

Laboratory Evaluation of BRILLIANT EverGlow®

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Purpose:

To evaluate the **BRILLIANT EverGlow®** composite system for strength, radiopacity, interface compatibility and flowability of **BRILLIANT EverGlow® Flow**.

Results Summary:

BRILLIANT EverGlow and **BRILLIANT EverGlow Flow** show remarkably similar mechanical properties of ultimate flexural strength and compressive strength as well as similar radiopacity. The compressive strength in particular is within the top 10 percentile for composites, and the radiopacity is in an ideal range to distinguish the composites from dental tissue. The MicroCT evaluation showed exemplary interface compatibility between **BRILLIANT EverGlow** and **BRILLIANT EverGlow Flow** and good marginal adaptation of **BRILLIANT EverGlow Flow** to the cavity walls. The flow characteristics of **BRILLIANT EverGlow Flow** resist slumping to allow precise placement with enough flowability to adapt to small crevices. Overall, the combination of **BRILLIANT EverGlow** and **BRILLIANT EverGlow Flow** appears to be a very physically compatible and well-designed composite system.

Experimental Design:

MATERIALS:

Composite: **Brilliant EverGlow** [lot: K34464 shade A1] and **BRILLIANT EverGlow Flow** [lot: K01698 shade A1] (Coltene)

Adhesive: **ONE COAT 7 UNIVERSAL** (Coltene)

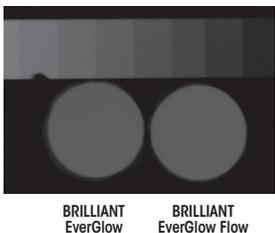
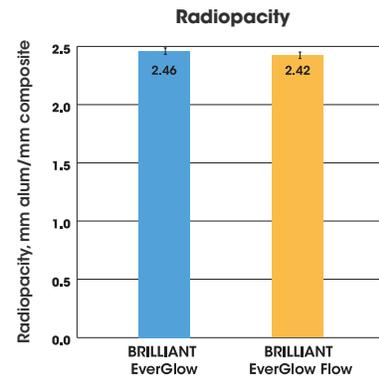
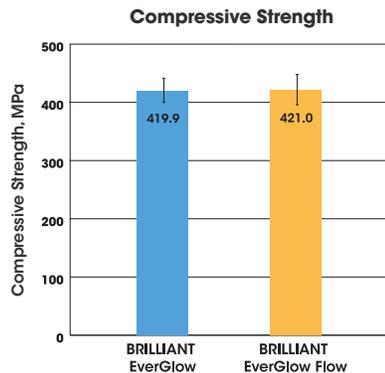
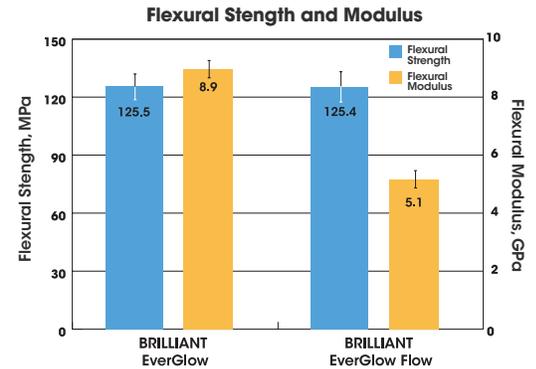
TESTS:

Flexural strength and modulus, (n=10): 2 mm x 2 mm x 25 mm bar specimens were tested after each set of specimens had been stored in distilled water for 24 hours at 37 C according to ISO 4049:2019. They were tested using an Instron 5866 universal test machine with a 1 mm/min crosshead speed.

The flexural strength is well above the ISO 4049 requirement of 80 MPa for a composite restorative indicated for occlusal surfaces. The packable version of **BRILLIANT EverGlow** has a higher modulus of 8.9 GPa to resist occlusal impacts with less flexing, while the **BRILLIANT EverGlow Flow** has a lower modulus for higher energy absorption typical for flowable composites.

Compressive Strength, n=10: 4 mm diameter x 8 mm cylinder specimens were made in a Teflon split mold, light cured for 40 seconds on each side and stored in distilled water for 24 hours at 37 C. They were tested using an Instron 5866 universal test machine with a 1 mm/min crosshead speed.

Both products exhibit a compressive strength on the high end of the spectrum found for composites cured intraorally [320-440 MPa]. They should be more than adequate to resist compressive forces in occlusion.



Radiopacity According to ISO 13116:2014, n=3: Composite specimens 1 mm thick and 10 mm diameter had digital x-rays (*Dexis Titanium*) taken alongside an aluminum step wedge and evaluated in an image analysis software using the histogram function to determine grey levels and measure and compare the radiopacity in units of mm of aluminum/mm of thickness for each material.

This is greater than the ISO 4049 requirement of 1.0 mm aluminum equivalent.

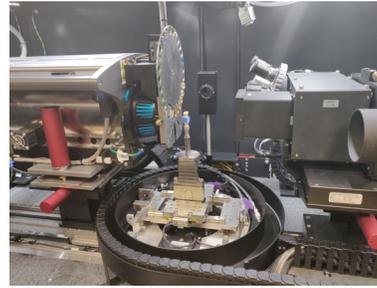
The radiopacity of dentin is roughly equivalent to 1 mm of aluminum, while enamel is equivalent to 2 mm. The radiopacity of **BRILLIANT EverGlow** is within an ideal range to be visually distinct from any tooth tissue.



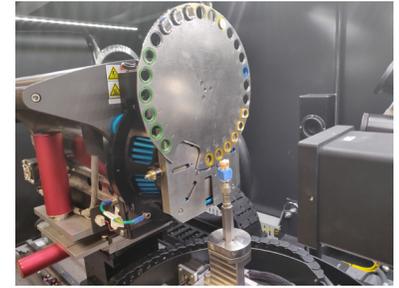
BRILLIANT EverGlow Flow during placement of Tooth#1



BRILLIANT EverGlow Flow after finishing and polishing

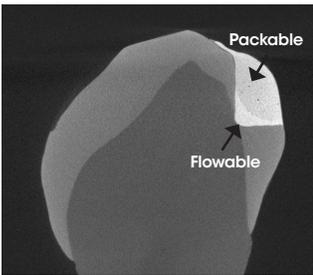


Zeiss Xradia Versa 520 3D X-ray Microscope

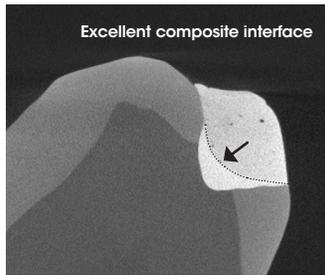


Zeiss Xradia Versa 520 3D X-ray Microscope

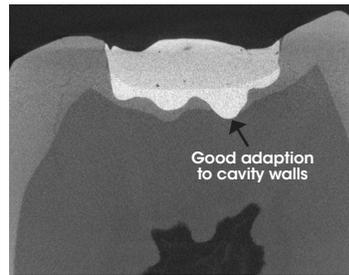
MicroCT Interface Evaluation: Three extracted molars, two which previously contained an amalgam filling and one carious molar were restored by a clinician, using **ONE COAT 7 UNIVERSAL**, **BRILLIANT EverGlow Flow** as a base/liner, and **BRILLIANT EverGlow** as a capping layer. The restorations were scanned using a Zeiss Xradia Versa 520 3D X-ray Microscope with a 1.4 um voxel resolution. The scans were qualitatively evaluated for how the composites worked together to adapt to cavity walls and provide smooth interfaces between the two composites.



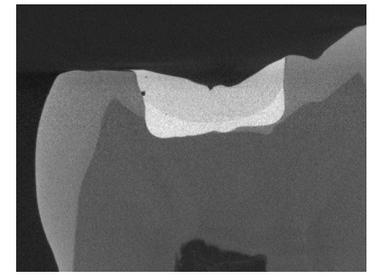
Packable
Flowable



Excellent composite interface



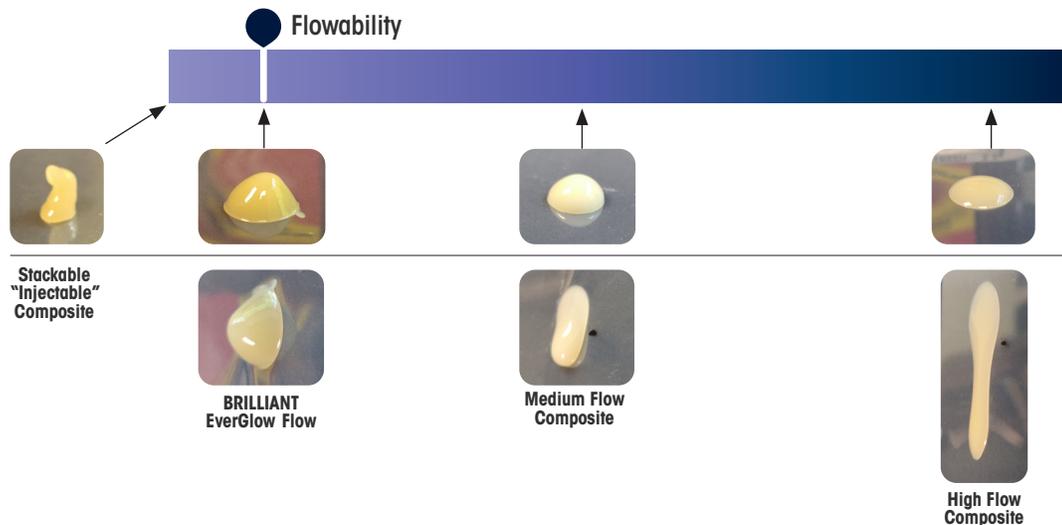
Good adaption to cavity walls



Integrity of Packable and Flowable Interfaces: No gaps were formed between the flowable and packable interfaces indicating a good ability of the packable composite to bond to the flowable composite. Having a strong bond between the composite interfaces which resists polymerization shrinkage allows maximum strength of the restoration by utilizing the lower modulus of the flowable to reduce stresses on the cavity walls while the packable composite resists occlusal stresses.

Adaptation to Cavity Walls: The adaptation of the composite restoratives to the prepared cavity walls was largely successful. This is a function of the rheological properties (ability to deform or flow under force/stress) of the composites for the restorations to have close adaptation to the shape of the prepared cavity, the composite to stick to the applied adhesive and resist polymerization shrinkage stresses. The **BRILLIANT EverGlow Flow** showed intimate contact with all walls and appears to have been successful in resisting polymerization shrinkage to maintain contact.

Flowability: **BRILLIANT EverGlow Flow** tends to stay in place where it is applied. It has high enough flowability to become round under its own weight (not stackable), but low enough flowability that when held vertical, it does not significantly move. The primary way in which it will fill crevices in cavity preps is from extrusion directly into the cavity preparation and allowing the rheological properties to spread the composite evenly across the cavity floor. Passing a probe tip through to material may allow more assurance that the composite adapts to all crevices and walls.



0.2 g of composite extruded vertically and allowed to pool for 30 seconds under light blocking shield.

Specimens from above picture were tilted 90 degrees (vertically) and allowed to flow for 60 seconds before light polymerization