

## Shear Bond Strength, Color Stability and Stain Resistance of Ventura Nanolux Composite

**Purpose:** The purpose of this project was to determine the shear bond strength, color stability and stain resistance of a composite which may be imported into the U.S.

### Experimental Design

#### Materials:

Composite: *Ventura Nanolux* (Madespa S.A.) Lot # 1155-17457

Bonding agent: *Ventura Unibond 2* (Madespa S.A.) Lot # 1815-17537

Substrate: ground superficial dentin

**Tests/Replications:** Ultradent Shear Bond Strength/ n=8, Color Stability and Stain Resistance/n=5

**Shear Bond Strength Conditions:** 24 h in 37 C water, and thermo-cycled between 5 and 55 C for 5000 cycles

### Methods

#### Ultradent Shear Bond Strength:

Adult human extracted third molars, previously stored in sodium azide solution, then in saline and then in water, were embedded in resin and abraded on the facial surface with 600-grit SiC paper to form bonding substrate specimens of superficial dentin. The bonding agent was applied to the dentin surface according to the manufacturer's instructions. Each prepared specimen was then mounted into the Ultradent jig where the composite was applied to the bonding agent prepared dentin surface using the Ultradent Teflon mold part of the jig to form the shear cylinder. The composite was light cured for 20 seconds using a *Demi* LED curing light (Kerr Corp.). Specimens were stored in water at 37 C for 24 h for the un-cycled specimens and then debonded in shear on a universal testing machine (Model 5866, Instron) at a crosshead speed of 0.5 mm/min. The "thermocycled" (TC) specimens were cycled from 5 to 55 C with a 23 second dwell time for 5000 cycles and then were similarly shear tested on the universal testing machine. Means and standard deviations of the bond strength were calculated.

#### Color Stability and Stain Resistance:

Composite specimens 10 mm diameter × 1 mm thick plus or minus 0.1 mm were fabricated using Delrin molds. Specimens were light polymerized between glass-backed Mylar sheets using a Demi curing light and then were submerged in 37 C water for 24 h. Specimens were ground to their final thickness using 600 grit SiC paper. Color was measured using a bench-top spectrophotometer (Color-Eye 7000, X-Rite, Grand Rapids, MI), at baseline (after 24 h in distilled water) and after exposure to following various experimental conditions as follows:

(a) Accelerated aging - 150 kJ/m<sup>2</sup>

(b) Coffee – specimens will be placed in small receptacles (50 ml) containing coffee for 3 days; coffee solution was replaced after each 24 h of immersion. The dependent variables –  $\Delta L^*$ ,  $\Delta a^*$ ,  $\Delta b^*$ ,  $\Delta E^*$  were measured. Means and standard deviations were determined.

## Results

### Shear Bond Strength:

Ultradent Shear Bond Strength to Dentin <i>Ventura Nanolux</i> composite, <i>Ventura Unibond 2</i> adhesive		
Test Condition	Bond Strength, MPa (SD)	Adhesion Failure, %
24 H	24.3 (4.4)	78
5000 TC	23.3 (9.7)	68

### Color Stability and Stain Resistance:

The means of color differences ( $\Delta L^*$ ,  $\Delta a^*$ ,  $\Delta b^*$ , and  $\Delta E^*$ ) for different comparisons are listed in the table below. Standard deviations are in the parentheses.

Comparison	$\Delta L^*$	$\Delta a^*$	$\Delta b^*$	$\Delta E^*$
Post H <sub>2</sub> O – coffee	-1.1 (0.3)	0.0 (0.1)	2.0 (0.3)	2.3 (0.2)
Post H <sub>2</sub> O – aging	0.3 (0.5)	-0.2 (0.2)	1.0 (0.9)	1.8 (0.8)

*Note: A  $\Delta E^*$  of 3.5 is equivalent to the 50:50% acceptability threshold and is representative of an acceptable color change.*

## Conclusions

The shear bond strength for the combination of *Ventura Nanolux* composite and *Ventura Unibond 2* bonding agent is acceptable for both 24 h and thermocycle tests.

The *Ventura Nanolux* exhibited better color stability upon artificial aging than upon immersion in coffee. However, recorded color differences were below the 50:50% acceptability threshold thus reflecting good color stability.

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