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The Dent-Liner™

A Bulletin Dealing With Issues For Dental Health Professionals

Peter T. Pontsa, RDT has over 40 years of experience in the dental profession. In 1991 he established Dent-Line of Canada Inc. and is currently president of this dental supply company. He is a leader in superior professional techniques in fixed and removable restorations and he shares this knowledge through articles and seminars which he regularly provides. Peter is a past president of the College of Dental Technologists of Ontario. He is also pleased to be involved as co-publisher of Spectrum Denturism.

Special Interest Articles:

Improved Bond Strength at the Porcelain Interface

When fusing porcelain to metal one of the most likely modes of failure with this system is the separation of the ceramic from the metal due to an interfacial breakdown of the metal-ceramic bond. The success of the metal to porcelain system depends upon the quality of this bond. An important factor contributing to the ability to bond the ceramic to the metal is the degree of mismatch between the co-efficient of expansion of the ceramic and the metal. If the mismatch is too great, stresses will build up during the cooling phase after firing. These stresses can be sufficient to cause crazing or cracking of the ceramic. Bredent's Ceram-Bond comes in a creamy paste that is made of ceramic and is used as an interface coupler between all metals before porcelain is applied. Ceram-Bond compensates for the different expansion levels of co-efficient of thermal expansion between metal and ceramics and also blocks escaping metal oxides. There are two types of bonding agents in use at present. Ceram-Bond is one and is made of ceramic materials and the second is a paste made of powdered gold. Both mask heavy oxides and increase chemical bonds at the interface with most alloys and non precious metals. Porcelain pop off from PFM crowns as a result of contamination of the porcelain to metal interface are caused by thick layers of surface conditioners (bonders) and under-firing of the opaque layers. Ceram-Bond is applied as a prewash or first ceramic coat and performs two major functions, in that it masks the colour of the alloy and is responsible for a metal ceramic bond. When a specific range of oxide particles sizes are used, most of the incident light is scattered and reflected rather then transmitted through the porcelain effectively masking the colour of the under lying framework. The oxides added to the original porcelain blend to help mask the colour of the alloy. Because these oxides have an optical index of refraction different from the other components, they cause incident light to scatter and thereby mask the framework. During firing the porcelain is taken above its glass transition temperature such that it can flow and fuse with the oxides into the ceramic. The quality of the metal-ceramic bond is controlled by the amount of micro mechanical bonding, the thermal coefficient compatibility and the chemical interaction between the metal oxides and the ceramics. The nature of the bond between the metal sub frame and the porcelain has been extensively studied and it is generally agreed that three mechanisms are involved. These three are mechanical retention, compression fit and chemical bonding. Mechanical retention occurs as the ceramics flows into the microscopic spaces in the surface of the metal. The roughness of the surface is often enhanced by sandblasting with Al ox2 or by preparing the surface with grinders, so that there is increased retention. This surface preparation has the added benefit of producing a very clean surface that inhibits the wetting action of the porcelain into the metal. Degassing in the furnace prior to opaquing burns off any remaining impurities and reduces the formation of bubbles due to trapped gases at the interface. This firing also creates an oxide that creates a chemical bond between the Ceram-Bond and the oxide coating of the metal. A study by Shell and Nielson produced results that concluded that dental porcelain to dental gold bond, if properly made was one of inter atomic bonding. The total bond had a shear resistance of about 10,000 to 13,000 psi. About one third of this resistance appeared to be due to van der Waals forces of wetting and two thirds appeared to be due to chemical bonding, perhaps a mixture of ionic, covalent and metallic bonding. Ceram-Bond can be combined with a wide variety of other ceramics that melt and fuse, producing a process of sintering the porcelain components together, preferably at temperatures of 960°C. The porcelain powder used by dental technologists is not a simple mixture of Quartz and Feldspar since these powders have already been fired once. The manufacturer mixes the

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Improved Bond Strength at the Porcelain Interface cont'd...

Ceram Bond is available in either a 7ml or 30 ml size.

components, adds additional metal oxides, fuses them together and then quenches the molten mass in water. The result is a ceramic material known as frit and the procedure is known as fritting. As a consequence of this rapid cooling, there are large internal stresses built up in the glass, resulting in extensive cracking. This ceramic material is usually ground up to produce a fine powder for use in crown and bridge construction. The particle size distribution is critical in ensuring that the particles pack together as tightly as possible in order that the shrinkage from firing is minimal. The average particle size is generally in the region of 25 microns. Some other ingredients are present such as metal oxides, which provide the golden, yellow appearance that results on the framework after Ceram-Bond has been fired onto it. The Ceram-Bond ceramic granules are optimally milled in a standard grinder to obtain the desired particle size and then mixed in a solution that is viscous enough to be able to applied evenly and thoroughly in one application. This technique is characterized by applying the Ceram-Bond slurry or wet powder material onto a framework followed by a sintering step in order to fix the coating material onto the framework to develop an interface for the fusion of ceramic to it. Studies have shown there were no significant differences in flexural bond strengths for the one and two opaque application techniques. Usually the crown or bridge is degassed at 980°C under vacuum for ten minutes before the bonder is applied. Sand blast with Al ox2, and then clean thoroughly with distilled water in the ultrasonic unit for 10 minutes or using a steam cleaner. Afterwards the metal surface should not be touched any further. Use a stain brush to apply one layer to coat the surface with a uniform thickness. Dry the wet framework in an open ceramic furnace that has been preheated to 650°C. for one minute. Firing Ceram-Bond starts at 650°C. and continues up to 980°C. The temperature increase is 55°C per minute under vacuum.

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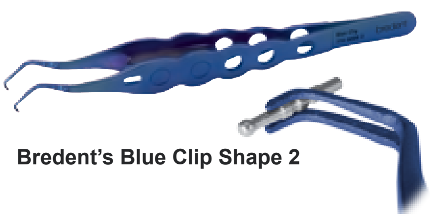
Bredent's Blue Clip Shape 1



Bredent's Blue Clip Shape 2

Bredent's Blue Clip Shape 3

Featured Product: Bredent's Blue Clip Tweezers

These three tweezers have tips that are diamond coated to enhance the retentive qualities when gripping small items. Shape one has a 3-point cross clamping function. Two and three have a spreading and clamping function. Since screws, nuts, attachment components are small and delicate the Blue Clip is ideal for removing them from packaging especially since the diamond tips provide greater grip than conventional tweezers. To achieve an enhanced contrast, the clips were coated blue using a plasma coating. You can avoid time-consuming searching while holding numerous small items safely. The unique three-point contact holds spherical and cylindrical small items securely in the diamond coated tip area. There is also a double function of spreading and self clamping or locking features. Ceramists will be able to easily hold anterior ceramic crowns on the inner side with the clamping function on Blue Clip type 2. For pricing availability or more information call us at 1-800-250-5111.

The wtm-050 Master Black Wet Tray by Labioniq

Featured Product: Labioniq's Master Black Wet Tray

This revolutionary new wet ceramic tray prevents eye fatigue since the black background provides contrast with the porcelain, allowing you to better judge the amount of porcelain and quantity ratios required. The black pad is easily cleaned and does not require the decontamination process as seen with many other traditional wet tray systems. There is no evaporation of water due to the airtight lid ensuring that the powder remains wet for several days and there is no need for membranes or filters. For more information call us at 1-800-250-5111.

Vario Soft 3 Zircon and Zircon mini attachments

Compoform and Seracoll UV burn out ash free.

The attachments are joined with Compoform.

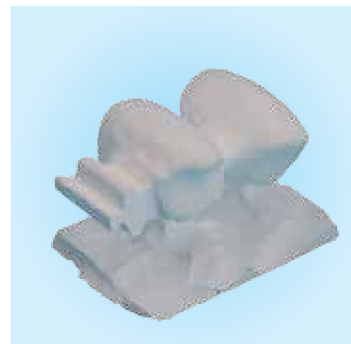
Two connections should be planned within the template.

Glue and accelerator fasten the restoration tension free.

Zirconium milling technology has come far in the last few years and the copy milling technique is simple and mastered quickly. The technique's high precision ensures implementation of the finest details as well as dimensional flexibility during the milling process. Zirconium dioxide ceramic (zircon) can be processed with exceptional efficiency, so that the cost of crowns and implants are minimized. By virtue of its aesthetic advantages such as high translucence, natural colour rendering and excellent flexural strength, it is the basis for bio-compatible restorations. Bredent has introduced Vario-Soft 3 Zircon and Zircon mini. These are special attachments to be used in copy milling zirconium restorations that require partial removable dentures or implants supported over dentures. The shear distribution is incorporated into the male attachment design eliminating milling into the restoration. Copying the attachment is easy due to its perfect geometry and it can be integrated into any system. As an example a bilateral restoration is constructed and molded using CompoForm U.V. a viscous resin which will hold up during the copy milling procedure. The male attachment is positioned with the parallel mandrel, affixed with CompoForm U.V. resin Then the surface of the restoration is wetted with Seracoll U.V. a more liquid resin and also cured to obtain a secure connection and added strength. The five motion light curing disc is light cured on both sides. The light curing disc and the corresponding zirconium blanc are fixed in the copy jig. The milling bur (4mm) and blank stylus are conversely clamped into the corresponding micro motors. The restoration is placed in the delineated area so as to check whether the equidistance to the zirconium block is efficient. Two connections should be planned for sufficient stability within the template .The circular space should be large enough that you can move the framework easily within the copy miller scanner. Trace the pattern on the disc and draw the connectors. Next using Bredent H200KM23 carbide cut the areas out that are not needed and leave the connectors for point of connection. Using the five motion glue and accelerator, the restoration is fastened to the disc (template) as is the zirconium blanc to the jig. The milling begins with the largest miller (4mm) from the cervical side. It is milled with the system in order to target an exact and safe removal of the unsintered restoration. Begin with the interior side of the crown and then continue with the exterior side of the crowns. By turning the clamping table or simultaneous turning of the framework, every area of the restoration is covered and milled including the attachment. The milled Zircon framework is separated from the zirconium block in such a way that a bar always remains on the oral side with at least two connections. This will allow for sufficient stability during sintering. The remaining area is ground down with H194GH40 carbide and smoothed out. The finer the zircon framework is milled and finished, the less reworking will be necessary in the sintered state. Then the zircon framework is placed in the colouring liquid for thirty seconds before the sintering process and the framework receives the corresponding primary colour. After drying the zirconium framework is placed in the firing dish filled with firing sand with the cervical side facing upwards. After sintering, the framework is separated from the bar with Diabolo Supra Disc. After applying porcelain the Vario Soft 3 zircon attachment is ready for processing. Whether the removable partial denture is constructed from Chrome Cobalt or thermo plastic material the idea of creating a removable prosthesis in combination with zirconium is both novel and compelling.

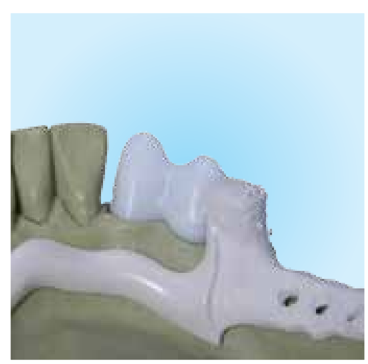
Source; Peter T. Pontsa, RDT

NOTE: The publication of the pictures were courtesy of bredent GmbH & Co. KG



After the milling process, the restorations are sintered.

The units are polished with Bredent's Zi-Polish.



Bio-compatible zirconium and thermoplastic partial denture.

Improved Bond Strength at the Porcelain Interface cont'd...

After completion of the firing process, the framework is immediately removed from the furnace. The substrate should take on a beige to golden yellow color. Apply the opaque material over it according to the tooth shade and process according to the manufacturer's instructions for the ceramic material. Please note the material is not suitable for Ticonium, Crystalloy or Crutanium alloys. It is critical to have a superior bond at the metal to porcelain interface since if the different dimensional change is sufficiently high the internal surface layer which is under tension will rupture to relieve the stresses. This will result in the fitting surface of the crown containing a large number of miniature cracks and it is these that will ultimately cause the crown to fracture. The bonding agent is chemically very stable and provides an excellent background for aesthetics and it does not deteriorate overtime. The bond strength between metal and ceramic is determined by the properties' different phases emerging in the diffusion zone during the firing process. The formation and growth of these phases indicate that very complex reduction-oxidation reactions take place in the interface region. These oxide layers play a fundamental role in adherence; one example is solid state diffusion bonding as referred to by Klomp 1987. Research by Lubovich and Goodkind indicate that great variations can occur regarding bond strengths of base metal alloys. This can be related to divergences in methodologies, metal casting and preparation of differences in the dental porcelains. With this in mind the overall decrease in bond strength was greater for non-precious systems then for gold porcelain systems, which makes a good case for using bonders for base metal alloys. Ozcelik mentions that colour differences of base metals with opaque application have been clinically accepted for aesthetics. We can see that bonders like Ceram-Bond can be applied for both gold and base metal systems with good results even under adverse conditions. This also applies to pressible ceramics as well but not so for zirconia. With gold prices over the $1000.00 level it would be prudent to shift away from bonders with gold bases to ones with ceramic frits. In Germany there has been a shift toward the use of base metals which is much more acceptable economically. A similar trend is expected in North America now that this proven method will result in predictable porcelain to metal bonding results.

Source; Peter T. Pontsa, RDT

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Announcements of Donations 2009:

Both Dent-Line of Canada and Renfert USA have been donating state of the art equipment and sundries to schools across Canada to provide students of dental technology programs with the training to change the lives of patients and offer new hope for the future of dentistry. This past October 22, 2009 Peter T. Pontsa RDT and Angela van Breemen BA from Dent-line with the co-operation of Renfert USA donated a Renfert Quattro Sand Blaster to the Dental Technology Program of George Brown College. Bernie Mullen RDT the Health Co-coordinator for the program was on hand to receive the donation as students looked on. Dent-Line and Renfert USA were also pleased to contribute a Renfert Twister Vacuum Investor to the dental technology program at Montreal based Collège Édouard-Monpetit. The presentation ceremony took place at the school on October 30, 2009. Peter and Angela were on hand to make the presentation. Stephan Provencher RDT department and program coordinator on behalf of the school accepted the gift. It's important to have an environment where students can expand their knowledge base while using the latest equipment as they progress through the curriculum on their way to contributing to society.

George Brown College: Pictured above are Bernie Mullen, Health Co-ordinator with Peter T. Pontsa and Angela van Breemen.

Collège Édouard-Monpetit: Shown are Stéphan Provencher, Department & Program Co-ordinator with Peter and Angela.

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