A new solution to compensate firing shrinkage with translucent shades.

by **Dr. Vincenzo Mutone,** Italy

Nearly all ceramic restorations that we see in our laboratory, whether they be crowns, bridges or long-span restorations, and regardless of whether they were manufactured using a complex or simplified build-up technique, undergo some volume shrinkage during the sintering process. The shrinkage effect is more severe the larger the restoration, but all are affected, including individual crowns.

Individual crowns

Fig. 01

Fig. 02

Long-span bridges

Fig. 03

Fig. 04

1. Adding dentine powders in the areas corresponding to the dentine and enamel areas on the incisal surface;

Fig. 05

Fig. 06

2. Overlaying enamel powders in the incisal and dentinal areas;

Fig. 07

Fig. 08

3. Adding neutral translucent powders in the incisal and dentinal areas;

Fig. 09

Fig. 10

4. Adding enamel and translucent powders in the incisal areas and mixes of dentine-enamel powders and/or dentine/translucent powders in the dentinal areas.

Fig. 11

Fig. 12

A new solution to compensate firing shrinkage with translucent shades.

Solutions to this common problem can depend on the experience and skill of the technician and how much time is available for a correction firing. Even an experienced technician might be uncertain about the most appropriate solution, knowing that the layer of product added to complete the shape will probably affect the end result. This is particularly true when the ultimate goal is to build a restoration whose shade matches one in a standard shade guide, maybe because the prosthetic dentist provided a specific shade reference or because the technician chose a shade judged to be the most appropriate for reproducing the appearance of the natural teeth.

The most critical and sensitive part of the crown in this correction layering is that reproducing the dentine area. This is the portion most severely affected by the addition of dentine, enamel and translucent powders with different characteristics that will consequently affect the hue, shade, intensity and value of the restoration.

Observing a sample of dental technicians using different build-up materials and techniques, I noticed that correction firings to complete the shape of the restoration were carried out using repetitive processes that could be classified into four groups:

A new solution to compensate firing shrinkage with translucent shades.

Obviously different techniques produce different outcomes. The following observations were made after correction firings using the four techniques described above:

Fig. 13


Fig. 14

1. Group 1 appeared to lack depth in the dentine area and often showed a sharp transition between the dentine and enamel areas;
2. Group 2 showed an excessive amount of enamel, affecting the dentine color, which deviated from the original shade;
3. Group 3 appeared to be different from the selected shade because the excessive amount of neutral translucent powder made the shade more gray, thus reducing the value;
4. Group 4 showed a final shade in which the dentine area featured a less saturated chroma compared to the desired starting shade.

The CST powders combine chroma and translucency features unique among current ceramic systems. These features help achieve the desired shape while ensuring a good match with the selected reference shade. In other words, these translucent powders enable the technician to produce the desired shape while guaranteeing life-like translucency and the brightness that is typical of natural teeth.

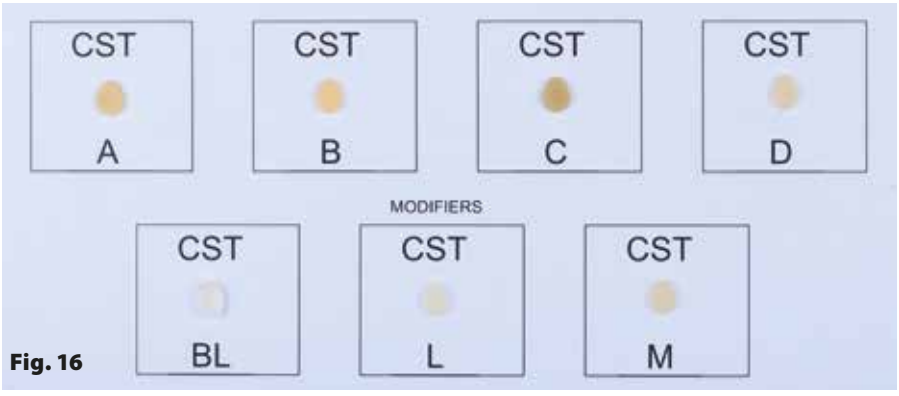

Fig. 16

The simplified Chroma Shade Translucent (CST) system includes just four base shades (one for each group of Vita shades) and three modifiers. By combining these powders, the entire Vita Color Shade Guide can be reproduced simply.

Fig. 17

Comparing the results of these four strategies that are aimed at solving the problem of volume shrinkage, we see that none of them produces a perfect match with the selected reference shade. But GC has introduced a new range of correction powders to its Initial MC line – called Chroma Shade Translucent (CST) – that solve the shrinkage problem by simplifying and standardizing the firing steps that are usually employed to achieve the final volumes.

Fig. 15

The powder combinations are summarized in the following table:

Vita shade	CST	Powder ratio	CST	Powder ratio
BL	BL	1		
A1	A	1	BL	3
A2	A	1	L	3
A3	A	1	M	3
A3.5	A	1	M	1
A4	A	1		
B1	B	1	BL	3
B2	B	1	M	3
B3	B	1	M	1
B4	B	1		
C1	C	1	BL	2
C2	C	1	BL	1
C3	C	1	M	4
C4	C	1		
D2	D	1	BL	1
D3	D	1		
D4	D	2	C	1

Fig. 18

A new solution to compensate firing shrinkage with translucent shades.

With the new CST system, correction is achieved by building up the volume, starting from the dentine portion then covering it and gradually thinning the layering down to the incisal area.

Fig. 19

Fig. 20

The incisal area is then finished using the usual technique, with enamel and translucent shades.

Fig. 21

Fig. 22

These new powders can be used effectively to build up occlusal areas where the amount of dentine is minimal. Indeed, the technician simply has to cover the opaque with a thin layer of dentine shade or opaque dentine.

A layer of translucent shade matching the color of the restoration is then applied on top.

Fig. 24

Fig. 25

Finally, the occlusal margins are finished with conventional and occlusal enamels.

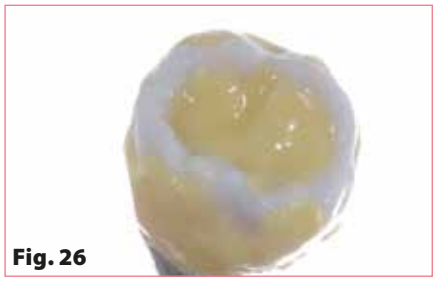

Fig. 26

Fig. 27

The correction firing achieves the desired characteristics i.e. the shade matches that of the reference shade guide while adding depth to the restoration.

Fig. 23

This use of the translucent shade allows a result that simulates depth in the occlusal area, while fully matching the selected shade.

Fig. 28

A new solution to compensate firing shrinkage with translucent shades.

APPLICATION OF CST POWDERS IN SELECTED CLINICAL CASES

Thanks to the characteristics of these powders, their range of applications is broad and versatile, as we can observe in this clinical case, which follows the first firing.


Fig. 29

In the next step, the case is completed with a correction firing using CST powders.


Fig. 30


Fig. 31


Fig. 32


Fig. 33

Observed in the patient's mouth, the finished restoration consistently matches and blends in with the remaining natural teeth.

In this second, much more extensive and complex case, we can see that, due to firing-induced shrinkage phenomena, the shapes and contours need to be adjusted.


Fig. 34

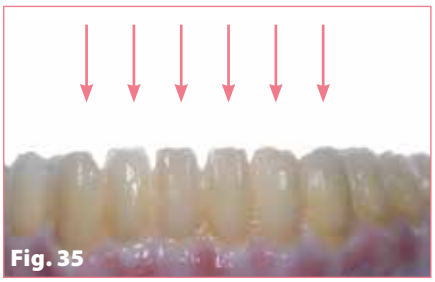
Fig. 35

The volumes are completed as necessary by adding CST translucent powders in the areas marked by the red circles.


Fig. 36


Fig. 37

The final result fulfills the patient's needs and requirements.

Fig. 38

These powders can also be used to build veneers. The following case shows how they are used to correct the shapes and contours.

Fig. 39

Fig. 40

The use of translucent shades can be fully appreciated after finishing and polishing, with an excellent degree of integration with the natural teeth.

Ideal effect of CST powders used for building veneers.

Vincenzo Mutone

was born on January 20th, 1965 and obtained his qualification as a dental technician in Naples IPSIA "Casanova".

He opened his own lab in 1983. He holds a lab since 1983.

He took part in many courses in Italy and abroad among which some with Klaus Muetherties and Willi Geller, from whom he learnt his practical teaching and aesthetic philosophy, attending his lab in Zurich (CH). He was business partner and co-owner of the Oral-Design 2 lab along with Mr. Giuseppe Zuppardi in the years 1994-1996. When this experience was over he met professionally Mr. Atoshi Aoshima, who led him to appreciate the Japanese aesthetic school. After this, he started another project that led him to make a systematics for ceramic masses multistratification.

In the last decade he has held conferences and communications on metal ceramics and aesthetics in many national and international meetings.

Today he focuses particularly on prosthesis implant and aesthetics using modern materials such as zirconia and CAD-CAM methods. He is also taking part in projects that aim to carry out and spread implantology based on computer planning with immediate function application and in the making of a multistratification system on zirconia oxide structures.