

## Bond Strength of CLEARFIL Universal Bond

**Purpose:** To determine the bond strength for *CLEARFIL Universal Bond* (Kuraray Noritake Dental Inc.) on tooth structure and ceramic substrates.

### Methods and Materials

The Ultradent shear bond strength test (n=5 per substrate) was performed on human, adult superficial dentin, human ground enamel, zirconia (*Lava Zirconia*, 3M ESPE) and lithium disilicate (*IPS e.max CAD*, Ivoclar Vivadent, Inc.). Human, adult, extracted third molars, previously stored in sodium azide solution, then in saline and then in water, were embedded in acrylic resin discs and ground through 600-grit SiC paper to form bonding substrates of ground enamel and superficial dentin. Enamel and dentin substrates were etched using *K-ETCHANT syringe* (Kuraray Noritake Dental Inc.). 12 x 13 x 3 mm coupons of zirconia were ground flat and smooth through 600-grit SiC paper, sintered, and sandblasted with aluminum oxide (50 µm particles). Lithium disilicate specimens were etched with IPS Ceramic Etching Gel (Ivoclar Vivadent, Inc.) per manufacturer's instructions. All substrates had *CLEARFIL Universal Bond* (Kuraray Noritake Dental Inc.) bonding agent applied, per manufacturer's instructions. The dentin and enamel specimens were prepared by applying and light curing *TPH Spectra* (DENTSPLY Caulk) composite on top of the bonding agent utilizing the *Ultradent* shear test mold. The specimens were stored in 37° C water for 24 h prior to shear bond strength testing. Bond strength to the zirconia and lithium disilicate substrates was tested using the indirect technique wherein single-sided adhesive Teflon tape, 0.13 mm thick, with an approximately 3 mm diameter hole was applied over the previously prepared bonding site. A small dab of *PANAVIA SA Cement Plus* (Kuraray Noritake Dental Inc.) cement was placed in the hole in the tape. A stainless steel, 8 mm diameter by 2 mm thick disc, treated with *Monobond Plus* (Ivoclar Vivadent, Inc.) was then placed on top of the cement and a bead of *Liquid Lens* (Danville Materials) oxygen barrier gel was applied around the perimeter of the disc at the substrate interface. The cement was self-cured under a load of 500 g at 37° C. During self-curing, the specimens were covered with warm damp towels. After 10-minutes the specimens were moved to a beaker with 37° C water for 24 h prior to testing. Testing was performed using a universal testing machine (Instron 5866) at a crosshead speed of 1 mm/min. Means and standard deviations of bond strengths were calculated.



### Results

Shear Bond Strength of *CLEARFIL Universal Bond* to Different Substrates

Substrate	Shear Bond Strength, MPa (SD)	Failure Mode from Substrate*	
		Adhesive, %	Cohesive, %
Lava Zirconia	46.8 (5.6)	100	0
IPS e.max CAD	47.2 (3.2)	100	0
Dentin	39.4 (3.9)	82	0
Enamel	33.0 (5.0)	100	0

\*Adhesive + Cohesive Failure % must add to 100%. If not, the missing '%' refers to adhesive failure between the stainless steel disc and the cement.

### Conclusion

The shear bond strengths of *CLEARFIL Universal Bond* to substrates of human enamel and dentin, lithium disilicate and zirconia were excellent.