An exciting change
Comparison of the IPS d.SIGN and IPS Style ceramic systems

By Velimir Žujic, Croatia

Change is exciting – also in day-to-day dental lab work. The author switched to using IPS Style layering ceramic some time ago. Before he started working with this ceramic system, he thoroughly tested the material and compared it to the product he had previously used.

The main aim of switching to a new ceramic system is to improve the quality of one’s results. We regularly used the fluorapatite-leucite glass-ceramic IPS d.SIGN® in our laboratory. Then, one day we asked ourselves the following question: Would IPS Style® (the first patented metal-ceramic material containing oxyapatite) offer a sound alternative to our accustomed product? We decided to test the new material on flat cobalt-chromium alloy samples. These test specimens enabled us to take a closer look at the layering ceramic. We used these base metal alloy samples (Coda CC) to examine and compare several properties of IPS d.SIGN and IPS Style: for example shade, brightness, shrinkage, fluorescence and dimensional stability.

Shrinkage behaviour and shade effect
In the next step, we compared the Dentin and Transpa T Neutral materials as well as the Opal Effect OEC materials. Each of the ceramics was applied to one of the metal samples. A line was drawn down the middle of the sample with a spatula for the purpose of comparing the shrinkage behaviour. The two different ceramics showed the same colour after firing. It was interesting to note that IPS Style exhibited less horizontal shrinkage than IPS d.SIGN (Fig. 1). The vertical shrinkage of both ceramics was almost identical. The samples were held next to each other and examined under a polarizing light. IPS Style was shown to be somewhat brighter than IPS d.SIGN. Both materials exhibited almost the same level of fluorescence. In this comparison IPS Style was at a slight advantage because its Transpa T Neutral and the Incisal materials displayed a more lifelike fluorescence.

Dimensional stability and test results
The dimensional stability of the ceramic systems was determined. The IPS Style layers successfully maintained the shape and dimension after firing. In contrast, IPS d.SIGN did not retain its shape completely. After this test series, we felt that we had gained enough information about the new material for our purposes. Even though the tests were relatively simple, they provided us with valuable insights into the two ceramic systems. Now we were ready to compare the two materials on the basis of an actual case study.

Case study
The patient was dissatisfied with the appearance of her upper teeth (Fig. 2). She wanted a new tooth colour, but wished the shape and position of her teeth to be maintained as best as possible. This simplified shade selection, since we “merely” had to select...
a slightly lighter tooth shade. Next, the teeth 21 to 25 were prepared (Fig. 3). Then a digital impression of the situation was taken with an introral scanner. From the manufacturing centre we were able to order both printed models and selective laser melting (SLM) metal copings. Both the models and the copings were produced simultaneously. This allowed us to start with the ceramic application immediately (Fig. 4). The restorations were built up on the frameworks with the two ceramic materials so that we could compare IPS Style and IPS d.SIGN in the patient’s mouth. A detailed description of the procedure involving the two ceramics is provided below.

Preparation of the copings
First, the metal copings were ordered according to the instructions of the manufacturer and then the opaquer was applied. The IPS 53 KON Paste Opaquer and the IPS Style Ceram Powder Opaquer exhibited excellent flow and masking properties (Fig. 5). Two firing cycles were adequate for producing the desired masking effect. The opaquer in paste form was easy to apply, since the material is supplied ready for use from the syringe. Depending on its application, the rather dense paste may have to be diluted with some Paste Opaquer liquid.

The IPS Style Ceram Powder Opaquer, however, is mixed to the desired consistency with a matching liquid component. The product is easy to apply with a brush or a glass-ceramic or ceramic instrument. Margin material was used to create a shoulder, thereby enhancing the aesthetic appearance of the restoration and establishing a tight seal to the gingiva. The Margin materials of the IPS Style and IPS d.SIGN systems helped to create a beautiful margin (Figs 6 and 7).

First firing
In order to make a visual comparison of the layers placed with the two ceramics, the materials were mixed with Liquid Visual Eyes (Harvest Dental). The Visual Eyes Liquid is a product that renders the colour of the fired ceramic visible before the material is actually fired (Figs 8 and 9). The basic dentin layer was created with 25 % Ceravin Transpal orange-pink and 25 % Ceravin Transpal khaki mixed with 50 % Dentin B2. Unmixed Dentin material was used in the central part. The incisal materials were produced with a mixture of 80 % Dentin B2 and 20 % Special Incisal grey. In the horizontal cut-back space, effect material Inter Incisal white-blue was applied. The incisal margin was completed with Opal Effect Of 1 and Transpal materials (neutral, orange grey). The mamilons and internal characteristics were created with a very fine separating instrument. After the first firing, the colours of IPS Style and IPS d.SIGN looked good and appeared almost identical (Fig. 10). IPS Style Ceram and IPS d.SIGN Traspal as well as Mamelon materials were used to make some slight adjustments to the shape of the anterior teeth. At this stage, a comparison showed that a few distal areas in the incisal edge of the IPS d.SIGN restoration were slightly more translucent.

Customisation of the layers and second firing
After the first corrective firing cycle, the teeth were customized with suitable IPS IVocolor® stains. These materials are used to characterise restorations (e.g. mamelons). Irregular enamel cracks and adjust the colour intensity and transluency of certain areas. Subsequently, the stains were fired.

In this case, a reddish hue was imparted to the incisal edge with IPS Ivocolor Essence E21 basic red to achieve a “lip gloss infiltrated” effect in the dental enamel. For the second firing, the crowns were coated with Transpal Dentin, Transpal Incisal and Transpal Impulse (Figs 11 to 13). Comparison of the results
After the second corrective firing of the different IPS Style Ceram Transpal materials, we were convinced that the product fulfilled all our criteria. The dimensional and shade stability of the ceramic was impressive. We effectively controlled the brightness of the material by adding Transpal T Neutral. All in all, we were completely satisfied with the result. The colours of IPS Style were lifelike and they were identical to those of IPS d.SIGN. A direct comparison clearly shows the excellent colour coordination of the different ceramic ranges (Figs 14 and 15). Furthermore, the same shade system applies to the IPS e.max® all-ceramics and the SR Nexco® light-curing laboratory composite.

Summary
IPS Style is definitely capable of replacing IPS d.SIGN, which we used in our laboratory for quite some time. It completely satisfied us in terms of its shade and dimensional stability and its high strength. This ceramic offers us incredible flexibility and satisfies all our demands. Moreover, the ceramic system is geared towards modern manufacturing techniques. At present, we use printed, milled and conventionally cast metal to fabricate the frameworks used in our laboratory. The different fabrication methods involve a wide range of CTEs. IPS Style accommodates this requirement and does not cause any problems related to fracture during firing. The ceramic is characterized by minimal shrinkage and high dimensional stability.

IPS d.SIGN, however, shows less dimensional stability and therefore does not perform as well in interdental areas and deep fissures. In this respect, it is less predictable than IPS Style. Nevertheless, the shade stability of IPS d.SIGN is comparable to that of IPS Style. In terms of fluorescence, both materials equally meet our criteria (Fig. 6). IPS Style Ceram Incisal and IPS Style Ceram Transpal T Neutral have a slightly more lifelike fluorescence than the corresponding IPS d.SIGN materials.

Conclusion
In the end, the IPS Style solution had a slight advantage. We chose it for the final restoration because of its beautiful tooth shapes and vital appearance in the mouth (Figs 17 and 18).

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The new Multimat Cube from Dentsply Sirona: powerful, user-friendly, reliable

By Dentsply Sirona

Working with the Multimat ceramic furnace has been a staple for dental lab technicians worldwide for many years due to their ease of use and reliable performance. Dentsply Sirona is excited to introduce the Multimat Cube and Multimat Cube press. Both the Multimat Cube and Multimat Cube press constitute the classical virtues of previous models with modern vision of the digital world.

First of all, the Multimat Cube and Multimat Cube press deliver exactly what every experienced dental technician expects of them. It is a universal furnace for all commercially available dental ceramics, including lithium silicate and lithium disilicate. A multi-stage heating program and a two-stage cooling program, together with the automatic resumption of the program after a brief power cut, ensure a high level of process reliability and guarantee cutting-edge firing results.

Specifically, the intelligent pre-heating program and the reliability of the restoration impresses users. A mobile furnace chamber independently balances out any vibrations. The Multimat Cube represents quality “Made in Germany”, and it is also approved according to international standards (ETL). This abbreviation stands for Edison Testing Laboratories, a renowned safety seal of approval that originates from the famous inventor, Thomas Edison.

Besides the high level of performance and reliability, the operation is also intuitive. It is operated via a large, clear touch display. It has a high-quality, three-millimeter thick tempered glass cover and guarantees clear access to the programs. The system gives the dental lab technician constant feedback on the current status of the firing process via an LED indicator. Two USB ports enable you to back up the data on a USB stick.

The programs for ceramic systems by Dentsply Sirona are pre-installed. Performance, reliability and operating comfort are also integral features of the Multimat Cube press. Besides the range of applications offered by the Multimat Cube, it also offers the possibility of processing pressable ceramics. For example, this system allows the user to press the popular high-strength glass ceramic Celtra Press using pre-installed programs, and then to fire the veneering ceramic Celtra Ceram.

With their minimalistic design, both of the new models are real eyecatchers when seen in the lab. Both the Multimat Cube furnace and the Multimat Cube press pressing and firing unit are recommended as reliable options, which are robust in day-to-day operation and offer a high level of user comfort.

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Course Objectives

In this seminar and hands-on course, two highly aesthetic framework materials are combined with the same veneering ceramic. Different procedures such as aesthetic veneering, cut-back technique or painting and glazing are demonstrated.

Every day new challenges arise for a dental technician. Different materials, depending on the indication, must have the same colour in the final restoration.

Every dental technician knows from experience that the perfect shade selection is crucial for an aesthetically satisfying result.

Choosing the right framework material with the right translucency and colour saves time and extra work. This is important when different preparation shapes have to be managed in parallel in the same jaw.

Refinements using the cut-back technique add extraordinary aesthetic value at low cost in terms of time and effort.

The aim of the workshop is to benefit from the speaker’s experience in selecting the shade to accelerate lab processes by purposeful shade matching. Simple build-ups and staining with maximum effect, shapes and surface structures with little effort and the final restoration with different materials and with different materials the same colours.

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Successful collaboration between Fraunhofer scientists and Dentsply Sirona

Award goes to ZLS researchers

By Dentsply Sirona

The Fraunhofer Gesellschaft (Fraunhofer), Munich, a globally recognized link between basic research and applied sciences, awarded its renowned Joseph von Fraunhofer research prizes on May 8, 2019. In the category "Technik für den Menschen” (Human-Centered Technology), Dr. Bernhard Durschang and Dr. Jörn Probst from the ISC (Fraunhofer Institute for Silicate Research, Würzburg, www.isc.fraunhofer.de) won the award with the prosthetic material ZLS (zirconia-reinforced lithium silicate). A wealth of ideas and successful collaboration with industrial partners, including Dentsply Sirona Lab (formerly DeguDent), contributed to the success, but the main factor here was courage: German Chancellor Dr. Angela Merkel did not miss out on personally appearing at the awards ceremony and making a welcome speech, which included offering her congratulations for the big anniversary (70 years of Fraunhofer). The Fraunhofer Model is a shining example of successful collaboration between science and the economy,” she said, outlining an example of successful collaboration between Fraunhofer scientists and Dentsply Sirona Lab (formerly DeguDent). The project to develop ZLS shows an outstanding example of these successful collaborations,” said Dr. Markus Vollmann, Research & Development at Dentsply Sirona Lab. Why did it need such a high level of courage? Quite simply because the researchers attempted something that was supposedly physically impossible. Until six years ago, glass ceramics were considered to be exhausted for use in dentistry. People were more or less resigned to the fact: Zirconia ceramics for structures with high strength (e.g., posterior bridge) and glass ceramics for beautiful, high transparencies, but with considerable limitations regarding the indication. If you explore the topic further, until six years ago there were two types of glass ceramics available on the market: The conventional variant was able to be integrated directly after milling. The high-strength lithium disilicate, however, stood out due to its higher strength and its ability to (non-adhesively) bond with glass ionomer cement. However, this material required subsequent process steps such as crystallization firing (30-90 minutes). A block for all cases A handful of researchers did not want to accept that the status quo that existed at that time is the best option. Therefore, the joint efforts of the Fraunhofer researchers and the industrial companies involved (DeguDent, Vita Zahnfabrik) produced CAD/CAM blocks for all cases (e.g., Celtra Duo) in 2013. This resulted in a combination of the beneficial properties of zirconia and lithium disilicate. After grinding, the (single-tooth) restoration could be inserted immediately (e.g., for inlays, onlays, partial crowns) or it could be glazed fired to give it the strength of lithium disilicate (e.g., crowns), now going clearly beyond this. Furthermore, pressable ZLS (e.g., Celtra Press, Dentsply Sirona Lab) is now available. Dental technicians value it for both its aesthetics and its higher strength. It even allows three-unit bridges in the anterior tooth region up to the second premolar as the terminal abutment.

An essential requirement: The course of development enabled the microstructure and surface quality of high-strength glass ceramics to be significantly improved. This allowed fields to be explored such as those that – putting it mildly – no one had ever thought possible.

Complete analytical method specifically for ZLS research

At the industrial partner Dentsply Sirona Lab (or DeguDent), the material testing team developed a number of things including a new method specifically for the analysis of crystal distributions and determining crystallization firing. This does not require the usual etching of the test specimen. Differential thermal analysis (DTA) was also used. This helped to clarify how the structure behaves at different temperatures, where phase transitions occur, and how they affect the manufacturing process. Even the researchers group was amazed by how well ZLS could ultimately be milled in the machine, e.g., the inLab MC XL (Dentsply Sirona Lab), in its final, crystallized tooth-colored state.

Since then, zirconia-reinforced lithium silicate has become a key all-ceramic material as it enables the dental technician to make first-class restorations quickly and safely, impressing both dentists and patients. The result can always be predicted well, just like the effort required for it.

Fig. 1: High-strength glass ceramics have been developed with vast detailed knowledge, a new analysis method, and great courage – the pressable zirconia-reinforced lithium silicate Celtra Press from Dentsply Sirona Lab in A1, A2 and A3, in B1, B3, C1, C3 and D2 and D3 as well as in B3, C3 and D3, each available in MT (medium transparencies) and ET (low transparencies). M01 and M02 (medium opacity) are available to cover discoloration and devitalized stumps.

Fig. 2: Celtra Ceramic. A highly versatile veneering material specifically for all ceramic frameworks made of materials such as lithium silicate and zirconia.