THE DENTAL SOLUTIONS COMPANY™

Dentsply Sirona

CEREC Tessera™
Advanced Lithium Disilicate

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A single chairside CAD/CAM restorative material that would provide optimum esthetics combined with maximum strength has proved to be an elusive goal. And to magnify the challenge, CEREC clinicians would welcome a simple and quick post-milling fabrication process for efficient clinical delivery.

Current CAD/CAM material development efforts are focused on two main approaches. One approach embraces the high strength of full contour zirconia recognizing the compromised esthetics. New developments in zirconia materials attempt to improve the esthetic qualities, especially translucency, while maintaining the high strength. The other approach recognizes the optimum esthetics that glass ceramic materials offer and works to improve the physical properties. As these two paths converge, a single material with optimized esthetics and strength may emerge.

Dentsply Sirona has introduced a new high strength glass ceramic material, CEREC Tessera™. It is characterized as an advanced lithium disilicate ceramic material. It has 40-45% glass content with a submicron particle size of ~0.5 µm. It is composed of ~90% lithium disilicate crystals, 5% lithium phosphate, with the remaining 5% virgilite crystals which are small (< 100 nanometers) lithium aluminum silicate platelet-shaped crystals. The high strength of the material is created by applying a surface glaze and subjecting the milled restoration to a 4 ½ minute Matrix Firing cycle in the SpeedFire oven (Dentsply Sirona). Matrix Firing optimizes the crystal structure by forming new virgilite crystals, surface healing the glass content, as well as increasing the density to achieve a flexural strength of greater than 700 MPa.

A significant advantage of using glass ceramic materials is the predictable ability to adhesively bond them to the tooth structure for durable retention of the restoration. CEREC Tessera™ blocks are a glass-containing material and can be etched with hydrofluoric acid for adhesive bonding with resin cements. This provides an opportunity for more conservative tooth preparations such as veneers or onlays. It also can provide effective retention for short clinical crowns with minimal mechanical retentive features in the preparation. For teeth with sufficient mechanical retention in the preparation and adequate restoration wall thickness, CEREC Tessera™ blocks may also be conventionally cemented due to the improved flexural strength compared to other glass ceramic materials. This affords the clinician the choice of delivery techniques without compromising strength or esthetics based on the specific clinical situation and retention developed in the tooth preparation.

An essential feature of any restorative material is to understand how the material should be handled to ensure the desired esthetic appearance and wear compatibility with the opposing dentition. A glaze must be applied to the surface of the restoration for the Matrix Firing process to create the high strength of CEREC Tessera™ Advanced Lithium Disilicate. This is not a crystallization process as the block comes precrystallized. And unlike a sintering process, there is no volumetric change to the restoration. If the SpeedFire oven is preheated to 400° C, the Matrix Firing process takes 4½ minutes. It is possible to use other types of ovens, but not in a 4½ minute cycle. The surface glaze acts as a wicking agent to concentrate the oven heating energy on the surface of the restoration ensuring achievement of maximum strength. It is also very important to center the restoration in the SpeedFire oven to ensure consistent heating. The honeycomb firing tray elevates the restoration to the optimum heating space in the SpeedFire oven and the firing pad over the honeycomb tray ensures the restoration glaze does not bond to the tray. A spray glaze is available to quickly apply the glaze prior to Matrix Firing. It is also possible to custom shade the surface of CEREC Tessera™ material using the Dentsply Sirona Universal Stains and glaze during the same 4½ minutes Matrix firing cycle.

A general concern is that abrasive wear of opposing tooth structure is a function of material hardness. This is more perception than fact, as abrasive wear is more a function of material surface smoothness and fracture toughness. Zirconia is a very strong material with a high fracture toughness (resistance to fracture). The reason a rough zirconia surface can be very abrasive to the opposing dentition is due to the high fracture toughness of zirconia. The rough peaks on the surface of the zirconia do not smooth over during functional abrasion (wear) and instead abrade the opposing surface. By polishing the zirconia surface, removing the sharp peaks, the material is still hard and strong, but the surface is no longer abrasive to the opposing dentition.

CEREC Tessera™ Advanced Lithium Disilicate has a significantly higher strength than other glass ceramics. However, the fracture toughness is not at the same level of zirconia. The fine particle size (~0.5 µm) of CEREC Tessera allows it to be easily polished to an enamel-like smoothness using a variety of contouring and polishing instruments to ensure it is not abrasive to opposing dentition. The polishing sequence is not an optional alternative to surface glazing and Matrix Firing. The glazing process is required to achieve maximum strength of CEREC Tessera™ material, but if post-glazing adjustment may be required it can be consistently polished to a smooth surface with a variety of polishing instruments. Polishing CEREC Tessera™ restorations prior to surface glazing and Matrix Firing creates an equally smooth surface compared to polishing after surface glazing and Matrix Firing. The choice to contour and polish CEREC Tessera™ restorations before or after Matrix Firing would be one of clinical preference.

The quest for a high strength restorative material with optimum esthetics for all single tooth restorations has resulted in the introduction of a new material, CEREC Tessera™ Advanced Lithium Disilicate. As with any new material clinical testing is important to validate the expected performance and longevity of the material.