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SoloCem® Universal and ONE COAT 7 UNIVERSAL Bond Strength Compatibility

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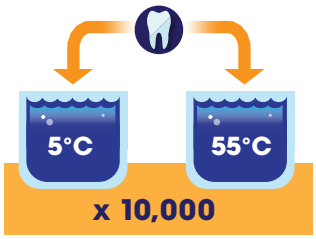
A current trend in dental materials is a new class of Universal Resin Cements with the ability to either be adhesively luted with bonding agents or used as a self adhesive cement without the need of a bonding agent.

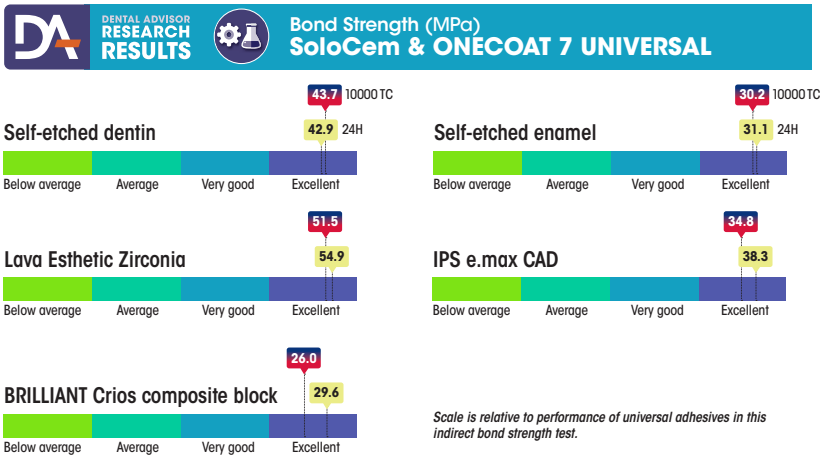
Universal Cement systems which are both self-adhesive and compatible with adhesives have the advantage of reducing the inventory of resin cements. They allow for a clinical choice of enhancing adhesion with an additional bonding agent for less retentive preparations. In cases of higher mechanical retention, the cement can be used alone where the extra strength of a bonding agent to tooth structure isn't necessary.

Generally, the use of a separate adhesive can give increased resin cement bond strength to dentin by forming a more extensive bridge including inside dentin tubules and higher bond strength to etched ceramics by more effectively filling the undercuts of crystal structures. The liquid of the adhesive which contains less of the inorganic fillers needed for cement strength will provide a more intimate fit to the bonding surfaces.

THERMOCYCLING



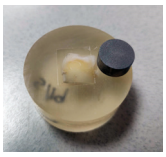
In this study, we tested the compatibility of ***SoloCem*** from Coltene which was previously indicated for self-adhesive use without additional adhesives with ***ONE COAT 7 UNIVERSAL*** for use together in their new universal cement system. As the main goal of this study was to illuminate any areas of incompatibility with the systems, we tested the worst-case scenario of these material combinations by testing with chemical curing only, and with extensive artificial aging with 10,000 thermocycles to five different bonding substrates. Thermocycling is a common durability test in adhesive and mechanical testing which transfers the materials from 5°C to 55°C for just long enough to change temperature before going back. This shrinks and expands the materials creating mechanical stress, while exposing the bonding



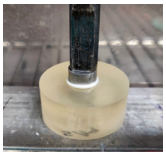
Previously, some of these self-adhesive cements with adhesive monomers and with a pH low enough to effectively etch enamel have been shown to be incompatible with some separate adhesives, so it is important to test each combination to ensure success. Many clinicians may not realize that mixing and matching products can have adverse effects on bond strength.

Self-etched dentin and enamel results show no significant drop in bond strength after thermocycling, indicating both great bond durability and compatibility with this system. The bond strength values for this test to dentin and enamel are within the 90+ percentile for universal adhesive systems.

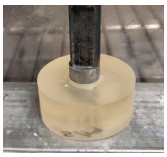
interface to hydrolytic degradation (water molecules react with the polymer chain which break resulting in smaller chains) for about 2 weeks which approximately simulates a year of clinical aging in-vivo. We also tested the materials after 24 hours to generate a baseline to assess any changes in bond strength and to determine if there were any differences in how the material fails after aging. In some cases, cements can debond completely after a thermocycling trial, and a 20+% drop in bond strength is common.



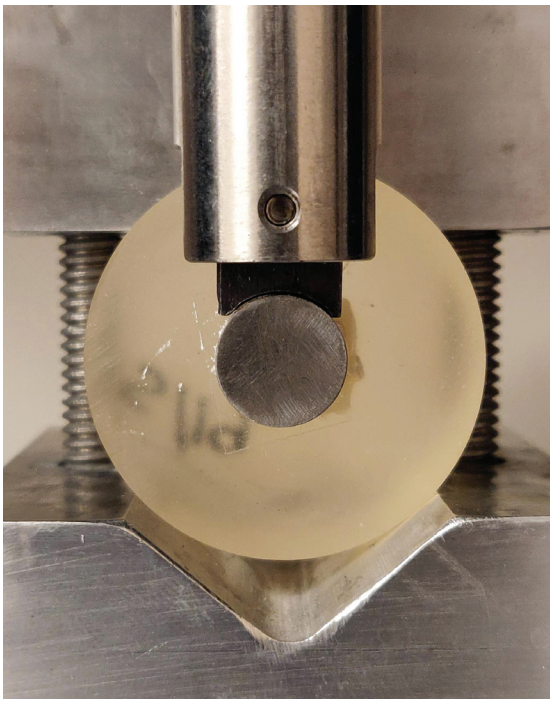
After surface treatment, tape with 3 mm hole is applied, and cement is applied to disc and placed over the hole.



Disc is loaded with 1 kg load.



Cement is removed under load before continuing to cure in ~99% R.H. chamber for 10 minutes before testing or placed in water.



Shear bond test is conducted with 1 mm/min crosshead speed using an Instron model 5866.

SUBSTRATE TESTING

BRILLIANT Crios from Coltene is a reinforced composite block and the surface was prepared with sandblasting with 50-micron aluminum oxide particles at 30 psi. **The bond strength to the composite block was among the best recorded for bonding to composite blocks with very little drop after thermocycling.** Bond strength values for composite blocks will vary depending on the block as they tend to start fracturing in the block at around 30 MPa in this test, and based on the composition of the block, a silane primer may be beneficial based on the filler glass content. There were small subsurface cracks at the bonding interface which may indicate this bond strength was near the maximum possible for this indirect composite material.

Lava Esthetic from 3M Oral Care was the zirconia material tested which was prepared with sandblasting at 50 psi before bonding. With over 50 MPa bond strength and no significant drop after accelerated aging, ***ONE COAT 7 UNIVERSAL*** was able to prime this zirconia material as well as dedicated ceramic primers.

IPS e.max CAD from Ivoclar was used to test the glass ceramic class of materials and was etched with 5% HF etching gel for 20 seconds. The bond strength results were very good for a universal adhesive which are typically in the 25-35 MPa range, with only a small drop after thermocycling.

*Overall the combination of **SoloCem** and **ONE COAT 7 UNIVERSAL** provides a strong and durable bonding to a variety of common substrates. No bond incompatibility was detected and results are consistent with a high bond strength in the self-cured adhesive cement mode. There was no consequential drop in bond strength after thermocycling or change in failure mode for any substrate indicating a high bond durability.*