## **SCIENTIFIC INFORMATION**

## X-tra Fil – Curing depth

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	Voco
	K-tra ft

With X-tra fil, VOCO offers a material that sets new standards in bulk restoratives through the possibility of placing 4 mm thick layers. The degree of curing depth and the involved physical properties were examined in a study.

The question of whether a filling composite can be applied in 1, 2 or 4 mm thick layers is a decisive criterion for the treatment time. It must be taken into consideration that not only placing a larger number of layers means more time, but especially lightcuring each individual layer also constitutes a large portion of the treatment time. X-tra fil has the ability to reduce the treatment time to a minimum through the option of placing 4 mm thick layers. The time-saving application must, of course, not be at the expense of insufficient polymerisation, since this would lead to reduced stability, increased water absorption, discolouration and other problems.

## Examination of the degree of polymerisation

At the University of Dublin, Fleming et al. investigated the degree of polymerisation in deep layers through the determination of factors: water absorption, transverse strength, Vickers hardness and toxicity.<sup>[1]</sup> A 2 mm thick specimen of Filtek Z250 (3M-ESPE) as well as a 4 mm thick specimen of X-tra fil were prepared according to the manufacturer's instructions for these tests. The X-tra fil specimen was subsequently divided into three parts; each respectively separated into a 1 mm wide specimen on the surface and bottom. It could thus be observed whether the specimen that was cured through 3 mm composite possessed the same properties as the portion of the restorative that was directly exposed.







## SCIENTIFIC INFORMATION

It can clearly be seen from the water absorption graphics, that there is practically no difference in the water absorption in the upper and lower segments of X-tra fil. Even the test specimen cured through the 3 mm composite exhibited a significantly lower amount of water absorption than Filtek Z250, the comparison product. The water solubility was likewise examined; both X-tra fil specimens exhibited a solubility that was less than 3  $\mu$ g/mm<sup>3</sup> after 25 weeks of storage in water, whereas the Filtek Z250 specimen exhibited a solubility of 8  $\mu$ g/mm<sup>3</sup> after this time period. A similar picture resulted from the comparison of the transverse strength (the 4 mm thick raw specimen was halved) and surface hardness parameters. Moreover, the material cured through the composite did not display a meaningful difference to the surface specimen here and even exhibited better values in direct comparison to the competitor's preparation.





**Figure 2:** Properties after storage in darkness for 24 h in distilled water at 37° C (left: Surface hardness according to Vickers, right: biaxial transverse strength)

No differences whatsoever were determined between X-tra fil and Filtek Z250 in the cytotoxicity test; the study certified that both materials have the biocompatibility of a normal resin-based composite.

Conclusion: X-tra fil can be cured in 4 mm layers without losing stability. X-tra fil exhibits very low water absorption as well as high transverse strength and hardness. Furthermore, the properties of the lowest layer of its increments are even superior to the properties of the surface of the comparison product.

[1] G. J. P. Fleming, M. Awan, P. R. Cooper, A. J. Sloan, Dent. Mater. 2008, 24, 522-529.

