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Biomaterials Research Report
DENTAL ADVISOR Biomaterials Research Center
Ann Arbor, MI 48104

Number 168 – August 2024

Laboratory Evaluation of BeautiLink SA Cement

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Introduction:

BeautiLink SA (SHOFU) is a new self-adhesive cement indicated for cementation for all ceramic, composite, metal and post restorations; with or without a separate universal adhesive (***BeautiBond Xtreme***, SHOFU) for increased adhesion. ***BeautiLink SA*** is among the few self-adhesive cements on the market which includes a silane in the cement for enhanced adhesion to glass ceramics. This study tested the bond strength of four cements in the self-cure mode to zirconia and glass ceramic, while the glass ceramic IPS e.max Press was tested with an additional ceramic primer as well as in the self-adhesive mode without an additional primer.

Conclusion:

BeautiLink SA has exemplary performance in bonding to zirconia without a primer, and to glass ceramics in combination with ***BeautiBond Xtreme***.

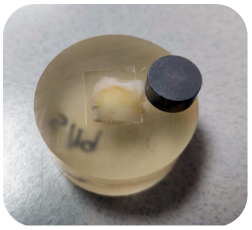
Materials:

- ***BeautiLink SA***, ***BeautiBond Xtreme*** (SHOFU)
- ***3M™ RelyX™ Universal***, ***3M Scotchbond™ Universal Plus*** (3M Oral Care)
- ***Maxcem Elite™***, ***Optibond™ Universal*** (Kerr)
- ***SpeedCEM® Plus***, ***Monobond® Plus*** (Ivoclar)

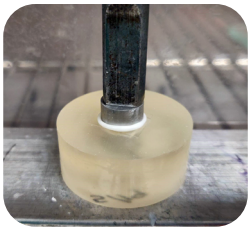
Test Groups: ***SHOFU Disk ZR Lucent Supra*** zirconia in Self-adhesive Mode, ***IPS e.max Press*** in Adhesive and Self-adhesive Mode
Storage Conditions: 24 hours, 5,000 thermocycles
Curing Mode: Self-cure

Methods:

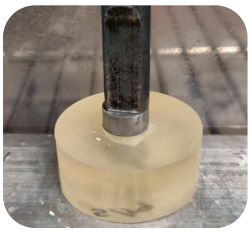
Indirect Shear Bond Strength: Zirconia plates were cut to be ~12 mm x 12 mm x 2-3 mm thick, processed according to manufacturer instructions, embedded in acrylic resin discs, finished through 600 grit diamond paper, and surfaces treated. The surface treatment was 5% hydrofluoric acid for at least 20 seconds to ***IPS e.max Press*** and sandblasting with 3 bar (0.3 MPa) pressure and 50 µm particles to Zirconia. Test groups for ***IPS e.max Press*** additionally had their surfaces treated for adhesive bonding mode. Specimens were prepared in which single-sided adhesive PTFE tape, ~0.10 mm thick, with an approximately 3 mm diameter hole was placed over the bonding site and burnished into place. A 10 mm diameter metal cylinder was ground with 60 grit SiC Paper, sandblasted and primed to simulate an indirect restoration which should have a higher bond strength than the substrate being tested. A dab of the cement was placed in the center of the hole of the tape and the cylinder gently applied concentric with the hole with finger pressure before being placed in a loading jig where a 1 kg weight was applied at room temperature. The excess cement was removed by microbrush without light and the load was removed then moved to a 37°C, 100% R.H. oven carefully and dwelled for 10 minutes. They were then transferred to a container with 37 °C water for 24 hours prior to shear testing. Additional test groups were tested after 5,000 thermocycles. Thermocycling consisted of 20s immersion in 5 and 55°C deionized water for 5,000 cycles which represents about 6 months of aging. The shear bond strength test was performed on a universal testing machine (Instron model 5866) at a crosshead speed of 1 mm/min. Means and standard deviations were calculated, data was analyzed by ANOVA and Tukey multiple comparison test for pair-wise comparison at a p-value of 0.05. Graphs are depicted with means and standard deviations.



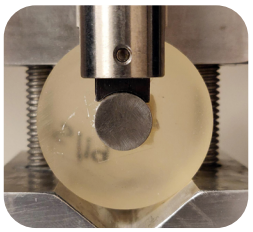
After surface treatment, tape with 3 mm hole is applied, and cement is applied to disc and placed over the hole.



Disc is loaded with 1 kg load.

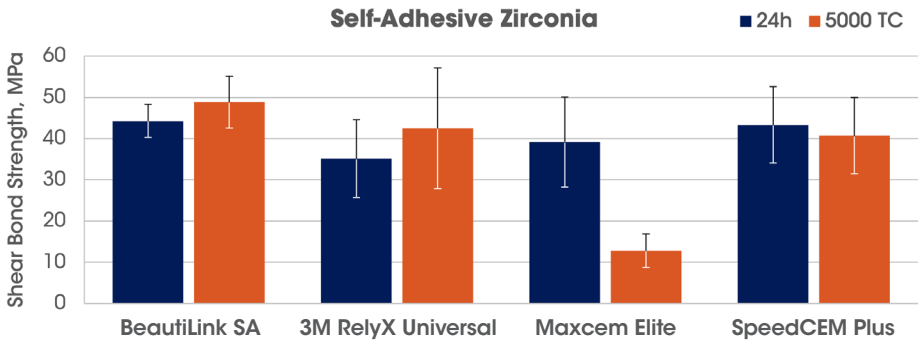


Cement is removed under load before continuing to cure in ~99% R.H. chamber for 10 minutes before testing or placed in water.



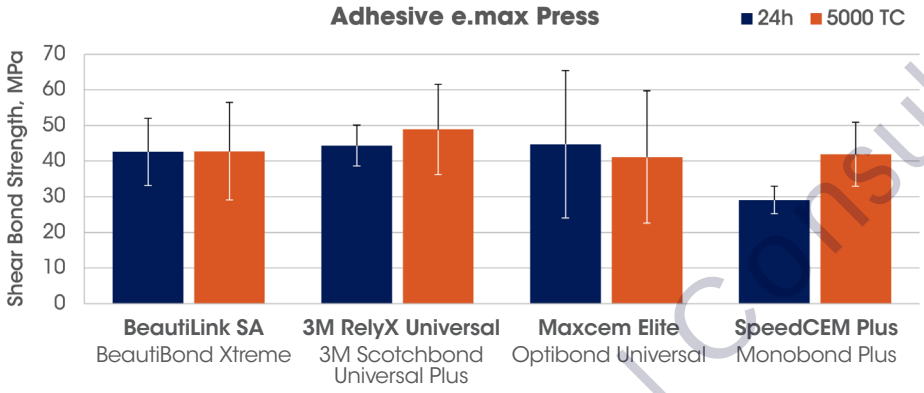
Shear bond test is conducted with 1 mm/min crosshead speed using an Instron model 5866.

Results Summary:



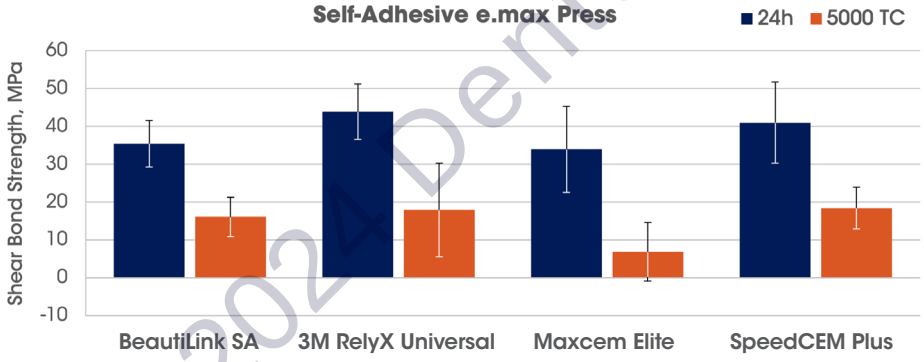
Self-Adhesive Zirconia:

BeautiLink SA had the most consistent bond strength to zirconia at 24 hours and after thermocycling among the cements tested. The failure mode for ***BeautiLink SA*** was primarily mixed or cohesive meaning that the cement fractured before debonding indicating that the adhesive strength at the interface may be even higher than the values tested.



Adhesive *IPS e.max Press*:

All cement and primer combinations provided excellent bond strength to the glass ceramic ***IPS e.max Press***.



Self-Adhesive *IPS e.max Press*:

There were no significant differences after 24 hours in bond strength between the self-adhesive groups as the micromechanical retention contributes significantly to hydrofluoric etched glass ceramic. After thermocycling accelerated aging, all groups showed reduced bond strength, however, ***BeautiLink SA*** had no spontaneous debonds during aging.

Research supported by SHOFU Dental Corporation.