Kerr | Bonding Agent / **OptiBond XTR**

Technical Bulletin

OptiBond XTR

OptiBond™ XTR is a two-component self-etch, filled, fluoride releasing, light-cure bonding agent designed for the universal bonding of direct and indirect restorations. The OptiBond XTR Self-Etching Primer was intelligently developed to boost enamel etching and enhance dentin penetration. Along with the combination of our *GPDM* monomer and *Ternary Solvent System*, OptiBond XTR Self-Etching Primer provides the anchor for exceptional bond performance.

The optimized chemistry of the OptiBond XTR Adhesive provides efficient polymerization, balanced chemistry, and increased hydrophobicity. These attributes enhance mechanical strength and compatibility with *any* composite resin, resin cement, or core build-up material. Together the primer and adhesive form a strong, durable adhesive layer with excellent dentinal sealing to further reduce post-operative sensitivity and ensure patient comfort.

Features and Benefits

Feature	Benefit
GPDM Monomer	Provides high-density cross linking to reinforce bonds Provides chemical and mechanical adhesion
Ternary Solvent System	Enhances self-etch and penetration of primer for the highest bond strengths Enhances material stability
No acid etch required	Simplifies and creates a consistent bond regimen for the doctor Provides extra degree of assurance around the enamel margin
Self-Etch	Minimizes the potential for sensitivity for a better post-operative experience
Effective penetration and sealing into dentin	Improves retention Reduces microleakage and sensitivity
Highest bond strength to dentin and enamel	Maximizes retention of restorations, enhances marginal integrity, reduces microleakage, and sensitivity
Universal compatibility with all dental materials	Provides reliable bonding efficacy to all surfaces while using a simplified bonding regimen
Direct and indirect indications	No need to stock multiple bonding agents Consistent technique, less confusion
15% filled and fluoride releasing	Increases strength and reduces stress to enhance bond durability Prevention of secondary caries

Advanced Chemistries for Improved Performance

Enhanced self-etching primer

Self-etch bonding agents are mildly or weakly acidic. Therefore, they are incapable of effectively etching enamel. This may compromise bond strengths and result in marginal staining or veneer debonding.

OptiBond™ XTR solves that problem by employing Kerr's proprietary Ternary Solvent System. This unique system—comprised of water, acetone, and ethyl alcohol—advances the OptiBond XTR Primer's mechanism of action (MOA) to dramatically improve enamel etching. Moreover, its hydrophilic nature allows for circulation throughout the dentinal tissue after treatment—it is not rinsed away. Therefore, the collagen network remains fully supported instead of collapsing, allowing excellent penetration of the adhesive while minimizing post-operative sensitivity.

Application of Primer to enamel or dentin

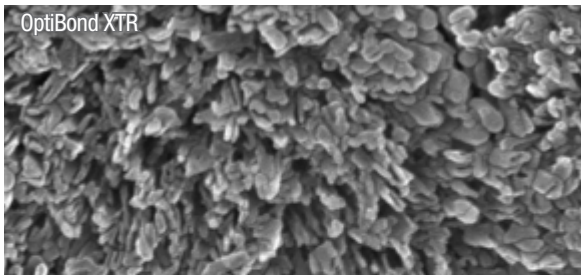
Hydrophilic nature and enhanced wetting of primer allows for enhanced penetration into dentin

Acetone rapidly evaporates, concentrating GPDM and water, increasing acidity and thus etching

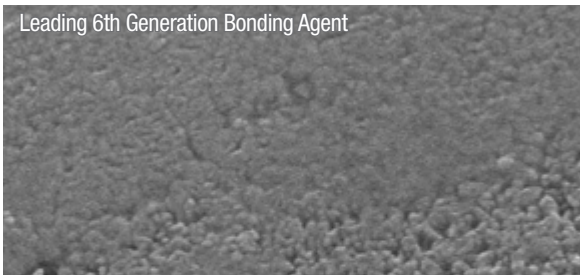
Promotes effective penetration, priming, and sealing of dentin

Promotes effective etching of enamel

Superior Etch to Uncut Enamel vs. Leading 6th Generation Bonding Agent



Magnification at 50,000x. Kerr R&D.

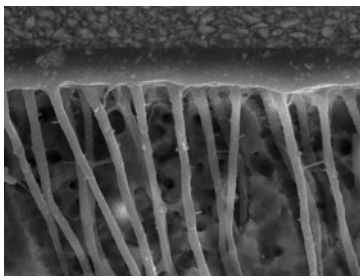


Magnification at 50,000x. Kerr R&D.

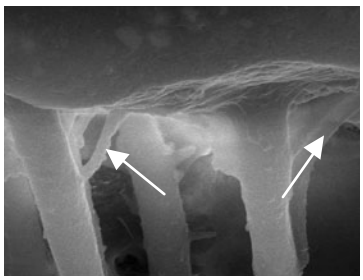
Optimized adhesive

Efficient polymerization of the OptiBond XTR Adhesive allows for the production of dense cross-linking of resin polymers, creating a strong and well defined adhesive layer as well as hybrid layer. The SEM photograph below shows the composite, adhesive, and dentin bonding interfaces. Excellent monomer penetration into dentinal tubules is well defined, with very long resin tags. Higher magnification shows vigorous penetration into the lateral tubules as well as a uniform hybrid layer.

This yields high bond strength, provides a durable bond between the adhesive and dentin substrates, and effectively protects against microleakage and sensitivity.



XTR creates clear, long resin tags with penetration into lateral dentin tubule branches (2,000x).

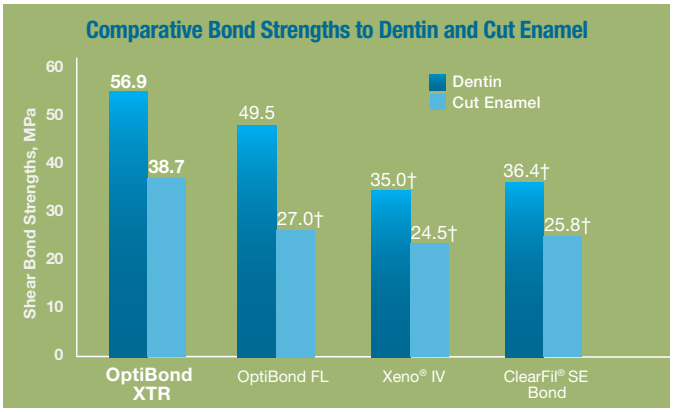


XTR penetration into lateral tubules (10,000x).

Exceptional Bond Strengths

Comparative internal testing showed higher uncut enamel and dentin bond strengths were achieved with OptiBond XTR vs. leading adhesives. To verify bond performance, OptiBond XTR was tested independently at Dental Biomaterials Research Laboratory, State University of New York at Buffalo.

In the study performed at the Dental Biomaterials Research Laboratory, OptiBond XTR demonstrated statistically superior dentin bond strengths vs. ClearFil SE Bond and Xeno IV. On cut enamel, OptiBond XTR demonstrated statistically superior enamel bond strengths to ClearFil SE Bond, Xeno IV, and OptiBond FL®.



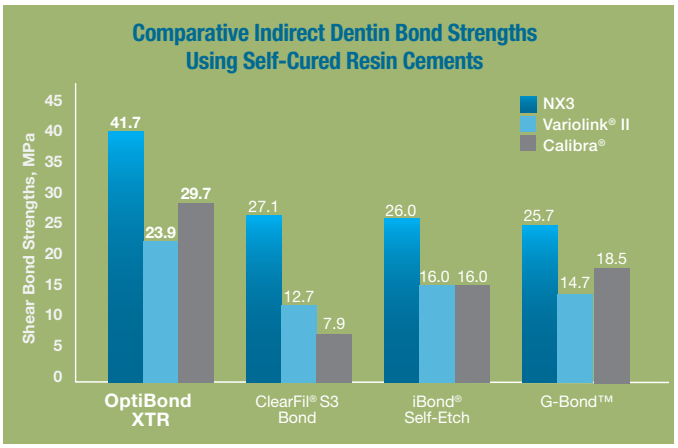
Dental Biomaterials Research Laboratory, State University of New York at Buffalo.
† Indicates statistically significant differences as compared to OptiBond XTR.

Universal Applications

Compatibility with all self-/dual-cured resin cements and composites

The acidic nature of simplified adhesives (5th- and 7th-generations) can react with the basic catalyst components of chemically or dual-cured composites, resulting in significant loss of bond strengths. With OptiBond XTR, the adhesive layer contains balanced (neutral) chemistry. Therefore, OptiBond XTR can be used with all self-cured or dual cured resin cements, composites, and core build-up materials.

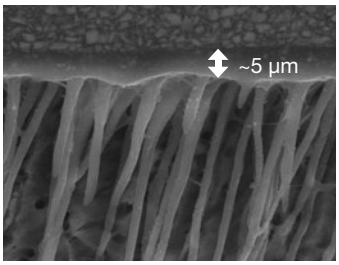
Since composite resins are hydrophobic (resistant to water), it is important for the adhesive layer to maintain a hydrophobic nature to maximize compatibility and sealing between the adhesive and composite interface. The OptiBond XTR Adhesive is highly hydrophobic, thus providing the ideal interface with composite resin material—for better sealing, improved bond durability, and maximum compatibility versus less-hydrophobic adhesives. Thus, OptiBond XTR can be used for both direct and indirect restorative procedures.



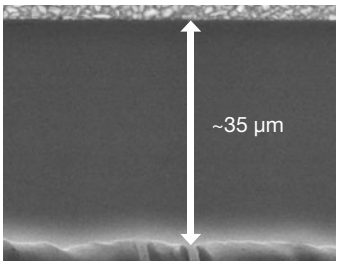
Indirect Dentin Bond Strength of 7th Generation Adhesive (with Self-Cured Calibra, Variolink, and NX3 Resin Cement). All bonding Agents were light-cured. Cements were allowed to self-cure. 24-hour testing conducted by Kerr R&D. Data available upon request.

Reduced film thickness

Low film thickness (~5-10 microns) and universal compatibility makes OptiBond XTR well-suited for indirect restorations since it will not interfere with final seating and the chemical/self-curing of resin cements and core materials.



OptiBond XTR
Magnification at 2,000x. Kerr R&D.



Leading 6th Generation Bonding Agent
Magnification at 2,000x. Kerr R&D.

Key Differentiators

OptiBond XTR embodies attributes that are missing from the leading 6th-generation bonding agent—attributes that are necessary to maximize results and provide an exceptional post-operative experience for the patient.

Attribute	OptiBond XTR	vs.	ClearFil® SE Bond
Unidose® Packaging	Yes		No
Fluoride Release	Yes		No
Filler Load	15%		10%
Universal Use/Direct & Indirect	Yes		No
Bond Strengths to Uncut-Enamel*	31.8		20.3
Film Thickness	~5-10 microns		~35 microns

*Testing conducted by Kerr R&D. Data available upon request.

OptiBond XTR Material Composition

Primer

Monomers

Glycerol phosphate dimethacrylate (GPDM) self-etching adhesive monomer

Hydrophilic co-monomers including mono and di-functional methacrylate monomers

Solvents

Water, acetone, ethyl alcohol

Photoinitiator

Camphorquinone (CQ)-based

Adhesive

Monomers

Hydrophobic, structural, and cross-linking monomers

Solvents

Ethyl alcohol

Photoinitiator

Camphorquinone (CQ)-based

Fillers

0.4-micron barium glass
Nano-silica

Fluoride

Sodium hexafluorosilicate

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