Zirconia

(continued from page 1)

translates into wear or attrition.

As we know from nature, elephants starve to death at the age of 50 - 60 years because their dentition at that stage is too abraded to process food.

Sintered Prettau Zirconia, owing to its own special material composition, displays incredible density and smoothness. Therefore the material does not cause any wear on natural dentition.

I illustrate this phenomenon by practical example: Rub wood against a smooth glass pane and nothing will happen but, rub wood against wood and it will splinter. As two materials of the same kind meet (tooth against tooth) natural dentition will inevitably wear also. However, when natural tooth meets smooth zirconia (like wood against glass) no abrasion occurs. The abrasive nature of any material is determined by its degree of surface polish and inherent density. The "softer" enamel will glide over polished, much harder zirconia without wear.

By contrast veneer porcelain (or even metal) will cause wear on natural dentition due to its highly porous structure which acts like sandpaper.

Veneer porcelain is 1000 times more abrasive compared to polished Prettau Zirconia.

Our experiences with zirconia vindicate our view: Zirconia causes practically no abrasion to natural dentition.

In the past we have observed the facts in our own environment and currently they are being tested scientifically in several universities. In general terms we can say this: The harder and smoother a material the less the wear it causes under friction. Wear results in abrasion.

Continuing Education

- Dental Services Group Conf. in Tempe, AZ: Sheri Hamberlin, James Hunter, Cresta Albertson, Jeremy Wright, Brett Memmott, Josh Brizzee, Steve Parks
- Zirkonzahn training in Atlanta, CA: John Treasure, Adrian Eames
- In-Lab Porcelain Training with Mike Bellarino: John Treasure, Cresta Albertson, Kathy DelaRosa, Clint Hall, Jeremy Wright
- IDEA "Morphology, Wax Up & Provision" in San Fransisco, CA: MaryBeth Holverson, Jonathan Fleming
- International Assoc. of Comprehensive Aesthetics Conf. in Boston, MA: John Treasure
- Idaho State Dental Lab Assoc. Meeting in Boise, ID: Harley Izatt
- Dental Lab Owners Assoc. in San Diego, CA: Sheri Hamberlin, Barry Treasure

Z-Prime Plus

(continued from page 3)

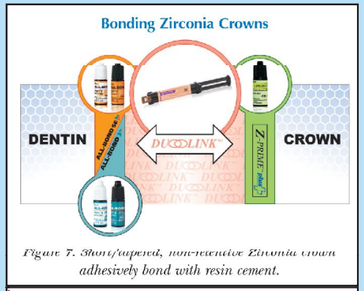
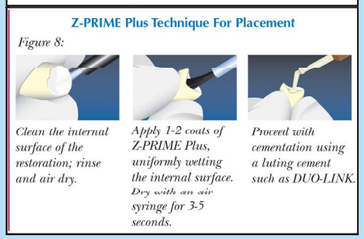


Figure 7. Short/tapered, non-retentive Zirconia crown adhesively bond with resin cement.



This combination creates a linked cohesive/hydrophilic seal between tooth and the indirect restoration. In preparations with adequate retention/resistance form, self-adhesive resin cements like BisCem can be used. BisCem contains hydrophilic phosphate monomers and bonds to zirconia as well as to the dentin/enamel substrate. Bond strengths are lower (10-12 MPa), but in retentive preparations, the ease of placement is a compelling benefit. However, Z-PRIME Plus can be used with self-adhesive resin cements like BisCem to double the bond of self-adhesive cements to zirconia, alumina and metal.

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- LAVA™ CZR Press Inlays/Onlays
- LAVA™ Milled Full Zirconia Crown/Bridge
- Zirkonzahn Zirconia Crown/Bridge/Implant
- Authentic Veneer
- Authentic Crown
- Authentic Inlay/Onlay
- IPS e.max Veneers
- IPS e.max Crowns
- IPS e.max Inlays/Onlays
- IPS Empress Veneers
- IPS Empress Crowns
- IPS Empress Inlays/Onlays
- Noritake Refractory Veneer
- Sinfony Composite Inlay/Onlay
- Sinfony Composite Temporaries

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- Precious High Noble Alloy
- Semi-Precious Noble Alloy
- Non-Precious Base (Tilite)
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Fall/Winter 2010

Zirkonzahn's Zirconia

We are excited to offer Zirkonzahn zirconia and feel it will be a great asset to our line of restorative material.

Zirkonzahn was founded in 2003 by Enrico Steger. The company's headquarters are in SouthTyrol, Italy and they have an office in Atlanta, Georgia

Prettau Zirconia

We all want strong restorations that look aesthetically pleasing and will have minimum failures. For this reason we have started using highly translucent Prettau Zirconia which is used in conjunction with a specialized colouring technique that eliminates the use of veneer ceramics in the functioning area. In this way aesthetically pleasing full-zirconia restorations, i.e. the 'Prettau Bridge' can be realized, especially in the field of implant dentistry.

In cases of limited available space or restorations with tissue flanges, Prettau Zirconia comes into a world of its own. From single crowns to full mouth reconstruction, this is the material of choice.

The Prettau Bridge

Implant-borne prostheses are exposed to much higher occlusal loads than conventional bridges due to the lack of periodontal load receptors. This may lead to occlusal veneer porcelain chipping. The so-called Prettau-Bridge provides a new way dealing with such situations. In the process of making a bridge of this kind a full set-up is produced first. This is tried in epoxy and checked for function. Following, the set-up is copied in zirconia with our manual milling system. We use the extra-translucent Prettau zirconia for such cases. The final restoration is made from 100% zirconia. Only the facial of the anterior teeth and the soft-tissue flange is veneered with porcelains of various shades. Full zirconia bridges display tremendous flexural strength which helps to minimize failures.

Is Prettau Zirconia too hard and abrasive?

In dentistry abrasion (Latin: abrasio = to scratch off) means the loss of tooth substance due to friction. Enamel and dentin are part of the so-called 'hard' tooth structure. Abrasion in this context

(Continued on Page 4)

BISCO: Creating Solutions to Clinical Challenges!

Bonding to Zirconia, Alumina, and Metal with Z-PRIME™ Plus

by Douglas J. Brown, DDS, FAGD

Zirconia: The Future of Aesthetic Indirect Restorative Dentistry?

Zirconia-based restorations and reinforced glass ceramics are the fastest growing segment in the North American laboratory market. Zirconia's high strength and fracture toughness are two of its unique advantages compared to current glass filled ceramic systems. Zirconia has a flexural strength (900-1100 MPa). Combined with a fracture toughness of 8-10 MPa and the ability to "transformational toughen", zirconia can now be considered a universal indirect restorative material.

The computer-aided design/manufacturing (CAD/CAM) technology, together with excellent mechanical and aesthetic qualities, has expanded the clinical use of zirconia to include aesthetic conservative restorations and long-span restorations. In addition, zirconia's hard and dense surface is ideal for resisting wear damage to opposing dentition and making zirconia an attractive material for dental restorations. The applications of zirconia in dentistry include: endodontic posts, implants, implant abutments, orthodontic brackets, cores for crowns, and fixed partial denture prosthesis frameworks.

Zirconia Demands Adhesion

The use of Zirconia in conservative aesthetic dentistry in combination with short, non-retentive preparation designs commonly seen in today's complex restorative cases demands that chemistry be created to allow development of adhesive primers, specific to oxide-based materials. This chemistry enhances the adhesion between hydrophobic resin composites/cements and indirect oxide-based substrates (zirconia, alumina, metal). BISCO's goal was to create a cohesive interface between the zirconia and resin cement, improve initial bond strengths capable of resisting hydrolytic degradation, and allow for the use of stronger and more durable resin cements.

Addressing the Needs of the Individual Substrates

The key to optimizing adhesive performance and durability is in understanding that enamel and dentin are alive.... and zirconia, alumina, metal and glass are dead! Enamel and dentin require adhesives that create micro-retention and infiltrate, such as ALL-BOND SE®; and ALL-BOND 3® from BISCO. Oxide-based indirect substrates require primers with phosphate co-monomers to covalently bond to the oxide (Z-PRIME Plus). Glass porcelains require silane to interact with silica in glass to form siloxane (BIS-SILANE™, Porcelain Primer) (see Figure 1). Cohesively recreating the lost fibrous DEJ between dentin/enamel and the primed indirect substrate are luting cements, which should be hydrophobic, stable upon aging and have self-cure modes that are proven.

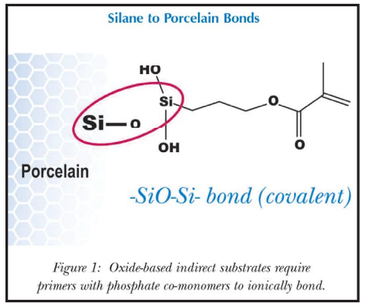

Figure 1: Oxide-based indirect substrates require primers with phosphate co-monomers to ionically bond.

Finding the solution to zirconia bonding begins with an understanding of adhesive interfaces. The gold standard in luting cements are hydrophobic resin cements (DUO-LINK™, BISCO). Unfortunately hydrophobic cements do not naturally adhere to oxides, and require a primer to create a cohesive interface. Traditionally, zirconia bonding incorporated the use of self-adhesive resin cements (Bis-Cem®, BISCO) or glass ionomer cements. Phosphate monomers within self-adhesive cements do have a mild affinity for zirconia oxide and can be used with confidence in retentive preparation designs, but unfortunately these categories of cements are known to be physically weaker. Creating simple adhesive systems that allow for the use of hydrophobic resin cements that work synergistically to improve retention is possible (DUO-LINK SE, BISCO).

Primers for Oxide-Based Substrates versus Glass Porcelain Substrates

The research of Dr. Byoung Suh and others confirm that the use of Silane (BIS-SILANE, Porcelain Primer) in conjunction with micro-mechanical retention from 11F acid or sandblasting is the gold standard of protocols addressing glass indirect substrates including lithium disilicates, reinforced porcelain and feldspathic porcelain. Stability of silane is dependent upon pH of the mixture and requires special attention by the manufacturer. Two recently introduced primers–marketed as suitable for both glass and oxide-containing indirect substrates–contain silane in addition to a phosphate monomer; but the combination of these two require a pH that causes silane to become unstable, resulting in hydrolysis and a significant loss of bond strength to porcelain and lithium disilicate (Figure 2).

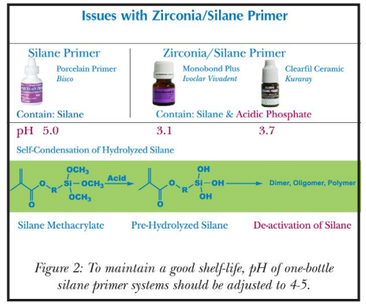

Figure 2: To maintain a good shelf-life, pH of one-bottle silane primer systems should be adjusted to 4-5.

Optimizing adhesive performance to Lithium Disilicate and glass-based porcelains, BISCO offers BIS-SILANE (2 bottle) or Porcelain Primer (1 bottle), specifically made to address glass substrates without the incorporation of phosphate monomers. Coupled with the use of BISCO's Porcelain Etchant (4% or 9.5% HF) the clinician can have confidence in predictable bonding to glass substrates (Figure 3).

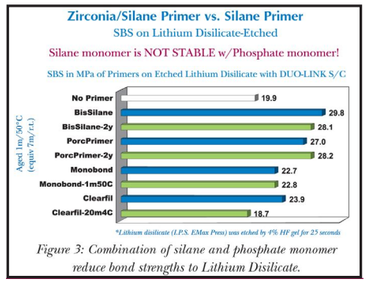

Figure 3: Combination of silane and phosphate monomer reduce bond strengths to Lithium Disilicate.

Adhesion to Zirconia Has Now Been Redefined

Through exhaustive research, BISCO has uncovered the formula that allows for cohesive adhesion to oxide-based materials (Figure 4).

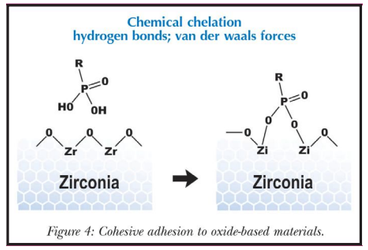

Figure 4: Cohesive adhesion to oxide-based materials.

Research supports the fact that MDP phosphate monomers contribute to long-term durable bonding to zirconia, while silane does not contribute to zirconia (oxide) adhesion. BISCO, in a proprietary formula, combined both phosphate and carboxylic monomers to create a stable, adhesive formula. Silane was not incorporated, which allows for greater concentrations of phosphate monomer that research shows promotes zirconia adhesion and provides stability in the formula. The proprietary combination of two proven adhesive monomers results in a "first of its kind" primer (Z-PRIME Plus) for adhesion to zirconia, alumina and metal (Figure 5). In addition, the co-monomers enhance the effectiveness of competitor cements over own primers! (Figure 6).

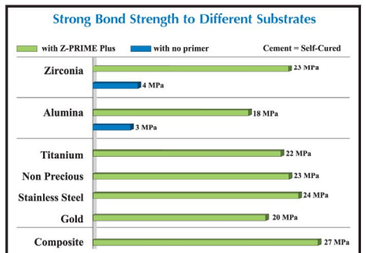

Figure 5: Z-PRIME Plus significantly increases adhesion to zirconia, alumina and metal.

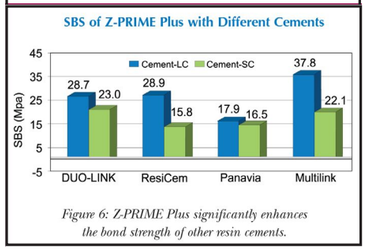

Figure 6: Z-PRIME Plus significantly enhances the bond strength of other resin cements.

DUO-LINK with "Catalyst Activated Technology"

The weakest link in cementation of indirect substrates should not be the luting cement. With Z-PRIME Plus, hydrophobic resin cements (such as DUO-LINK) can be used. The traditional use of weaker self-adhesive cements (including glass ionomers) can now be improved. Additionally, a dual-cured cement is preferred over a light-cured only cement, removing the potential for limited light transmission through opaque zirconia, alumina and metal copings. However it is important to note that all dual-cured cements are not created equal. Finding a dual-cured cement that performs equally well in both light-cured and self-cured modes, is not affected by aging, and has an appropriate (and accurate) setting time can be a challenge. Resin cements that fully polymerize in the self-cured mode within six minutes allows for interproximal flossing, whereas one that sets in 10 to 12 minutes requires careful and appropriate measures not to interfere with the bonding we are trying to create.

Optimizing Adhesive Performance to Zirconia, Alumina and Metal Oxides

The ideal protocol for luting a zirconia, alumina or metal crown in conservative or non-retentive conditions: (see Figures 7 & 8)

1. Treat the dentin and enamel surface with a bonding agent (ALL-BOND 3 or ALL-BOND SE)
2. Treat the zirconia, alumina or metal internal surface with Z-PRIME Plus
3. Apply hydrophobic resin cement (DUO-LINK)

(Continued on Page 4)