

Venus Bulk Flow ONE

Flexural Strength

Prof. Dr. Nicoleta Ilie – LMU Munich, Germany

Mechanical behaviour of one-shade resin-based composite (RBC)

One of the recent trends in the development of resin-based composites focuses on ONE-shade composites to avoid time-consuming shade matching.

Aside from the time standpoint, one of the most important criteria, especially for posterior restorations, is the strength of composite materials and their ability to withstand mastication forces, as has been tested and published in previous studies. Since fractures are one of the reasons for restoration failure, the flexural strength of composite is an important indicator as to which extent the material is able to resist high forces.

To further ease the dentists work, Kulzer has developed Venus Bulk Flow ONE. It is a flowable bulk fill composite, suited for basic restorations. It can be applied in layers up to 4 mm, saving time by reducing the number of increments. Also its ONE shade technology allows for an aesthetic restoration, by adapting to the colour of the surrounding tooth.

The following in vitro study by Prof. Dr. Nicoleta Ilie compares the flexural strength and flexural modulus of Venus Bulk Flow ONE to other bulk fill materials.

Giving a hand to oral health.



KULZER
MITSUI CHEMICALS GROUP

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Objective

The study analyses different bulk-fill resin-based composites amongst others in terms of the flexural strength and flexural modulus at two different aging conditions.

Materials & Methods

The tested composites including their shades and recommended curing times are indicated in the table below.

Brand name	Type of composite	Manufacturer	Shade	Curing time
Venus Bulk Flow ONE	Bulk Fill Flowable	Kulzer	ONE	20 seconds
Tetric PowerFill	Bulk Fill pasty composite	Ivoclar Vivadent	IVA	10 seconds
Omnichroma	Pasty composite	Tokuyama	Universal	20 seconds

Flexural strength:

120 specimens (40 per product) of 2mm x 2mm x 18mm were prepared in following the recommendations of ISO 4049:2019 for the 3-point bending test. Moulds were filled with the uncured material, covered by a Mylar strip and pressed between two glass plates. The composites were light cured (LC) from the top and bottom using a blue LED (Bluephase® Style, Ivoclar Vivadent, Schaan, Liechtenstein). The light curing times of each composite followed the recommendations in the respective instruction for use (see table above).

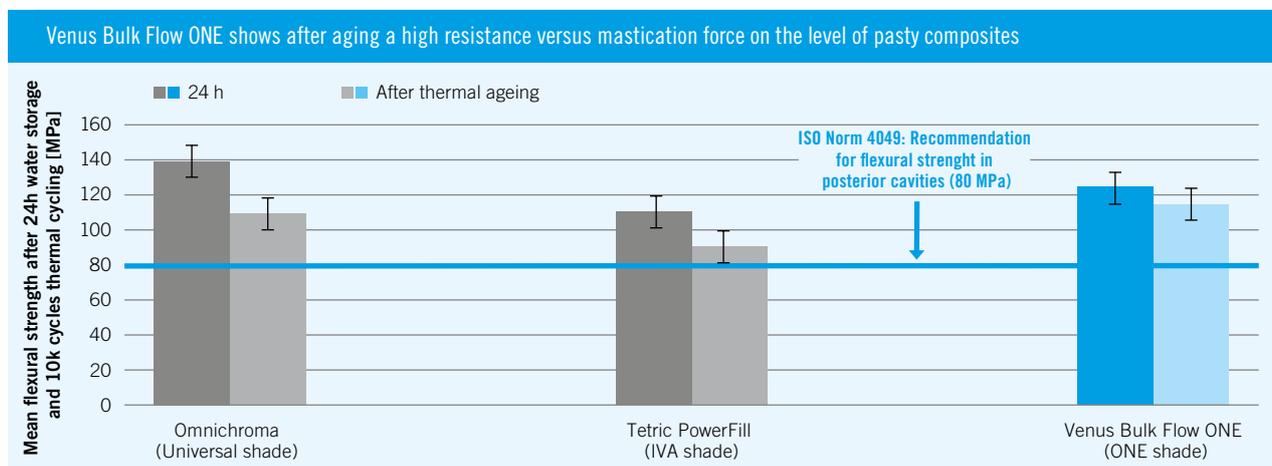
The specimens were removed from the mould and immediately placed in distilled water with a temperature of 37 °C. They were then stored in a dark environment for 24h. After the 24h, half of the samples of each material underwent a 3-point bending test, while the other half underwent additional thermal ageing (10,000 cycles between 5 °C and 55 °C, dwell time 30 seconds, transfer time 5 seconds) prior to testing.

A 3-point bending test according to NIST No. 4877 was used to establish the flexural strength and flexural modulus. The specimens were filled into a universal testing machine (Z 2.5 Zwick/Roell, Ulm, Germany) until fracture. The force during bending was measured as a function of beam deflection, while the slope of the linear part of this curve was used to calculate the flexural modulus.

For statistical analysis an ANOVA followed by Tukey HSD test was used ($p = 0.05$).

Results

Flexural strength:



Statistical analysis indicates a significant effect on the factors materials and ageing ($p < 0,001$). The influence of the material was stronger than the influence of ageing. Significant differences between the unaged groups were seen between all materials. Within the aged groups no significant differences were found between Omnichroma and Venus Bulk Flow ONE, whereas Tetric PowerFill demonstrated significantly lower flexural strength than the other materials. Tetric PowerFill had an e-modulus of 6.6 GPa after 24h and 6.0 GPa after ageing, whereas Omnichroma showed 5.4 GPa after 24h, respectively 5.1 GPa after ageing. Venus Bulk Flow ONE had an e-modulus of 3.9 GPa and 3.7 GPa after ageing.

Conclusion

Venus Bulk Flow ONE meets the ISO 4049 recommendation for flexural strength in posterior cavities also after accumulated thermal aging.

Comment

Venus Bulk Flow ONE exceeds the ISO 4049 recommendation for restoration materials suitable to restore occlusal posterior surfaces (minimum of 80 MPa) since these are the restorations which are subjected to the highest mastication force and possess therefore a higher risk for restorations fractures or chippings. This means that Venus Bulk Flow ONE is suitable to be used in restorations with occlusal surfaces without a capping layer, which contributes in saving time during the treatment. It is important to mark that the composites used for comparison were pasty, while Venus Bulk Flow ONE is a flowable composite. It is in particular suitable to be used in deep slot cavities where the incremental technique is difficult. The bulk& body technique with the usage of the flowable Venus Bulk Flow ONE as base covered with a pasty composite (e.g. Venus Diamond) can be an option if cusps or bigger functional occlusal surfaces need to be restored. To conclude, Venus Bulk Flow ONE supports the dentist efficiently in restoring basic posterior cavities.

Source

Ilie N, Moldovan M, Ionescu AC: Microstructure and mechanical behaviour of modern universal-chromatic and bulk-fill resin-based composites developed to simplify dental restorative procedures. Journal of Functional Biomaterials 13, 178, 2022: <https://doi.org/10.3390/jfb13040178>

The study was abbreviated and summarised and all diagrams and titles have been established by Kulzer.

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