Reproduction of dentin color using Initial Spectrum Stains

by **CDT Fotis Megas**, Greece

Fotis Megas *was born in 1984 in Athens, Greece. He graduated from the School of Dental Technology of the Technological Educational Institution in 2011 and now owns his own laboratory, 'Megaslab' in the center of Athens. Fotis is specialized in aesthetic anterior restorations and collaborates with the Dental School of the National and Kapodistrian University of Athens and its postgraduate programs of Dental Prosthodontics and Dental Surgery. Fotis is an Opinion Leader for GC products in Greece for Maurice Faratzi since 2012 and Key Opinion Leader for GC Europe for Initial ceramics since 2016. He gives lectures and organizes hands-on courses all over the world as well as live patient courses in his own lab.*

Dental ceramics consist of an amorphous glass phase and a crystalline phase. The higher the glassy content, the more translucent and aesthetic the ceramic will be; however, the crystalline phase makes the ceramic stronger, but also more opaque. To improve the aesthetics, the glassy, more translucent ceramics are used as veneering ceramics and baked onto the more opaque core.

With the introduction of new classes of materials, overall properties of ceramics were improved a lot. Glass ceramics based on lithium disilicate have a high ratio of crystalline phase, but are more translucent because of the low refraction index of lithium disilicate crystals. Hence, restorations can be made of monolithic material and can be much thinner, which is a huge benefit because less tooth tissue needs to be removed, or in some cases no tissue at all.

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Stains can mimic vitality and pigmentation and help us to characterize the core in order to immediately obtain the shade and light refraction of natural dentin. The use of lithium disilicate material enables the dental technician to create restorations with minimal thickness, good strength and ensuring a natural appearance. The clinical case hereafter will guide you through the characterization process for monolithic restorations and restorations which require minimal translucency layers.

To achieve the desired color combination and shade, use a ceramic plate to mix different stains in different proportions. Choose your Initial Spectrum Stains powders, mix them gently with one or maximum two drops of Glaze Liquid to obtain the desired paste structure (Figures 1 and 2).

Check your mixtures by comparing them to a shade guide. Place the shade guide tab slightly angulated next to your mixtures in order to know if you need to add slightly more stain powder (Figure 3).
It's easier to choose the correct amount of stain powder for darker shades, as for the lighter shades only a minimal amount of stain powder is required.

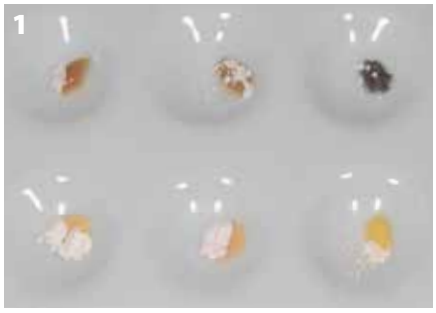

Fig. 1: GC Initial Spectrum Stains on the ceramic plate in different proportions.

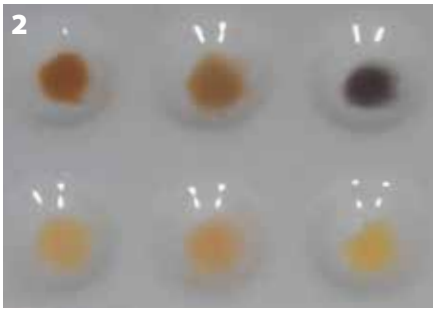

Fig. 2: GC Initials Spectrum Stains after mixing.

Fig. 3: Comparison of the mixed Initial Spectrum Stains to a shade guide.

Following tip can help you to obtain a very nice and natural result. When comparing your mixtures to the A1 V-shade, you will notice it's not easy to choose the correct mixture as they will all look darker (Figure 4a). Therefore, add some SPS-1 (Ivory White), some glaze powder and, in this case, some SPS-2 (Melon Yellow) in order to obtain the A1 V-shade (Figure 4b). By comparing the shade guide to our mixture under a slight angle, it's clear that this shade is exactly the one we want (Figure 4c).

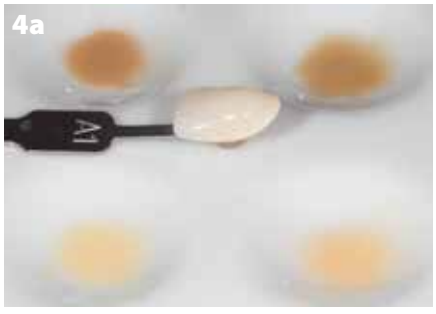

Fig. 4a: Obtaining a lighter shade is harder than a dark one.

Fig. 4b: Addition of SPS-1 (Ivory White), SPS-2 (Melon Yellow) and some glaze powder.

Fig. 4c: After addition of the lighter powders, the desired A1 V-shade is obtained.

If the core or the monolithic restoration is brighter than intended, some SPS-13 (Twilight) can be added to decrease the value (Figure 5a-d).

Fig. 5a: Compared to the shade guide, the mixture is slightly too bright.

Fig. 5b: Add some SPS-13 (Twilight)…

Figs. 5c: …to decrease the value.

Fig. 5d: The shade of the mixture matches the shade guide.

"My experience with GC Initial Spectrum Stains teaches me they are the only and best solution in case of aesthetic restorations, even in case of small spaces or discolored preparations." – Fotis Megas

How to obtain the correct dentin color on lithium disilicate.

In case of a light-colored preparation, choose an ingot with a high translucency, such as GC Initial LiSi Press MT-B1 (Figure 6a-c).

Fig. 6a: Initial LiSi Press ingot (MT-B1) after sandblasting.

Fig. 6b: Application of Glaze Liquid.

Fig. 6c: Visual control of the LiSi Press MT-B1 shade.

Application of SPS mixture without glaze powder

Fig. 7a: Application of SPS mixture.

Fig. 7b: Spread the mixture up to the middle third and pull up towards the incisal edge.

Then the chromatic Spectrum Stains mixture is applied to the lithium disilicate framework (Figure 7a-c).

Application of SPS mixture with 20% glaze powder for a softened effect

Fig. 8a: The mixture with 20% glaze powder is again applied up to the middle, this method is more similar to the way we layer ceramics.

Fig. 8b: Pull the mixture up to the incisal edge.

To create a milder and softened characterization to your substructure, you can add 20% of Glaze Powder to your Initial Spectrum Stains mixture in order to obtain a more subtle result (Figure 8a-b).

This technique allows us to cover the entire surface with sufficient powder without leaving stains or streaks.

Important note

- Leave it to dry next to the furnace before placing it on the fire tray for at least 10 minutes.
- Raise the temperature with 45°C per minute to a final temperature of 780°C and hold it for 1 minute.

How to block a discoloration using white stain (SPS-1) mixed with glaze powder

Fig. 9a: A pencil marking on the die gives an idea about the translucency.

Fig. 9b: Application of Glaze Liquid.

Fig. 9c: SPS-1 with 20% Glaze Powder.

In some cases, the underlying tooth substrate has severe discolorations that impact the final shade of the thin restoration. These discolorations can be blocked using some white stain (SPS1) mixed with glaze powder (Figures 9 and 10).

The pencil mark doesn't show through the restoration (Figure 11), which means discolored preparations can be masked.

Applying transparent glycerin – to mimic the resin cement – will help to estimate what the restoration will look like in the mouth (Figure 12a-c).

Fig. 10: Wash firing using FD-91.

Fig. 11: Fired at 780°C with vacuum.

Fig. 12a: The 'discolored' die on the stone master model.

Fig. 12b: Transparent glycerin mimics the resin cement.

Fig. 12c: The discoloration is masked.

Clinical case of an anterior lithium disilicate crown on 11

Fig. 13: Shade taking.

In this case, our goal was to use the pressed coping as a dentin structure and apply only a very thin layer of ceramic with a total thickness of 0.5 mm. We've analyzed the picture the clinician sent us (Figure 13) and tried out different mixtures of Initial Spectrum Stains on the LiSi Press coping (Figure 14). In the cervical area, it was necessary to increase the opacity and add more chroma. On the middle and incisal third of the tooth, the value had to be decreased with grey Spectrum Stains (SPS-13 and SPS-16) and small amounts of brown-orange stains (SPS-10 and SPS-4).

Fig. 14a: Two different mixes of stains SPS-4, SPS-10, SPS-13 and SPS-16 (left) and SPS-1, SPS-2 and SPS-4 (right).

Fig. 14b: A more chromatic and opaque mix is used to cover the cervical area.

After placing the fired coping on the printed, removeable die model (Figure 15), it was time to do the ceramic layering. We layer our lithium disilicate (LiSi Press) coping with Initial LiSi, which is dedicated for this type of framework.

Fig. 14c: The coping before firing.

Fig. 14d: Coping after firing.

Fig. 15: The fired coping on the model.

Fig. 16: Highly chromatic dentin mixture in the cervical area with Initial LiSi IN-42 & TN.

For the cervical area, a highly chromatic dentin mixture of 50:50 INside powder (IN-42) and Transpa Neutral (TN) was used and pulled up towards middle third of the tooth (Figure 16). This gave the restoration the warm effect of the deep dentine which can also be observed in the neighboring teeth.

Fig. 17: mixture of equal amounts of IN-42, TN & E60.

Fig. 18: E60.

Fig. 19: Mamelon structure in FD-93.

Fig. 20: Bringing bluish-grey natural translucency on the marginal edges with EOP Booster with 5% SPS-16.

Fig. 21: Yellow-orange semi-transparency with CT-24.

Fig. 22: Palatal view.

IN-42, TN, E60 E60 FD-93 EOP Booster with 5% SPS-16 CT-24

For the middle and incisal third of the dentine part, a mixture of equal parts of Inside (IN-42), Transpa Neutral and Enamel (E60) was used. This mixture is less chromatic and was used for a smooth transition between the highly chromatic cervical part of the restoration and the more translucent incisal third. This layer slightly covered our cervical part and was pulled up towards the incisal edge. An individualized mamelon structure was taken into account (Figure 17).

The incisal edge was then completed with enamel powder (E60). As in the previous step, this layer slightly covered the dentin part to ensure a smooth transition from opacious to more translucent parts (Figure 18).

Additional incisal effects, created based upon the clinical pictures, lead to an optimized individualization of the restoration. The mamelon structure is highlighted with Fluo Dentin (FD-93) (Fig. 19).

The unique EOP Booster, in this case mixed with 5% SPS-16 (Midnight), brings blue-grey opalescence and translucency in the mesial and distal part of the restoration (Fig. 20).

Alternating opacious and translucent powders ensure a contrast of light dynamics in the incisal area and contribute to a lifelike and natural appearance.

For this case, the final anatomical shape of the incisal edge was done with CT-24. These Cervical Translucent powders are quite translucent, yet chromatic and can be used for multiple purposes: Palatinal marginal edges of incisors and canines or slightly discolored incisal edges can be built up with these powders, as well as cervical areas where more chroma is required (Figures 21-22).

After firing, shaping and contouring is performed, having token the anatomical form of tooth 21 into account (Figures 23-24).

Fig. 23: Directly after firing

Fig. 24: Shape contouring

Directly after placement, the restored tooth on 11 shows a good integration and small shrinkage.
The opacious, chromatic cervical area; the more translucent middle third and a translucent, yet chromatic incisal area, alternated by the opacious mamelon structures fits perfectly in the existing oral situation (Figures 25-26).

Fig. 25: Intraoral buccal view

Fig. 26: Intraoral lateral view

"As dental technicians we need materials that can make our daily life much easier. Initial Spectrum Stains with their fine-grained structure can easily match the color of natural dentition. The right proportion of different stains can reproduce any color we can find in the natural tooth. I am very happy to work with them in my laboratory for my posterior cases, but also for highly aesthetic anterior cases." – Fotis Megas

Acknowledgement

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