Technical Profile

Rev. 00- Jan/09

Composite for Anterior
and Posterior Teeth

LLiS

Você merece. FGM

ÍNDICE

1. Presentation

Llis is a microhybrid, radiopaque composite for anterior and posterior restorations. Its composition was based in modern concepts so that methacrylate monomers, silanes and fillers with adequate size distribution were combined to produce a product with differential physical, mechanical and optical properties. Llis presents a simplified system of shades, offering enamel, dentin and incisal shades. The inorganic filler loading of Llis is 77.5 to 78.5% by weight or 56 to 59% by volume and presents particles sizes between 40 nm and 3.0 microns with an average particle size of 0.8 μm.

2. Indications

It is a product for professional dental use, indicated for dental restorations with functional and esthetic needs. The main indications of the product are:

• Occlusal, proximal and occluso-proximal restorations of medium and small sizes;
• Anterior Class III, IV and V restorations;
• Direct composite veneers;
• Re-attachment of tooth fragments;
• Reducing and/or closing diastemas;
• Correcting and/or altering the form of one or several teeth;
• Structural defects: Amelogenesis Imperfecta, enamel hypoplasia, non-carious cervical lesions;
• Restoration of primary teeth;
• Correcting and/or altering the shade of part or the whole tooth surface.

3. Basic Composition

•**Active ingredients:** Bis-GMA monomer (Bisphenol A diglycidyl ether dimethacrylate), Bis EMA (Bisphenol A polyetheylene glycol diether dimethacrylate), TEGDMA (tri[ethylene glycol] dimethacrylate), camphorquinone, co-initiators and silane.
•**Inactive ingredients:** Barium-aluminum silicate glass and silicon dioxide nanoparticles.

4. Modes of Product presentation

•**5 Shades kit:** EA2, EA3, EA3.5, EB2 and DA3 (4-gram syringes);
•**Enamel Refill:** EA1, EA2, EA3, EA3.5, EB1, EB2, EC2 and Incisal (4-gram syringes);
•**Dentin Refill:** DA2, DA3, DA3.5, DB2 (4-gram syringes).

Table 1: Color availability, translucency and exposure time:

Category	Shades	Time Exposure	Translucency (%)*
Dentin	DA2 DA3 DA3.5 DB2	40s	43-46
Enamel	EA1 EA2 EA3 EA3.5 EB1 EB2 EC2	20s 20s 20s 20s 20s 20s 40s	53-56
Efect-Translucency	Incisal	20s	66

* For thicknesses not beyond 2.0 mm depth and light cured with a light intensity of 500 mW/cm2. The exposure times described in Table 1 must be followed to guarantee an adequate curing depth, degree of conversion, color stability and mechanical properties of the composite resin. There is no possibility to overexposure the composite.

The Llis enamel and dentin shades follow accurately the parameters of the VITA shade guide. Additionally, Llis composite presents the INCISAL shade to reproduce dental areas of high translucency as the incisal third.

5. Main Characteristics

- It shows an adequate polishability compared to competitive products;
- The availability of shades meets the clinician needs;
- The enamel and dentin shades follow accurately the Vita Classical shade guide;
- Easy shade identification through the letters E (enamel), D (dentin) and Incisal;
- Its mechanical properties meet the requirements for anterior and posterior restorations (microhybrid composite);
- Excellent radiopacity;
- The opalescence of the Llis composite is very similar to the natural teeth;
- Fluorescence balanced with the dental structure;
- High conversion degree;
- Ergonomic syringe, with its lid attached to the syringe body.

6. General information

Physical, Chemical and Mechanical Properties

6.1 Elastic Modulus

The elastic modulus represents the reversible elastic deformation of a material when it is submitted to external loading. Therefore, restorative materials should present elastic modulus values as close as possible to that of dental structures. Consequently, the mastication stresses will not cause irreversible plastic deformation to restorative materials.

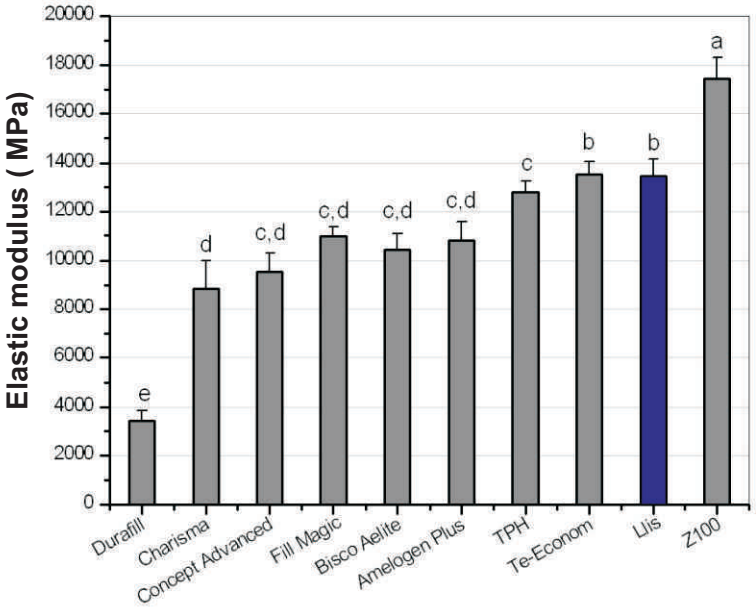

Figure 1: Elastic modulus of several composite resins. Groups with the same letters show statistically similar means ($p>0.05$).

The Llis composite showed an elastic modulus mean that was statistically similar to the Te-Econom composite (Ivoclar Vivadent) and superior to most of the other composites evaluated.

6.2 Compressive Strength

Compressive stress occurs when a body is placed under a load that tends to compress or shorten it. The compressive strength indicates the ability of a material to withstand vertical loading. This property is extremely important for materials indicated for stress-bearing areas such as posterior restorations due to the forces developed during the mastication process. For this reason, restorative materials should possess satisfactory values of compressive strength for the longevity of restorations.

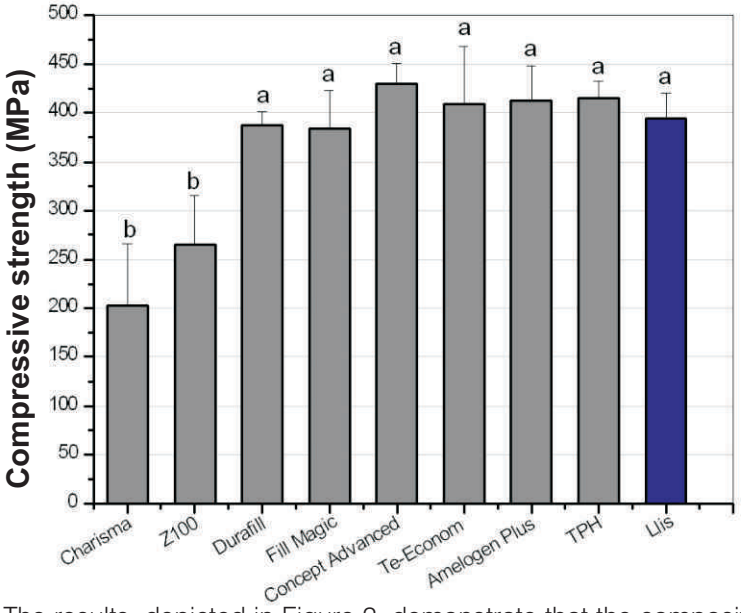

Figure 2: Compressive strength of several commercial composite resins. The results were obtained following the ISO 4049 standards. Groups with the same letters show statistically similar means ($p>0.05$)

The results, depicted in Figure 2, demonstrate that the composite Llis are in-between the best ones, being statistically superior to the composites Charisma (Kulzer) and Z100 (3MESPE). Besides that, the mean value of compressive strength presented by the composite Llis permits its safe use in anterior and posterior restorations.

6.3 Degree of conversion

The degree of conversion is a measure of the percentage of monomers that have been converted into polymer after the polymerization reaction. Therefore, the achievement of a high degree of conversion improves the mechanical properties and the color stability of the composite and reduces the water sorption of the final restoration. The residual monomers, i.e., those that were not converted into polymer, are responsible for several restoration problems such as reduction of mechanical properties and toxic effects to pulp cells.
The quality of the polymerization depends on several factors. The degree of conversion, for instance, can be affected by the reduction of the light intensity delivered by the light curing device due to continuous use without proper maintenance, reduced exposure time and factors inherent to the chemical composition of the composite resin. Therefore, if not properly cured, the composite resin may have a lower degree of conversion and consequently its physical, chemical, biological and esthetic properties may be altered, jeopardizing the clinical performance of the composite restoration.

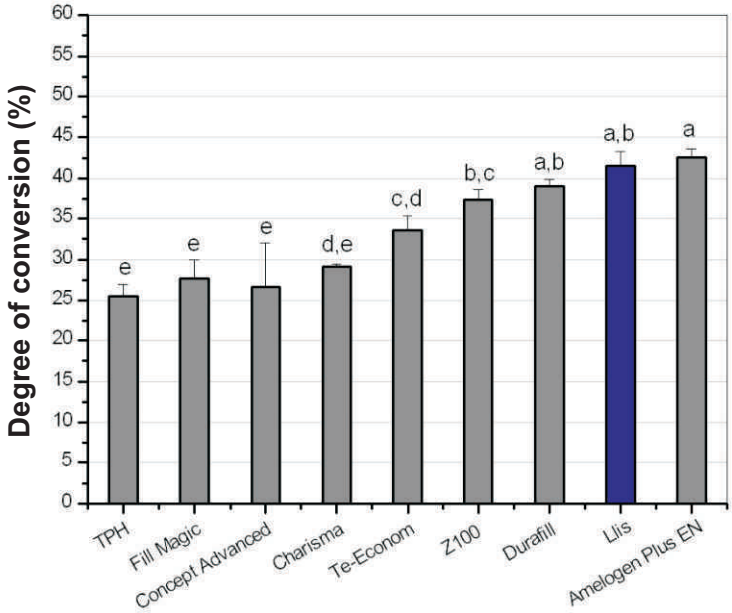

Figure 3: Degree of conversion of commercial composite resins. The results were obtained after light curing the composites by the time recommended by each manufacturer with a quartz-tungsten halogen light. Groups with the same letters show statistically similar means ($p>0.05$)

Figure 3 demonstrates that the degree of conversion of the composite Llis is statistically similar to the composites Amelogem Plus (Ultradent), Durafill (Kulzer) and Z100 (3MESPE), and superior to the other composites evaluated such as Te-Econom (Ivoclar-V- VIvadent) and Charisma (Kulzer). Besides the immediate advantages of the high degree of conversion of Llis composite, this has a decisive role on the color stability and reduced wear of this composite.

6.4 Polymerization shrinkage stress

During the polymerization reaction, the monomer molecules get closer to one another, which causes a reduction in the composite volume. The composite polymerization shrinkage can create contraction forces opposed to the bonding between the composite material and dental structures, and depending on their magnitude, the restorative material may disrupt from the cavity walls leading to bonding failure.
This disruption of the bonding interface and the consequent microleakage that might follow it can be responsible for secondary caries, marginal discoloration, post operative sensitivity and pulp damages. With the aim to reduce such detrimental effects, the composite material is inserted incrementally in the cavity. The incremental filling reduces the microleakage and contributes to an adequate light curing of the composite as thin layers of composites are placed. Therefore, the knowledge of the polymerization shrinkage stress of a composite resin is of paramount importance.

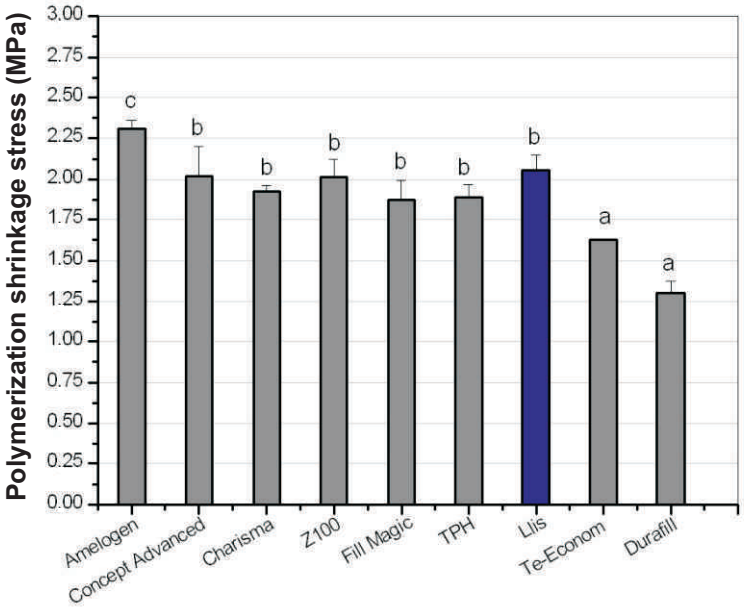

Figure 4: Polymerization shrinkage stress of commercial composite resins. The results were obtained after light curing of composites with a quartz-tungsten halogen light. Groups with the same letters show statistically similar means ($p>0.05$)

Figure 4 depicts that the polymerization shrinkage of Llis composite is comparable to most composites evaluated.

7. Clinical Cases

Restoration of anterior teeth:

Fracture of the incisal third of both maxillary central incisors

Aspect of both teeth after restoration with Llis composite. The right central incisor was restored with EA2 and Incisal, while the left central incisor was restored with Da2, EA2 and a thin layer of Incisal composite.

Restoration of posterior teeth:

Initial aspect of maxillary second premolar.

Final aspect of the class I restoration after placement of DA2 as the first increment and EA2 in the occlusal third.

8. References

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