceramic and brush). **Fig 2** The functional requirements of a metal-ceramic restoration are very high.



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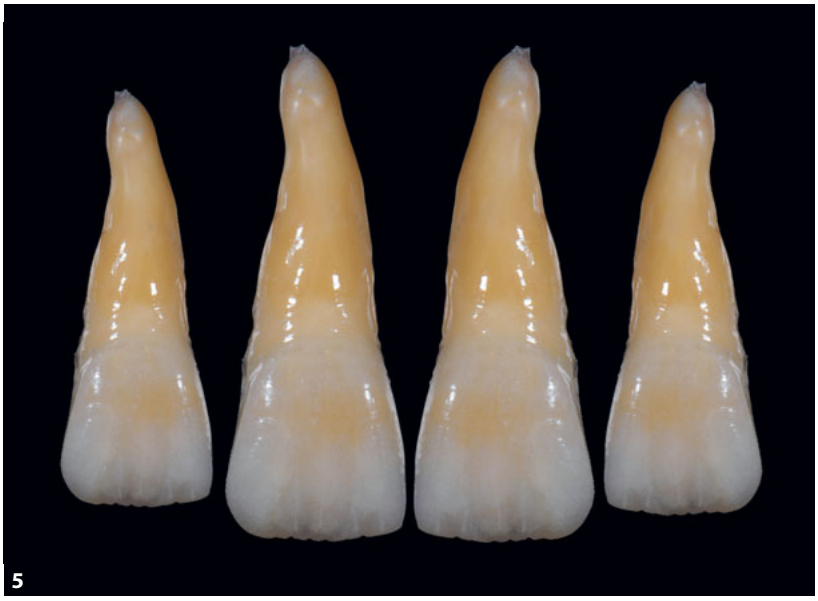

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Fig 3 For non-prep veneers, it is necessary to use highly resistant and esthetic materials such as HeraCeram Saphir. **Fig 4** A high-quality assortment of veneering materials should also make possible the reproduction of the red esthetic. **Fig 5** Reproduction of natural structures.

From standard to high end

A modern veneering ceramic stands out through a natural three-dimensional color reproduction, good physical resistance properties, and a very low shrinkage rate. This means that it is possible for a beginner dental technician to efficiently reproduce a simple standard color of the shade guide using the chroma dentin, dentin, and enamel materials. On the one hand, the high standard of veneering that is often requested should reproduce the basic shade and the value characteristics of the natural example. On the other hand, despite the few materials used, it should achieve a natural three-dimensionality and opalescence in the incisal area (Figs 6 to 10).

For a clinician, esthetically demanding veneering consists of an assortment of materials that are easy to classify and structure in different shade groups and chroma intensities to safely acquire the required shade without using a vast number of effect materials; instead, a few efficient materials should be used to achieve the desired result. Once the use of the materials is understood, it is possible to achieve any possible tooth structure through mixing them in the correct proportions.

For this purpose, the HeraCeram Matrix materials, which are identical to one another, comprise a simple system that can be safely used in combination with the Triple Layering Technique (TLT) described by the author (Fig 11).

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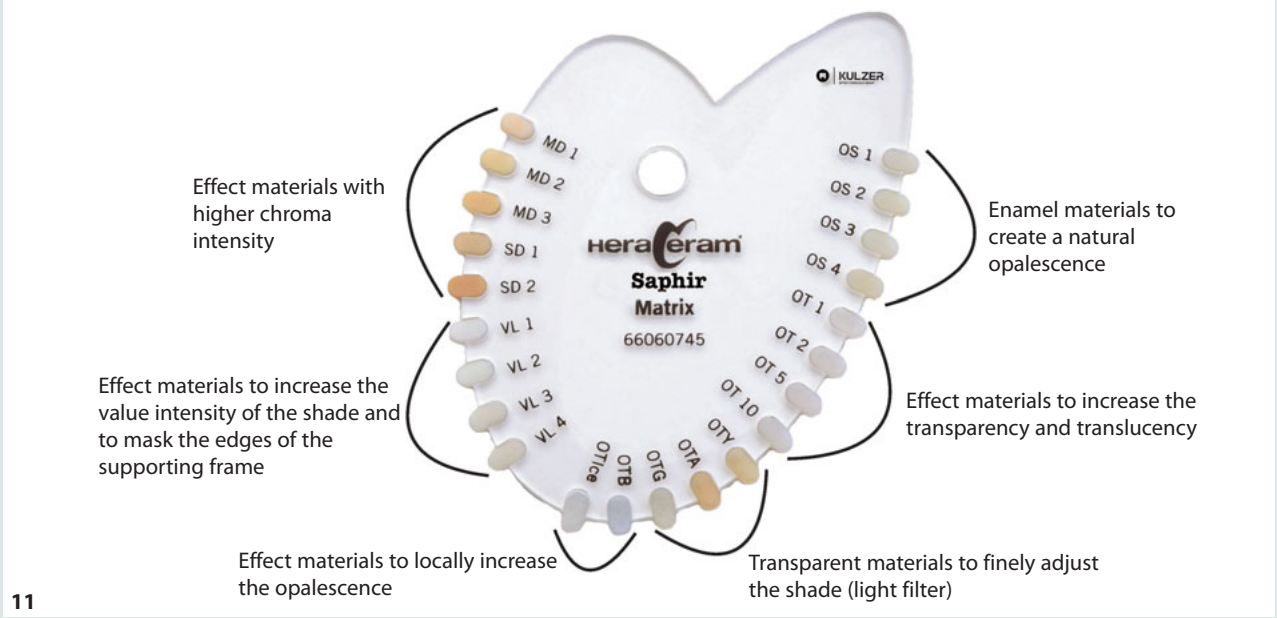

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Fig 6 The opaque metal coping with the ceramic shoulder makes it possible to achieve good esthetic results.
Fig 7 To stabilize the basic shade even with a very thin layer, the metal coping is covered with chroma dentin.
Fig 8 The basic shade and the value progression are adjusted with the dentin and enamel. To highlight the mamelon structures, the chroma dentin can be used again.
Fig 9 To complete the morphology and to improve the three-dimensionality, the veneer is completed with an opalescent enamel.
Fig 10 The right proportions of chroma dentin, dentin, and enamel are sufficient to fabricate restorations according to the shade guide.
Fig 11 A clearly arranged range of effect materials is the base to handling a veneering assortment in a simple and replicable way.

Perfection starts with the opaque

When using the newly developed paste opaque it becomes clear that HeraCeram Saphir belongs to a new generation of veneering ceramic. Due to its viscosity, the user manages to homogeneously mask the metal framework soon after the first application of the material. The consistency is adjusted in a way that the opaque can be applied to the surface of the framework with a broad brush, and after a short time, the material will level itself equally to the minimum thickness. In particular, this feature can save working time considerably compared with a large framework (Figs 12 to 14).

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Fig 12 A new generation of paste opaque enables maximum efficiency.
Fig 13 The use of HeraCeram NP-Primer makes the oxidation firing unnecessary and prepares the framework surface for the application of the opaque.
Fig 14 Thanks to the adhesive force of the newly developed paste opaque, the metal frameworks can be completely masked with a single opaque firing.

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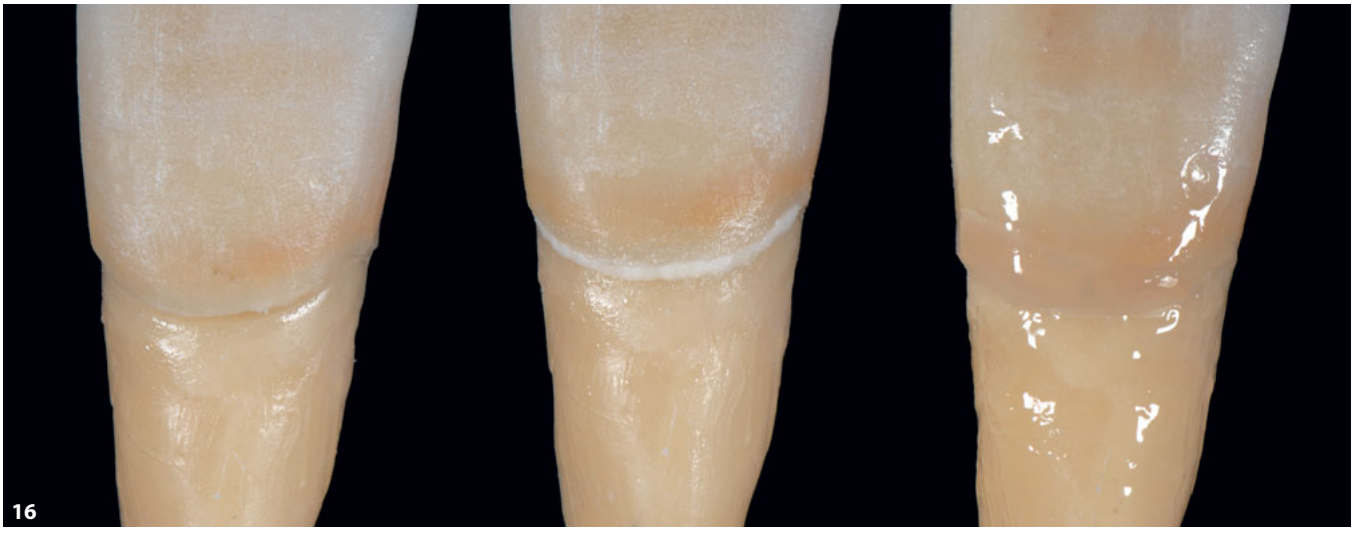

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Fig 15 The high adhesive forces of the high fusing margin (HM) shoulder material make it possible to fabricate metal-free margins without problems. **Fig 16** The HeraCeram low fusing margin (LM) shoulder material can be used to make corrections at a lower temperature.

Shoulder materials make it possible to achieve a perfect red–white esthetic

Especially when using metal frameworks with anterior teeth, the shoulder materials make it possible to achieve a convincing esthetic result. The liquid of the special shoulder material gives the needed cohesion to the mixed shoulder powder. These components, calibrated to each other, guarantee a simple and efficient fabrication of the cervical margin. To keep the shrinkage as low as possible, oversizing should be avoided. After the application, the liquid should be absorbed with a paper tissue. Before removing it from the dye, the frame should once more be firmly pressed down to slightly press the shoulder material. The eventual residues of liquid coming out on the surface should once again be absorbed with a paper tissue. At this point, the frame with the modelled shoulder can be carefully removed from the dye, previously treated with a separation agent, and then fired (Fig 15).

Small corrections can be made with the shoulder material using a lower firing temperature (HeraCeram LM) until the final glaze firing (Fig 16).

HeraCeram Saphir combined with the Triple Layering Technique

Just as each person is unique, so each person's set of teeth is unique. To be able to reproduce this individuality, Kulzer divided the fabrication of veneers into three categories. The result was the Triple Layering Technique (TLT), which allows the user to achieve an individual, but reproducible, final result. Starting from the analysis of the basic shade of the patient, up to the final realization of the restoration, the technician has available a transparent working plan (Figs 17 to 19).

Basic shade and chroma intensity

The first step is the basic shade, with which the hue of the dentin body can be reproduced. Looking at the cross-section of a tooth, it is clear that, due to the dentin volume, the highest intensity of the color (chroma) is located in the cervical area.

To solve this, the HeraCeram assortment allows the use of chroma dentin and materials such as SD1 and SD2, as well as MD1, MD2, and MD3, to control the basic shade and its chroma intensity. These are chromatic materials with high intensity and low transparency; therefore, they can be used together with the opaque framework (Fig 20).

Value characteristics and age-related effects

Due to the reduction of tooth volume in the incisal area, the intensity of the chroma diminishes. This results in a higher brightness (value), and increasing transparency and opalescence. To be able to reproduce these properties in detail, it is very important, especially with metal frameworks, to specifically mask the edges of the supporting frame.

This can be achieved with the application of the correct quantity of the fluorescent materials: value 1 to 4 (Fig 21). Due to the fluorescent property of this material, there is a high reflection of light, resulting in a higher degree of brightness of the restoration and, at the same time, a perfect masking of the edges of the supporting framework. This is a unique combination that efficiently masks the edges of the supporting framework (Fig 22).

To control the incisal translucency and opalescence, the user has enamel materials with four different value degrees available. According to the age-related structure of the tooth, it is possible to choose between the enamel materials S1 to S4 as well as between the opalescent enamel materials OS1 to OS4.

Especially with young patients, there is often a high opalescence in the incisal area. This is caused by the interference of the incident light splitting through the microstructures of the enamel and dentin. The structures appear to be of a blueish color. During the fabrication of the HeraCeram opalescent materials, this interference of light is reproduced (Fig 23), and must not be artificially copied through the use of blue-colored effect materials.

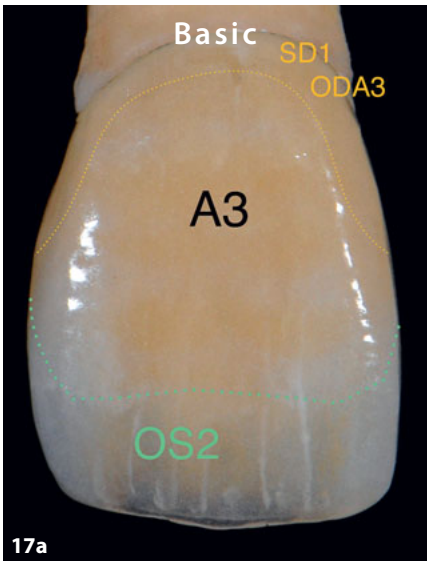
Further age-related effects such as mamelons, secondary dentin, sclerotic dentin, and different degrees of transparency can be established and achieved through the use of the Matrix shade guide. The Matrix materials can be finely adjusted in their degree of intensity by adding chromatic pigments or more transparent materials (Fig 24).

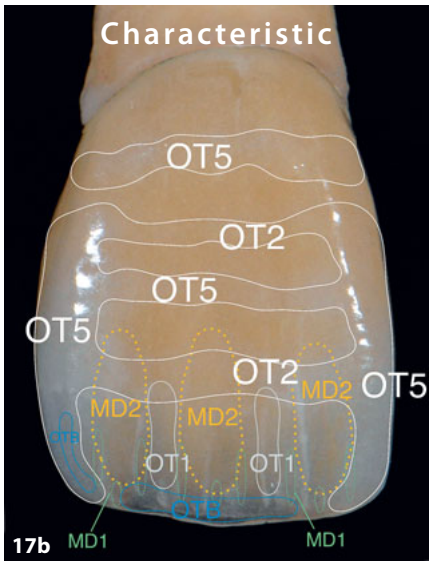
At this point, the HeraCeram universal stains should be mentioned. The assortment of stains allows the user to paint age-related effects onto the sintered base structure (basic shade and value characteristics) and to fix them through a specific firing cycle (Fig 25). Afterwards, the morphology can be completed with the layering of transparent materials (light filter) (Fig 26).

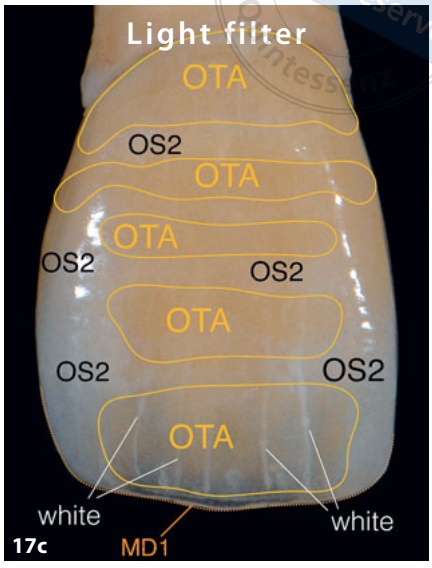
Light filter

The author describes the completion of the morphology as light filter. As this is the outer layer of the veneering, only materials with a high degree of transparency can be used for this stage of the work. According to the author, using four materials of the HeraCeram Matrix assortment is enough. The purpose of applying the light filters is to control the depth effect and finely adjust the shade hue. The hue of the tooth shade can be divided into grey, green, yellow, and red tones. Accordingly, the Matrix system offers the opalescent transparent materials OTG (greyish transparency), OTY (yellowish transparency), OTA (reddish transparency; Fig 27), and a clear transparent material (T). By mixing together OTG and OTY, it is possible to achieve the greenish effects of the Vita Classic D1 to D4 shades.

Furthermore, the Enhancer materials offer the user a complete light filter system according to the Vita Classic shades as well as further materials to lighten or darken the veneer (Fig 28). This results in a reproducible working procedure to finely adjust the restoration at the end of the working cycle.







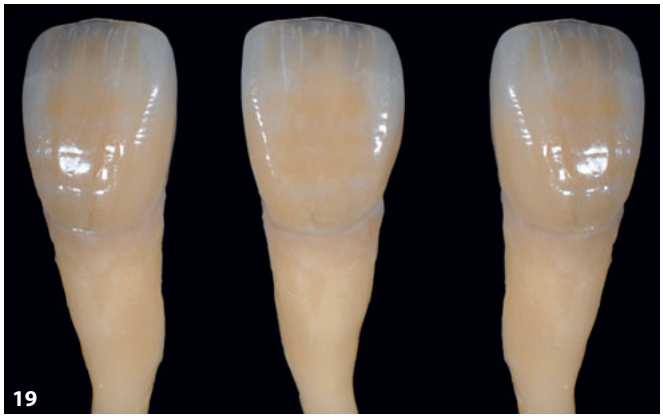


Fig 17 Triple Layering Technique: the veneering, from the shade determination to the finished work, is subdivided into three layers.
Fig 18 From the basic shade and the value characteristics, through the personalization until the completion of the morphology with light filters.
Fig 19 An individual and simultaneously reproducible restoration.
Fig 20 The basic shade is defined with saturated materials directly onto the supporting frame.

Fig 21 The edges of the supporting frame are well masked with the use of the value materials VL 1 to 4.
Fig 22 Through the controlled use of the value materials, it is possible to achieve incisal results that are no different from a full ceramic restoration.
Fig 23 With the opalescent enamel materials OS 1 to 4, the opalescence of a young tooth enamel can be copied.
Fig 24 Through the correct mixing of the effect materials it is possible to reproduce any age-related characteristic of the tooth.

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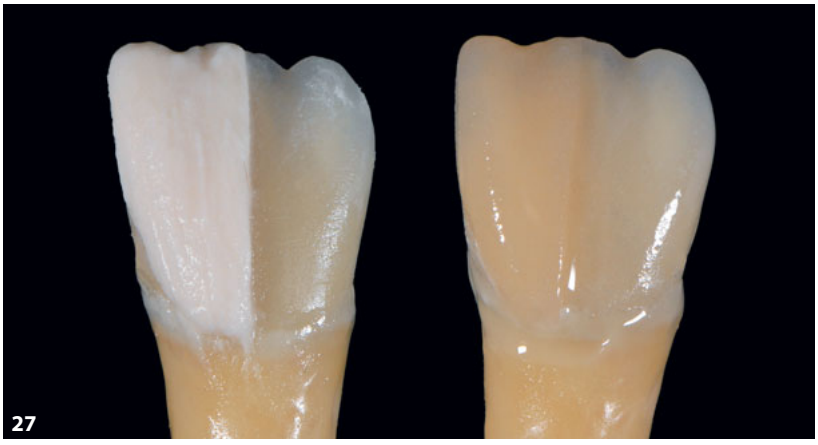

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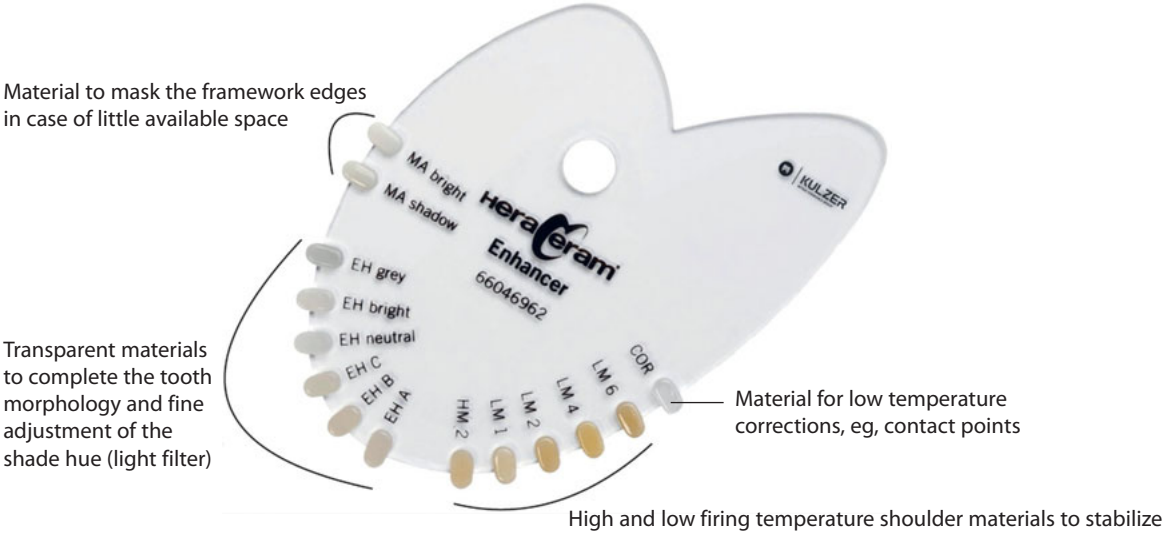

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Fig 25 The personalization of the basic layer with HeraCeram stains allows for the making of very thin veneers. **Fig 26** Final result after the completion with light filters. **Fig 27** Through the use of light filters, with specifically colored transparent materials such as OTA (reddish transparency), it is possible to influence the final hue of the shade. **Fig 28** The enhancer material is a further light filter assortment.

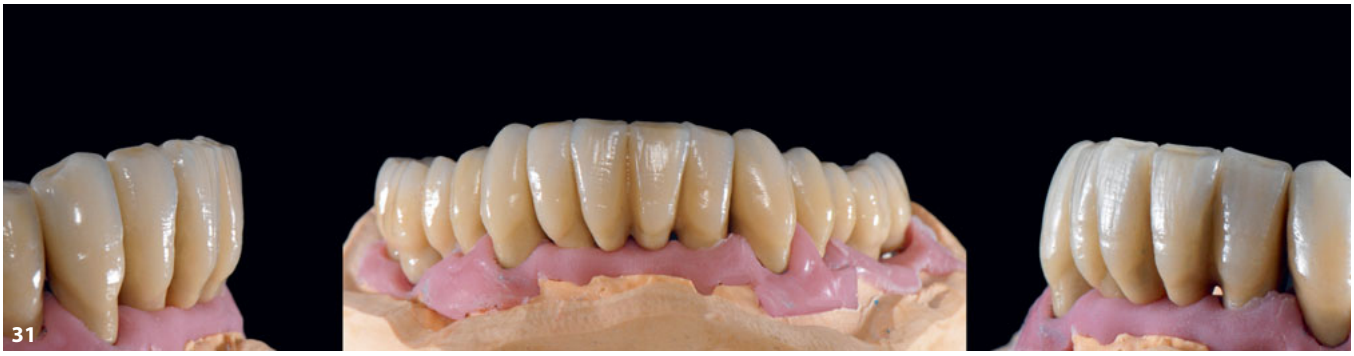

Fig 29 Due to the very low shrinkage rate of HeraCeram Saphir, the morphology of the restoration can be conducted in detail even before the first firing cycle.
Fig 30 The result after the first firing shows that the dimension shrinkage is below average.
Fig 31 With HeraCeram Saphir it is possible to efficiently fabricate extensive restorations.

Firing cycle

Due to a fast heat rate of 100°C/min, the firing and cooling cycles of the ceramic are very short. However, experience has shown that the size of the restoration and the volume of the metal framework should always be taken into consideration when deciding the appropriate heat rate.

In addition to the user-friendly firing parameters, HeraCeram Saphir has a very small and uniform shrinkage rate. Thanks to these properties, the volume of work during the second firing is reduced. Also, the small amount of shrinkage of the ceramic allows for the correct placement of the effects material and eliminates the otherwise necessary and time-consuming correction of the patient's specific characteristics (Figs 29 to 31).

Conclusion

Thanks to modern fabrication procedures, Kulzer has developed a ceramic with the highest degree of purity. The properties of the material allow for the reproduction of nature in a simple and precise way.

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