



A new state of the art hybrid glass CAD/CAM block

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Title: "Ein neuer hochmoderner CAD/CAM-Block aus Hybridglas"

Introduction

Computer-assisted design/computer-assisted manufacturing (CAD/CAM) technology is currently at the forefront of the emergence of digital dentistry in clinical practice. Together with this new technological developments, the dental laboratory industry is also being revolutionized. Specifically, in the last decade, CAD/CAM technology and advances in digital dentistry have led to a paradigm shift in dentistry with the fabrication of indirect dental restorations replacing the traditional techniques in fabricating dental restorations.

New technological advances in CAD/CAM materials are revolutionizing restorative dentistry with each development trying to address both physical and esthetic properties and ultimately the clinical success of the restoration.

Currently, CAD/CAM materials range from highly esthetic pure glass ceramics on one end to particle filled ceramics and composite blocks on the other end. However, all existing materials have some downfalls of their own like lack of strength, brittleness, prone to chipping or lack of long term color stability.

Properties of the new edelweiss CAD/CAM BLOCKs

edelweiss dentistry has recently launched an innovative single glass phase CAD/CAM Block representing a breakthrough in the fabrication of CAD/CAM materials. Through a process of modern laser sintering and vitrification, edelweiss dentistry has developed state of the art CAD/CAM blocks. Through this process, the finished product consists of a single glass-phase embedded in a resin matrix. As a result, the esthetic properties are similar to that of feldspathic glass ceramic without having the brittleness of pure ceramics. The base material of the edelweiss block is glass, in which crystals are joined by controlled laser sintering (figure 1).

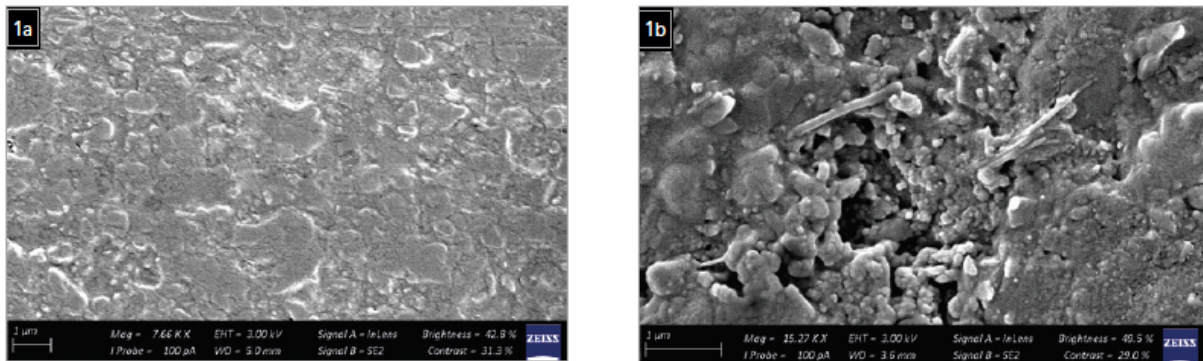


Figure 1a. Scanning electron microscopy showing single glass phase of edelweiss CAD/CAM BLOCK, devoid of any voids or defects. Figure 1b. Manufacturer B - the usual CAD/CAM block. The irregularly shaped structures, which represent an uneven surface, are clearly visible on the surface.

The edelweiss CAD/CAM BLOCK is mainly composed of silica and barium glass with a very small portion of resin, almost combining the added advantages of ceramic and polymer materials into one block. Aluminium oxide is added to give additional strength to the material. The strength and optical properties are similar to that of ceramics but maintaining the flexibility and reparability of polymer based materials. The addition of zinc oxide nanoparticles and fluoride provides antibacterial properties, a unique feature of the edelweiss CAD/CAM BLOCK.

Optical properties

Having a unique hybrid glass phase, the edelweiss CAD/CAM BLOCK exhibits natural translucency mimicking that of natural enamel, with light reflection showing an extremely glossy surface.

Cementation

A unique feature of the edelweiss CAD/CAM BLOCK is the cementation procedure. The edelweiss BOND is used to provide adhesion to the glass phase/resin component of the edelweiss CAD/CAM restoration and has been shown to provide optimal bonding across the entire surface. The bond between the restorative interface and the tooth is enhanced through the use of edelweiss COMPOSITE or edelweiss FLOWABLE COMPOSITE whereby the composite cement and the block have the same composition. This, thus acts as a monobloc system ensuring there will be no color difference between the restoration and tooth surface at the cementation interface providing a perfect margin color match. The edelweiss cement and the edelweiss restoration have the same optical properties, hence no unsightly restoration margins are visible. Furthermore, this monobloc system ensures a perfect marginal adaptation/seal. In-vitro studies have shown no marginal leakage on both enamel and dentin interfaces when cemented with edelweiss bonding systems. With the edelweiss bonding system, sub-margination or ditching at the tooth interface is non-existent as the cement and the restoration are one system. Staining at the marginal interface is completely absent with the edelweiss bonding system.

The edelweiss CAD/CAM system consists of 2 types of blocks (figure 2), namely edelweiss T-BLOCK and edelweiss C-BLOCK.



Figure 2. edelweiss C-BLOCKS representing the chroma shades and the edelweiss T-BLOCKS mimicking the natural enamel in translucency.

The T-BLOCK (Translucent) are highly translucent blocks that mimic the natural enamel in optical properties while the underlying dentin shade can then be duplicated through the use of various resin composite/cement shades (figure 3). This can be further individualized by varying the composite shades according to cervical and incisal color variations in the natural tooth. Clinicians are now for the first time, in complete control of the final esthetic outcome by being able to adjust the final shade matching and characterizations according to the patient's needs, thereby eliminating any errors in shade matching



Figure 3. Using edelweiss T-BLOCK the final color adjusted by varying the composite/cement to obtain proper shade matching.

Individual characterizations can be also accomplished using edelweiss EFFECT SHADEs or other resin- staining kits (figure 4).

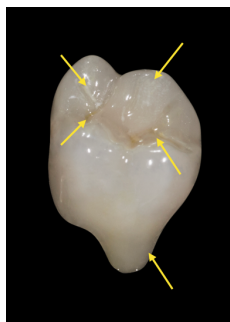
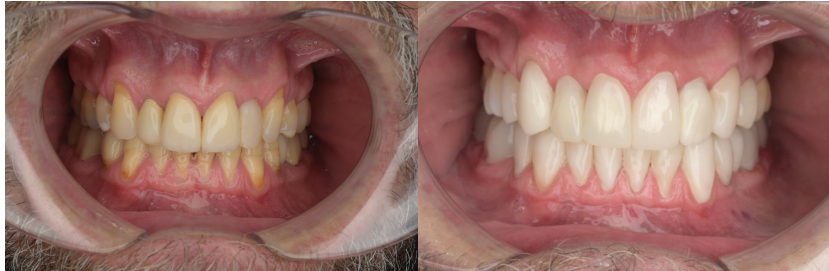


Figure 4. Individual external staining obtained with resin stains to individualize pits and fissures or the cervical areas.

The edelweiss C-BLOCK are highly chromatic shades that correspond to shades A0, A1, A2 and A3. These are similar to the traditional blocks whereby the color is directly matched to the tooth shade. These blocks can be cemented using either edelweiss composite or conventional resin cements.

Figures 5 and 6 shows before and after treatment pictures, illustrating the enamel like esthetic outcome of the edelweiss CAD/CAM T-BLOCKS. The edelweiss A0 dentin shade masks the underlying discolored dentin producing an highly esthetic natural enamel like appearance.



Figures 5 & 6. Before and after treatment pictures showing the natural appearance of the final outcome using edelweiss T-BLOCKS.

Basic idea for material development

The rationale for edelweiss dentistry developing an hybrid glass CAD/CAM Block materials was to:

- 1) obtain a material that will resemble the esthetics of pure glass ceramics and the strength of particle filled ceramics;
- 2) obtain a material that more closely simulates the modulus of elasticity of dentin compared to traditional ceramics;
- 3) develop a material that is easier to mill and adjust than particle-filled ceramics e.g. lithium disilicate or polycrystalline ceramics; and
- 4) be able repair or modify with composite resin that is much faster and easier than other systems by simply adding material chairside.

Conclusion

The uniqueness of edelweiss CAD/CAM BLOCKs lies in the manufacturing process where through the process of vitrification and laser sintering process a state of the art hybrid glass block is manufactured. This ensures the edelweiss CAD/CAM BLOCK combines the properties of current CAD/CAM systems into one single block. It resembles the esthetics of a feldspathic glass, the strength of particle infiltrated ceramic and the resilience and ease of reparability of composite blocks. Clinicians can now minimize their inventory, as they can now have all 3 properties of esthetics, strength and flexibility in one single edelweiss CAD/CAM BLOCK.

More information about edelweiss dentistry:



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