

Looking beyond the shade guide: the aesthetic power of true opalescence

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Javier Tapia Guadix, DDS, CG Artist, was born in 1978 in Madrid, Spain. He finished dental school at the European University of Madrid in 2003. Thereafter, he worked as associate professor in the prosthetics department during 2004. In 2005, he started his career as professional computer graphics artist, focused on illustration, animation and application development. He received the Collegiate Merit Award by the Spanish College of Dentists from the 1st Region in 2005 for his collaboration in the commission of new technologies. In 2011, he founded the Bio-Emulation group together with Panaghiotis Bazos and Gianfranco Politano. He actively collaborates as invited professor with several universities across Europe and is member of the GC Restorative Advisory Board. In 2017, he became an official reviewer for the International Journal of Esthetic Dentistry. Javier works in his private practice in Madrid, focused on restorative dentistry and aesthetics. He is an international lecturer with participation in more than 300 congress, hands-on courses and live courses. He has published several articles on restorative dentistry, dental photography and computers in dentistry.

The colour of a tooth is determined by the paths taken by light through enamel and dentine structures. Colour, in fact, is light, either directly seen from a light source or reflected by an object. While in the past, the colour of the restoration was most often determined with a conventional, monochrome shade guide, it's nowadays acknowledged that the actual tooth shade is far more complex than that. Other optical properties of the teeth have a significant contribution and should be carefully considered when highly aesthetic restorations are desired. The scope of this article is to look in more detail into the replication of one of the most remarkable optical properties of the human enamel: opalescence.

When light passes through natural enamel, an interesting colour play takes place. Light that is reflected gives a bluish sheen to the tooth, while the light that is transmitted, renders an orange colour. This optical phenomenon is known as opalescence (Fig. 1). Opalescence of enamel brightens the tooth without decreasing the translucency and renders depth and vitality. The effect of opalescence is most obvious in the incisal third, because there is no influence from the underlying dentine.

In the following, two cases with Initial LiSi Block (GC) are presented. Initial LiSi Block is a fully crystallised lithium disilicate CAD/CAM block, which means it doesn't require firing to reach its strength. It can be finished by either polishing or glazing. Next to its excellent mechanical properties, its optical properties are absolutely remarkable, especially the opalescence. While the majority of restoratives merely show a pseudo-opalescent effect, Initial LiSi Block is truly opalescent and this provides a huge benefit in shade matching, as will be evident in the presented cases.



Annelies Van Ende, DDS, PhD, finished her Master in Dentistry at the KUL (University of Leuven, Belgium) in 2009. She received the Junior Robert Frank award of the CED-IADR in 2008 for the research she conducted as part of her dissertation. Shortly after, she started as a PhD fellow of the Flanders Research Foundation (FWO) at the Biomat Research Cluster under the supervision of Prof. Dr Bart Van Meerbeek, where she received her doctoral degree in 2015 and published her research on the topic of composites in various international, peer-reviewed journals. After her graduation, she has been working in her family's practice in Kinrooi, Belgium. In 2016, she started working as a medical content specialist, editor and journalist.

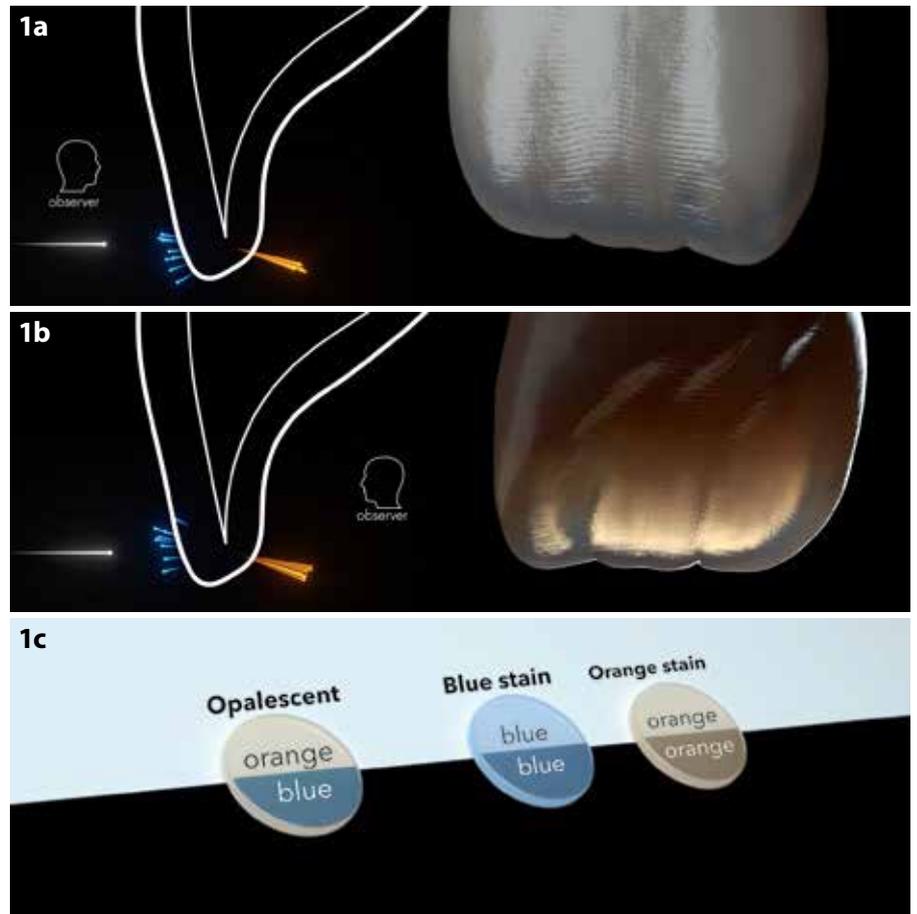


Fig. 1: Opalescence explained. **a)** The incisal third of teeth has a bluish sheen from the reflected light; **b)** The light transmitted through that same incisal part gives it an orange-yellow appearance. **c)** True opalescence vs. mimicking with stains. On a black background, the surface reflection reaches the eye while transmitted light is absorbed; on a white background, the light is transmitted through the disk before it is reflected by the surface underneath.

CASE 1: Polished monolithic Initial LiSi Block veneers (Figs. 2-7)

This lady previously underwent a treatment with palatal veneers due to a persistent open bite after orthodontic treatment. After the placement of these veneers, made of hybrid ceramics (CERASMART270, GC),

she had regained anterior guidance and the pain she used to have in the temporomandibular joint was also gone (Fig. 2).

The vestibular veneers to improve the



Fig. 2: The anterior maxillary teeth prior to the treatment with lithium disilicate veneers. The patient previously underwent treatment with palatal veneers from hybrid ceramics (CERASMART270), to correct the open bite that relapsed after previous orthodontic treatment.



Fig. 3: Initial LiSi Block veneers (Shade A1 HT). The observed shade is dependent on the incident light - changing from a bluish to an orange-yellow shade, illustrating the true opalescence of the material. Note that the incisal edge is quite thick due to the palatal veneers.



Fig. 4: Polished lithium disilicate veneers (Initial LiSi Block, shade A1 HT) on the printed model with beautiful gloss and surface texture.



Fig. 5: The upper frontal teeth (canine to canine) after treatment with polished Initial LiSi Block (Shade A1 HT).

aesthetic aspect were made from Initial LiSi Block, shade A1 HT (Fig. 3). No stains or glazes were used; the veneers were simply polished to high gloss (Fig. 4), which is possible due to the fact that the lithium disilicate blocks are already in their fully crystallized state when purchased.

For this patient of rather young age, the morphology was left somewhat pronounced and was really brought out very nicely after polishing. Even without characterization, the restorations integrated remarkably well; this can be mostly attributed to the beautiful, true opalescence of the block (Figs. 5-7). Lithium disilicate is less fluorescent than natural teeth in nature; this can however be compensated by means of a highly fluorescent luting cement. The cement's fluorescence diffuses well through the rather thin veneers with high translucency. At the control appointment after one year, no changes could be observed due to the high stability of the treatment.



Fig 6: An excellent shade match with the lower, natural teeth was obtained, with the same opalescent effect, which is most apparent in the transition areas where the enamel goes from thick to thinner. Insert: on teeth 11 and 41, the dichroism is marked in blue and orange.



Fig. 7: View on the transilluminated restorations, showing the excellent light transmission of Initial LiSi Block and its natural opalescence on the incisal and approximal areas.

CASE 2: Microlayered Initial LiSi Block veneers with ONE SQIN (Figs. 8-12)

The gentleman in this case (Fig. 8) received veneers from teeth 13 to 23. To add some more detail to the incisors, the restorations in this case were micro-layered with the Initial IQ ONE SQIN system. The canines were,

like in the previous case, left uncharacterized and finished with manual polishing only. The vestibular portion of the morphology was slightly reduced in the CAD/CAM software before milling the veneers

from Initial LiSi Block (shade A2 HT) (Fig. 9). Contact points, palatal side and incisal edge was left monolithic, without any reduction and hand polished. The incisal protection of veneers is crucial for increasing their



Fig. 8: Situation before treatment.



Fig. 9: Veneers from Initial LiSi Block. The buccal side of the 4 incisors was slightly reduced; approximal contacts, palatal and incisal edge were left monolithic, whereas the canines were left fully monolithic. The opalescence is present in the entire restorations, but is mostly notable in the thinner, incisal portion.



longevity, avoiding mechanical problems such as chipping, which often occurs with regular feldspathic veneers. Usually, the incisal protection comes at the expense of the aesthetics in the incisal third. However, with Initial LiSi Block there is no such compromise as the pure uncharacterised block also exhibits a natural opalescence. One aspect of opalescence that makes it an important property for the aesthetics, is that it can enhance the shade of a tooth without changing the translucency. To get the most benefit therefore means that one should make use of stains very sparsely. When used in abundance, stains will spoil the translucency and the restoration will lose its vitality. Another important principle is that opalescence is not restricted to the incisal third of the tooth, but present over the entire body.

Initial IQ Lustre Pastes ONE are applied for internal characterization and also serve as the connection firing for the SQIN ceramics. Only L-NLF (Neutral Fluo) and L-OP (Opal) were used, with a limited use of Initial Spectrum Stains on the mamelons, to simulate a more

sclerotic dentin in the incisal third, in this way we can obtain a more natural and realistic result on the final aspect. (Fig. 10)

After the firing with the Lustre Pastes, the SQIN ceramics were applied: for the dentine part, Dentin Body-A was used on the mamelon tips while a thin layer of Dentin BL-D (Bleach Dentin) was used on the entire body in order to increase the overall luminosity of the tooth.

For the enamel part, Enamel E-57 was mixed with Translucent TO (Opal Booster); in the incisal portion, only the Translucent TO was used (Fig. 11). After final firing, restorations were manually polished to a high gloss and a texture suitable for a young adult was created to enhance the natural appearance. The obtained surface was extremely fine with absence of microporosities due to the remarkable behaviour of the ultrafine glass particles of the Initial ONE SQIN ceramic.

The final result was excellent, with a perfect transition from the micro-



Fig. 10: After internal characterization with Initial Lustre Pastes ONE and Spectrum Stains. Meanwhile, this serves as the connection firing for the SQIN ceramics.

layered incisors, over the monolithic canines to the natural teeth. Once again, this beautiful integration can for a large part be attributed to the inherent natural opalescence of the restorative materials that were used for this case. The combined power of Initial LiSi Block and Initial IQ ONE SQIN definitely takes the aesthetics to a higher level without the use of a complex and very elaborated polychromatic layering technique. The difference sometimes lies in subtleties, such as the combination of the smoothness with the texture, but the end result was striking and gave the patient a confident smile.



Figs. 11 (a-c): After application of the SQIN ceramics and manual finishing. a) Frontal view, showing remarkable gloss; b) Opalescent effect showing a prominent halo; c) Very smooth surface, free from porosities, yet maintaining the highly detailed texture.



Figs. 12 (a-c): The final smile looks entirely natural, with optical properties like real teeth.