

REFLECTYS

UNIVERSAL RESTORATIVE COMPOSITE

WHITE PAPER



Product description

Reflectys is a universal light-cured microhybrid composite with integrated nano fillers.

Main composition	Action
Barium aluminosilicate	Filler / radiopacity
Fumed silica	Filler
Bis-GMA	Resin matrix
TGMA	Resin matrix
Others	

The ratio is 20% resin matrix / 80% fillers.

Main advantages:

- Universal application designed for use in posterior and anterior restorations.
- Excellent marginal sealing and surface texture due to its high filler content, resulting in minimized polymerization shrinkage.
- High strength and abrasion resistance due to its optimal polymerization initiator system.
- Radio opaque filler for a high radiopacity
- Easy and convenient polishability
- Easy handling
- Does not stick to instruments

Indications

Reflectys is indicated for:

- All cavity classes for restoration of anterior and posterior teeth
- Stratification (enamel and dentin shades)
- Splinting
- Restoration of primary teeth

Shades

Reflectys shades have been developed according to the Vita shade guide in order to provide a complete solution to each clinical case. The wide range of shades and the four degrees of translucency enable an optimal stratification for a natural result.

System of shades	
A1, A2, A3, A3.5, A4 B1, B2, B3 C2, C3 D3	Universal shades with medium translucency to fit all clinical cases
A20, A30	Opaque shades – with very low translucency to stop any shade alteration
E	Enamel - very high translucency. This shade aims to replicate the enamel layer above the opaque shade, bringing luminosity
I	Incisal - very translucent. Developed for enamel young adult restorations and for area needing natural translucency
P	Pedo - very light shade. Recommended for primary teeth

Technical properties

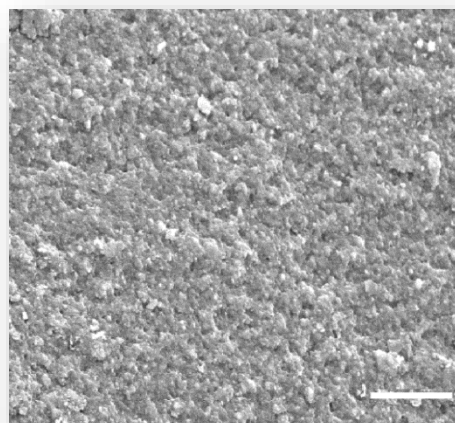
Filler system:

Hybrid composites contain a mix of different sizes and composition of particles to increase the filler percentage and enhance the material's properties [2].

Filler content allows a reduction of the monomer content and consequently the polymerization shrinkage, optimising wear, translucency, opalescence, radiopacity, intrinsic surface roughness and, thus, polishability. Hence, the aesthetics is enhanced and handling properties are improved [3].

Based on this, **Reflectys composite has been formulated with a filler content of 80 wt% for optimised mechanical properties.**

The adjusted filler contents enable good polishability properties, providing a very good wear resistance.



SEM picture 20kV 500 x 20.0 μm

Composite	Resin matrix	Filler contents (wt%)
Reflectys	BisGMA, TEGDMA	80
Filtek Z250	BisGMA, BisEMA, UDMA	82
Tetric Ceram	BisGMA, TEGDMA	79
ClearFil AP-X	BisGMA, UDMA, TEGDMA	89

Table 1 - Composition of different composites on the market [4]

Optical properties:

The use of nano fillers provides favorable translucency, as well as polishability and surface-gloss retention [5].

Reflectys Filler	Particle size
Barium aluminosilicate	$\leq 1 \mu\text{m}$
Fumed silica	$0.04 \mu\text{m}$

Table 2 - Reflectys fillers [6]

The refractive index of Bis-GMA is very close to that of silica filler particles. Hence, the refractive index of the resin increases by the addition of Bis-GMA to TEGDMA to more closely match that of the filler, enhancing the translucency of the composite [5].

Reflectys has a natural opalescence to simulate the natural translucency and brightness of tooth. This aspect allows to brighten the restoration and to render depth and vitality [7].

	Reflectys	Filtek Z250 (3M)
Translucency (A2 shade)	10.8 ¹	10.094

Table 3 - Reflectys optical properties

In compliance with the standard ISO 4049; 2000, **Reflectys presents a radio-opacity equal to 2.20 mm/Al equivalent** due to the presence of the Barium Aluminosilicate opacifier [9].

¹ Translucency of 11.6 for human enamel [8]

Solubility:

Reflectys composite has a good tightness due its low water sorption and water solubility properties.

Water sorption	23.1 $\mu\text{g}/\text{mm}^3$
Water solubility	39.3 $\mu\text{g}/\text{mm}^3$

Table 4 - Properties with water [10]

Technical properties / market competition

Color stability:

Discoloration of the composite resin after prolonged period in the oral environment can cause color mismatch. Hence, the success of composite resin restorations is highly dependent on their shade stability [11].

The evaluation of the color unstability has been assessed according to four-point scale:

- 0 = No stain
- 1 = Light stain (yellow to light brown or gray)
- 2 = Moderate stain (medium brown)
- 3 = Heavy stain (dark brown to black)

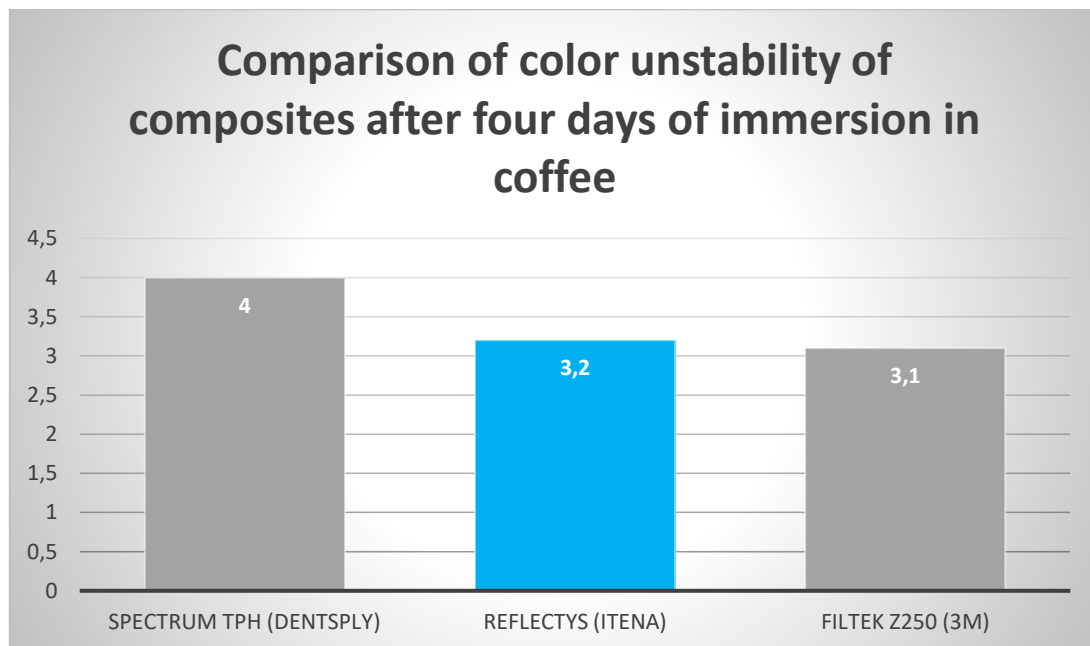


Figure 1 - Staining of Reflectys after immersion in coffee compared with other products on the market

Reflectys has higher color stability than Spectrum TH and similar to Filtek Z250 after four days of immersion into coffee [11].

Depth of cure:

Reflectys needs to be light-cured with visible light source at 400 mW/cm².

Depending on shade, the exposure time is between 20 and 30 seconds [6].

Shade	Thickness	Exposure time
A1, A2, A3, A3.5, B1, B2, B3, C2, C3, I, P, E	2.5 mm	20 secs
A4, D3, A2O, A3O	2.5 mm	30 secs

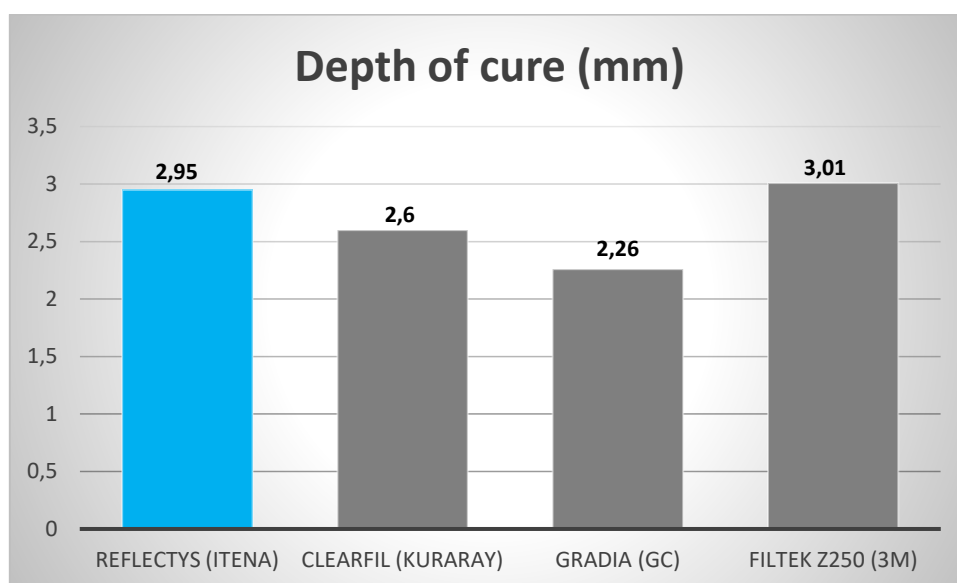


Figure 2 - Reflectys depth of cure compared with other products on the market

Internal tests have shown that Reflectys has a lower depth of cure than Filtek Z250 but the highest depth of cure compared with Clearfil and Gradia [1].

Mechanical properties:

Flexural strength measurement provides important information to predict the resistance to fracture of a composite when used for stress-bearing posterior restorations.

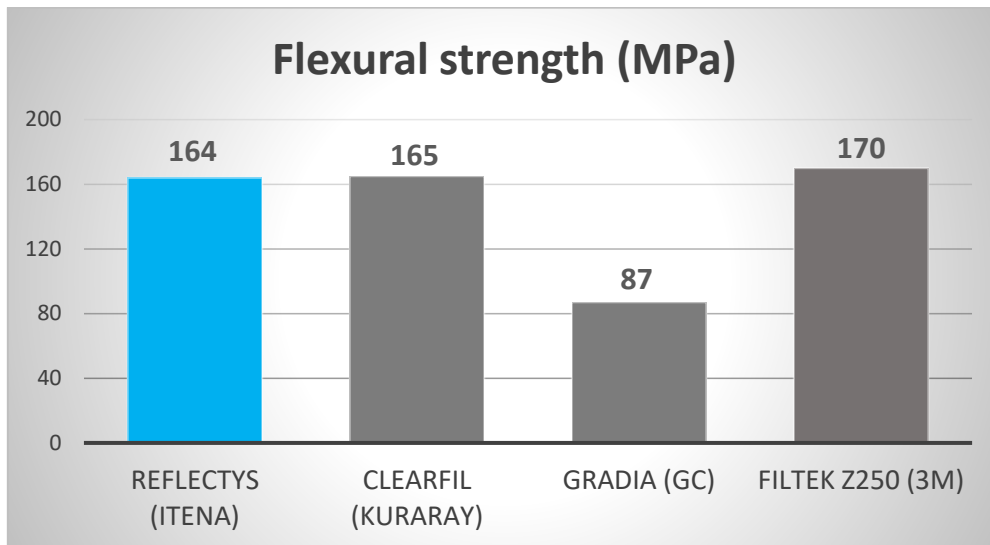


Figure 3 - Flexural strength of Reflectys compared with other products [1]

Reflectys presents a flexural strength of 164 MPa similar to Clearfil and much higher than Gradia composite [1].

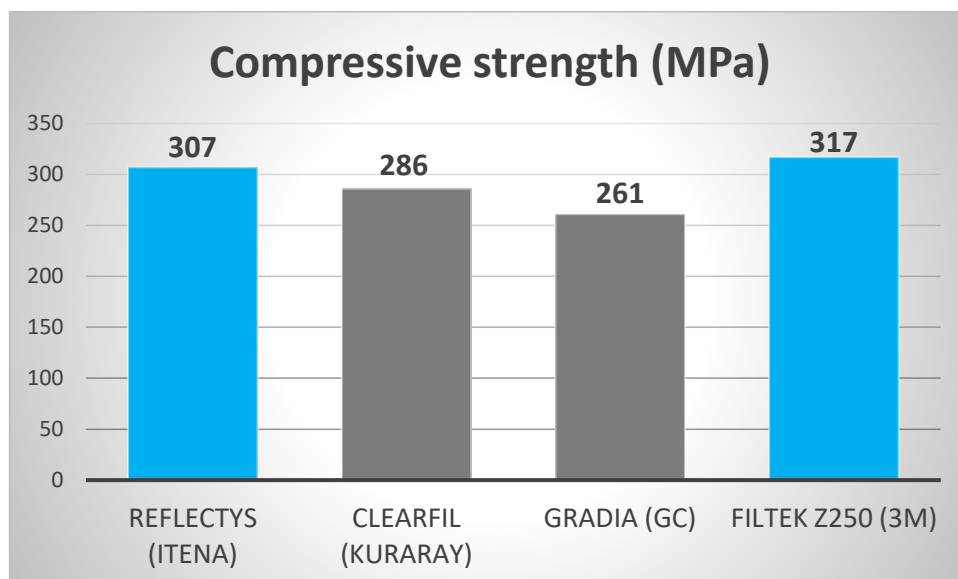


Figure 4 - Reflectys compressive strength compared with other products on the market [1]

Reflectys shows lower compressive strength than Filtek Z250 but higher than other composites on the market.

Thanks to its high flexural and compressive strengths, Reflectys is the good solution for weakened tooth structure. These results also confirm Reflectys to be the **ideal universal composite material for permanent posterior restorations**.

Abrasive wear resistance is beneficial in occlusal contact areas to resist the chewing force.

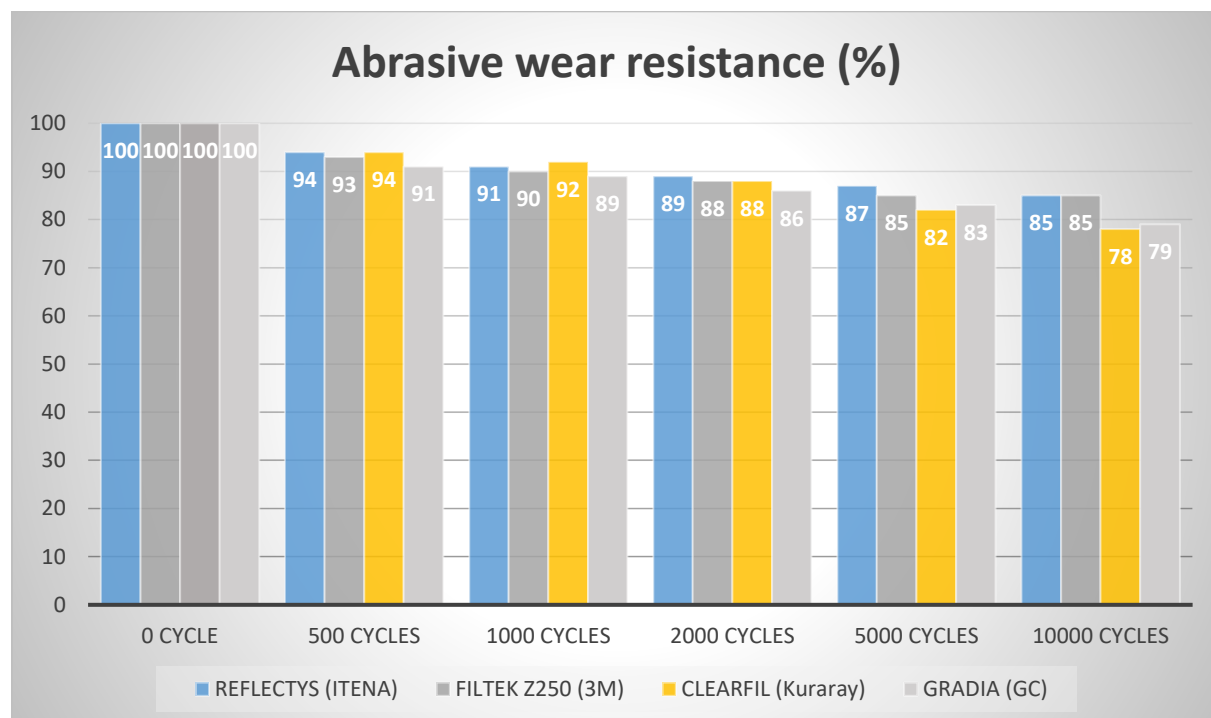


Figure 5 - Reflectys abrasive wear compared with other products on the market [1]

Reflectys shows the highest wear resistance compared with other composites on the market.

The micro-hardness of a composite is a good indication to know its degree of polymerization.

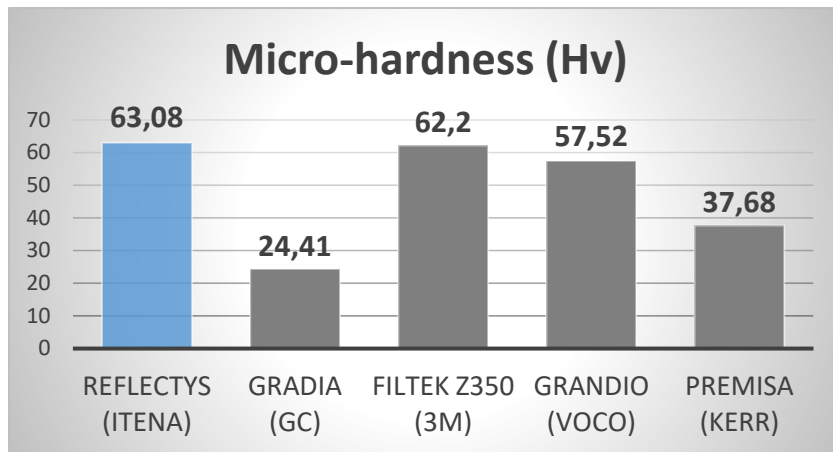


Figure 7 - Reflectys micro-hardness compared with other composites on the market [13]



Figure 6 - Result of micro-hardness showed indentation - Reflectys

Hence, the Reflectys high micro-hardness shows a high degree of polymerization compared with other composites [13]. Micro-hardness values are in the range from 205 to 378 Hv for human enamel and from 37 to 98 Hv for human dentin [14].

The initial modulus development of composites during curing plays a very important role in determining the polymerization shrinkage stress [15].

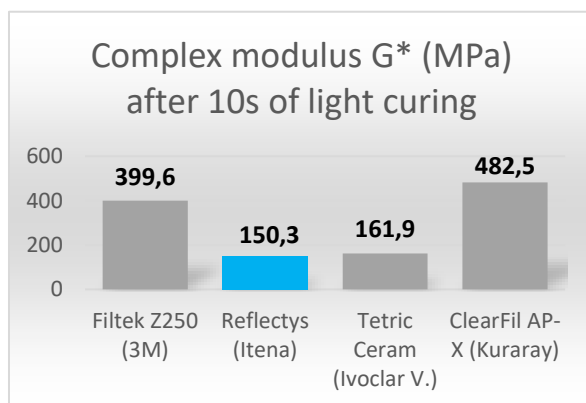


Figure 9 - Reflectys complex modulus G* compared with other products on the market [15]

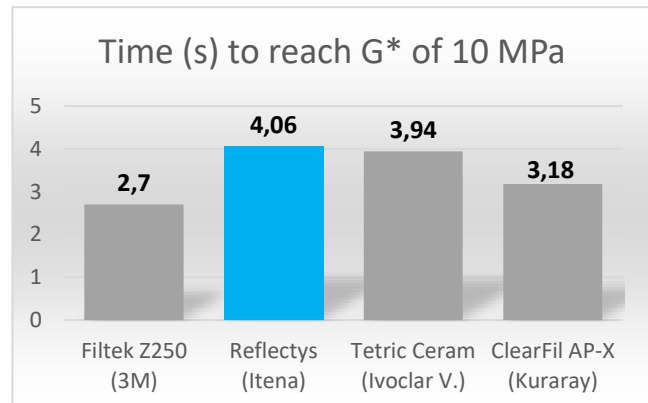


Figure 8 - Reflectys time to reach complex modulus of 10 MPa compared with other products on the market [15]

Reflectys composite has much lower modulus after 10 seconds light curing and slower speed modulus development than other materials on the market.

These results explain Reflectys outstanding high homogeneity and low polymerization shrinkage stress, equals to 2.20%.

Scientific Literature data:

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