Heraeus

Venus® Composites

Compendium

Venus®
The new aesthetics.

Introduction

Composites have been used for more than 40 years as direct filling materials for restoring damaged teeth. Composite is the general term used for a compound comprising at least two different phases (e.g. monomers and fillers). This broad definition means that glass ionomer cements, compomers and ormocers are also included in this group of materials. All composites have one characteristic in common; during curing, they all form a matrix into which glass, quartz or porcelain filler particles are embedded.

Generally the term composite is used to refer to resin-based materials. When used in the following text, the term composite refers to all filling materials consisting of monomers and filler particles of different sizes and types, which can be polymerised.

Why are composites used in dentistry? Former plastics were not strong enough to withstand masticatory forces in the oral cavity. They also exhibit relatively high shrinkage and do not exhibit the handling properties required by dentists.

Inorganic fillers have to be added to these materials before they can be used in area subjected to masticatory forces. This normally involves using filler material mixtures (fractions) of different sizes and particle distribution to attain a tightly packed density and a high ratio of filler material. As the actual filler materials exhibit a constant volume, any polymerisation shrinkage is kept to a minimum.

The reinforcing effect of the fillers depends on their chemical structure (e.g. hydrated silica, quartz or glass fillers) as well as on their particle size and distribution. Generally speaking, strength increases in proportion to the hardness and size of the particles. Only the correct combination of different filler fractions, however, produces optimum mechanical properties and ensures that the material can be easily polished and is wear-resistant.

Composites are classified according to their viscosity, chemical base, type of polymerisation and size of their filler particles. Filler particle size is the most commonly used classification.

Macrofilled composites
Macrofilled composites have relatively large filler particles with diameter of 5–100 µm. The types of glass used for these composites are compact solids, so they exhibit very high strength. The size of the filler particles, however, has a detrimental effect on the surface polish and the wear-resistance of these filling materials. It is virtually impossible to polish macrofilled composites after trimming; the (only) best way to attain a short-term smooth surface is by polymerising the composite under a strip of cellophane.

Microfilled composites
Further development of filling materials concentrated on reducing the size of the filler particles to improve the polishing characteristics of the filling materials. It seemed as though the solution had been found with the use of pyrogenic SiO_2 as a filler material. Because they have a minute average particle size of 0.04 µm, these filler materials are called microfillers.

They are easier to polish and more abrasion-resistant than macrofilled composites. The overall proportion of filler material which could be used was, however, lower due to a less favourable volume/surface ratio. SiO_2 fillers are also not nearly as strong as glass or quartz fillers. This results in a much lower mechanical load-bearing capacity in comparison with macrofilled composites and greater polymerisation shrinkage.

In the late 1970s Heraeus Kulzer developed a new technique to increase the proportion of filling material: in addition to pure SiO_2, finely ground, prepolymerised microfiller particles were mixed in with the microfiller composite. This allowed polymerisation shrinkage to be kept to an acceptable level without any detrimental effect on the excellent polishing characteristics or elasticity. Homogeneous microfilled composites, which contained only pyrogenic hydrated silica, haven't put through.

Inhomogeneous microfilled composites are still used for anterior restorations. Durafill VS, which has been clinically successful for over 25 years, is a classic example of this group of materials.

Despite these improvements, the mechanical strength of inhomogeneous microfilled composites is inadequate to allow them to be used in areas subjected to masticatory forces. This only became possible when microfillers were combined with fine to ultrafine filler materials made of quartz, glass or porcelain to form hybrid composites.

Hybrid composites
Hybrid composites contain filler materials of greatly varying size. They have the advantage of combining in one material the optimum physical properties of glass macrofillers with the excellent polishing properties of pyrogenic hydrated silica microfillers. Hybrid composites are therefore ideal for use as universal composites.

Continual development of glass grinding techniques enabled the average particle size of glass fillers to be reduced still further. High performance hybrid composites exhibit an average particle size of less than 1 µm.

Venus and Charisma are typical examples for submicron particle hybrid composites. The patented barium glass filler particles have an average particle size of 0.7 µm. Composites are usually classified according to their viscosity as well as according to the type and size of their filler particles.

Flowable composites

Nowadays cavities are no longer prepared according to the basic principle of extension for prevention; preparation now tends to be minimally invasive. A more general use of minimally invasive preparation techniques has not only been brought about by the rapid development of adhesive restorative materials, but can also be attributed to new preparation instruments on the market. These include, for example, ultrasonic instruments which can be used to prepare very small cavities while conserving residual tooth structure and adjacent teeth as much as possible. Another example is airbrasives, which provide an alternative to conventional rotary instruments, particularly when treating initial caries in fissures. It is often difficult to work with medium to high viscosity composites in these very small cavities. With medium viscosity composites it is difficult to apply and adapt small portions without producing gaps and with condensable composites it is virtually impossible. Flowable composites are ideal for use in this situation. The first flowable composite Durafill flow was marketed in 1980 by Heraeus Kulzer.

Most flowable composites are based on the technology used for hybrid composites. They contain both SiO_2 and finely ground glass or quartz filler materials. They differ from conventional hybrid composites in having a lower proportion of filler material. Venus flow from Heraeus Kulzer is a typical example of a flowable composite.

Venus flow has a filler content of only 62% by weight compared with Venus', which has a filler content of 78% by weight.

The main areas of application for flowable composites are in minimally invasive Class III cavities, Class I and II cavities without masticatory loads, pit and fissure sealing as well as extended pit and fissure sealing and Class V cavities.

Another useful application is as a cavity lining, i.e. lining a Class I or II cavity with a layer of Venus flow approx. 0.5 mm thick. Its excellent flow property ensures that there is a gap-free bond with the polymerised bonder. After Venus flow has been polymerised, the hybrid composite, e.g. Venus, can then be applied and polymerised in the usual way. It is also argued that, when used as a base lining, flowable composites act like a buffer, which cushions the polymerisation stresses produced by the outer filling material.

Packable composites

Packable composites were especially developed for use in the posterior region. Solitaire, one of the first packable filling materials, was launched by Heraeus Kulzer in 1997 and underwent continual development before being replaced by Solitaire 2 in 1999.

Packable composites generally contain a slightly higher proportion of filler material or use specialised filler technology, as in the case of Solitaire 2 (integrated matrix fillers).

The packable property of these materials facilitates contouring the approximal contact area when using standard metal matrices. These composites do not stick as readily to the instrument and exhibit excellent positional stability, which facilitates contouring the occlusal surface.

Their high viscosity means, however, that these composites are not as suitable for use with minimally invasive preparations.

Composition

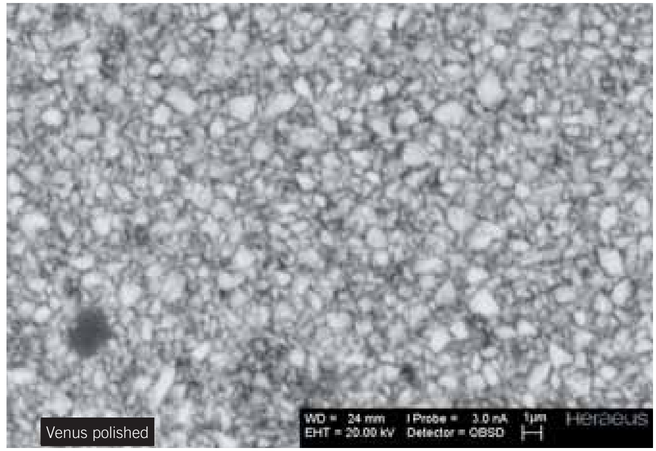
Venus is based on monomers which have been tried and tested for decades:

- Bis-GMA
- TEGDMA

The initiators and coinitiators start the polymerising reaction during curing with blue light (400–500 nm). The initiators (camphor quinone) and coinitiators used for Venus are coordinated so that, on the one hand, they achieve high-quality polymerisation of the cured material and, on the other hand, there is adequate working time for the operator.

Venus uses precisely coordinated amorphous barium glass and various SiO_2 fillers as filler materials. Barium glass provides Venus with its high transparency and excellent optical properties. If the correct shade is selected, the material blends in with the surrounding tooth structure (Color Adaptive Matrix). The barium content produces radiopacity, which corresponds to an aluminium equivalent of 200%.

Figure 1: SEM photograph of a polished Venus surface



The photograph shows the extremely homogeneous particle distribution of the filler material, which produces a filler volume of 78% by weight. The very fine particles, which exhibit an average diameter of less than 1 µm, produce the excellent high-lustre polishing properties of Venus.

Venus® system

Venus: A microhybrid restoration system

Durafill was one of the world's first light-curing microfilled composites (1979) and set the standard for all subsequent microfillers. Charisma microhybrid composite with its natural transparency has been the first choice of many dentists for over 15 years. Venus is the product of experience gained in the development of light-curing composites. Excellent aesthetics are not simply a matter of chance or time-consuming trial and error with Venus. The Venus „Color Adaptive Matrix" and 2-Layer shade system produce excellent aesthetics easily, quickly and reliably.

Mechanical properties of Venus

Venus combines easy handling with excellent physical properties, as it has an optimum mixing ratio of monomer matrix and filler particles or high dispersion silica.

- Flexural strength > 100 MPa
- Young's modulus > 7.500 MPa

Mechanical test measurements relate to the lower limits for a standard shade, i.e. A2 after being stored for 24 hrs at 37 °C.

(Source: Internal data, data on file)

Clinical indications

Venus®, Venus® flow, Charisma®, Durafill® VS, Solitaire® 2

Applications	Venus®	Charisma®	Durafill® VS	Venus® flow	Solitaire® 2
Class I cavities	■	■		■ (not subjected to masticatory forces)	■
Class II cavities	■	■		■ (not subjected to masticatory forces)	■
Class III cavities	■	■	■	■ (minimal invasive)	
Class IV cavities	■	■	■		
Class V cavities	■	■	■	■	■
Inlays (direct and indirect)	■				
Veneers (direct and indirect)	■				
Core built-up	■				
Fissure and pit sealing				■	
Cavity linings				■	

Properties of Venus®

Excellent handling
Venus does not stick to the instrument, can be easily contoured and has excellent positional stability.

Natural transparency
Its transparency emulates natural enamel and facilitates the fabrication of natural and vital restorations.

Color Adaptive Matrix
The refractive indices of the matrix and monomer system are optimised in Venus to enable the Venus restoration, in certain circumstances, to assume the shade of the surrounding enamel. This enables the natural teeth and restoration to blend optically if the correct shade is selected.

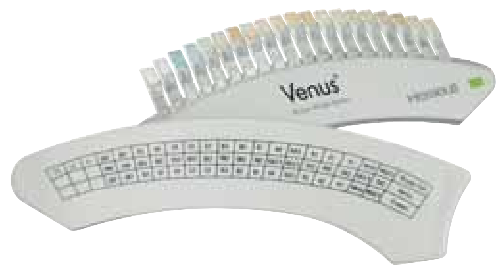
27 Shades, 3 Levels of opacity
The Color Adaptive Matrix, 2-Layer shade guide fabricated from original material and wide choice of 27 shades also allow more aesthetically demanding restorations to be easily fabricated. Venus shades differentiate between dentin, enamel, incisal and bleach shades.

High-quality dentistry is assured with Venus.

Coordinated initiator system
The coordinated initiator system ensures a high degree of polymerisation even with thicker layers (max. 2.0 mm, exposure 20 sec. for light shades, 40 sec. for dark or opaque shades, cf. recommended exposures).

2-Layer shade guide

Unlike most standard shade guides, the Venus shade guide is layered using original material. This gives a very precise impression of how the finished restoration will look before the tooth is restored.



2-Layer shade guide
The 2-Layer shade guide is fabricated manually from original material to give the user a realistic impression of the shade of the finished restoration. The cervical area of the shade tabs is made up of dentin shade which is covered with matching enamel shade up to the incisal of the shade tab.

The layering in the shade tab gives the user an impression of how the shade looks clinically, e.g. in the structure of an anterior tooth. A diagram of the built-up is provided on the back of the 2-Layer shade guide.

Venus® shade range

Vita shade groups

A shades	Reddish brown
B shades	Reddish yellow
C shades	Grey hues
D shades	Reddish grey

Highly transparent incisal shades

Shade T1	Translucent (cool blue), highly transparent incisal shade, slight blue hue
Shade T2	Translucent (neutral), highly transparent incisal shade
Shade T3	Translucent (warm yellow), slightly less transparent incisal shade

Customised shades
(for whitened teeth)

Shade SB1	Super Bleach (warm), light incisal shade for restoring bleached teeth
Shade SB2	Super Bleach (cold), light incisal shade with a slightly cool blue hue effect for restoring bleached teeth
Shade SBO	Super Bleach Opaque, light dentin shade for restoring bleached teeth

Venus shade range

Enamel shades (higher transparency)	A1	B1	C2	D2	SB1*
	A2	B2	C3	D3	SB2*
	A3	B3	C4		
	A3.5				
	A4				
	HKA2.5*				
	HKA5*				
Incisal shades (very high transparency)	T1				
	T2				
	T3				
Dentin shades (less transparency)	OA2	OB2	OC3	OD2	SBO
	OA3				
	OA3.5				

Venus shades are matched to Vita® shades.

*Heraeus Kulzer shades

VITA® = registered trademark VITA-Zahnfabrik, Germany

Available kits

Venus Masters Kit

The name of this kit is self-explanatory; it was developed for dentists, who want to make clinical use of the complete range of Venus shades. This kit can be used for all aesthetic, direct composite restorations.

- 27 Venus shades, (7 shades x 10 PLTs and 20 shades x 5 PLTs) à 0.25 g
- 2 x Venus flow syringes A2, Baseliner white (1.8 g each shade)
  Ideal liner for posterior restorations
- 1 x 1ml bottle GLUMA Desensitizer
- 2-Layer shade guide
- Accessories

Venus Refill packs

- 4 g syringes
- 0.25 g PLTs* (10 x 0.25 g or 20 x 0.25 g)*

Venus Basic Kit

This kit contains the 5 most popular enamel and dentin shades as well as T1 "Cool Blue" incisal shade. It is the ideal set for new users and contains the tooth shades which are used most often.

- 6 Venus shades (syringes or PLTs)
  Shades: A2, A3, HKA2.5, OA2, OA3, T1
- 2-Layer shade guide
- Accessories

Venus flow Syringe Assortment:

- 4 x Venus flow syringes A1, A2, A3, Baseliner white (1.8 g each)
- Accessories

Venus flow Refill packs:

- 1.8 g syringes in the following shades:
- A1, A2, A3, A3.5, A4, B2, B3, HKA2.5, OA2, SB1, SB2, SBO, T2, Baseliner white

*PLTs = Pre loaded tubes for direct application

Direct Veneers

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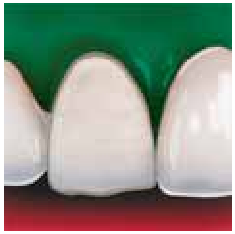

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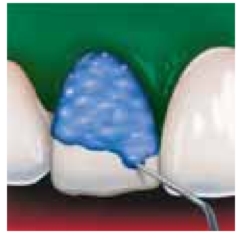

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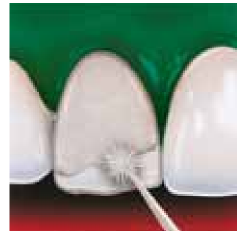

1. Selecting the shade

- Select the matching shade tab from the Venus 2-Layer shade guide.
- Instructions for layering are provided on the back of the shade guide.
- Layering enamel and dentin shades is recommended for veneers. If that area of the tooth being restored is highly transparent or very opaque, the restoration may be fabricated without layering.

2. Preparing

- Reduce approx. 0.5 to 1 mm of enamel. Ensure that the preparation does not extend beyond the enamel if possible.
- Prepare a chamfer at the approximal margins and cervically.
- Any existing filling, which is discoloured, should be replaced before preparing for the veneer. without layering.

3. Etching

- Apply GLUMA Etch 20 to the whole cavity starting with the enamel and leave it for 30 sec.
- Afterwards apply GLUMA Etch 20 to the exposed dentin and leave it for 15 sec.
- Rinse GLUMA Etch completely with water for at least 30 sec.
- Dry cavity with oil-free air. Do not dessicate dentin!
- If you are using a self-etch bonding system drop this step!

4. Bonding

- Apply adhesive (e.g. iBOND*, GLUMA Comfort Bond + Desensitizer) according to manufacturer's instructions for use to the entire cavity surface.
- Remove excess amount of adhesive and evaporate the solvent by using a gentle air blast. Solvent is evaporated, if surface film stops moving during air blasting.
- The whole cavity must be uniformly shiny after this step.
- Light cure for 20 sec.

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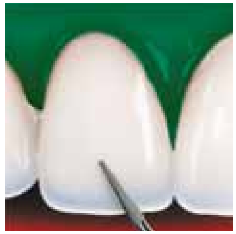

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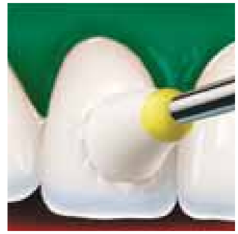

5. Applying Venus

- Apply either the enamel or dentin shade or a combination of both.
- Translucent shades (T1, T2, T3) can also be used if the incisals are very transparent.

7. Polishing

- Use a suitable polishing technique (e.g. iPol from Heraeus Kulzer) which progresses gradually from rough prepolishing to a fine high-lustre polish.
- Check the occlusion.

6. Finishing

- Remove excess composite and contour the anatomical shape using a fine-bladed tungsten carbide cutter or diamond finisher.

Note: *iBond adhesive contains components of the tried and tested GLUMA Desensitizer. The active substance of GLUMA Desensitizer promotes effective, long-term reduction of post-operative hypersensitivity even during treatment.

Closing a diastema

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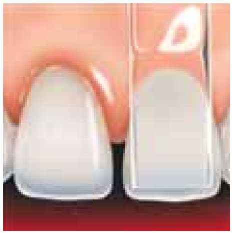

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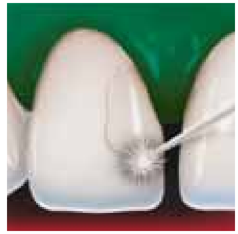

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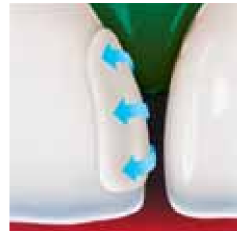

1. Selecting the shade

- Select the matching shade tab from the Venus 2-Layer shade guide.
- Instructions for layering are provided on the back of the shade guide.
- Layering enamel and dentin shades is recommended for veneers. If that area of the tooth being restored is highly transparent or very opaque, the restoration may be fabricated without layering.

2. Preparing and etching

- Roughen the enamel from the labial to palatal with a fine diamond rotary instrument.
- Prepare subgingivally if required.
- Apply GLUMA Etch 20 to the whole cavity starting with the enamel and leave it for 30 sec.
- Afterwards apply GLUMA Etch 20 to the exposed dentin and leave it for 15 sec.
- Rinse GLUMA Etch completely with water for at least 30 sec.
- Dry cavity with oil-free air. Do not dessicate dentin!
- If you are using a self-etch bonding system drop this step!

3. Bonding

- Apply adhesive (e.g. iBOND, GLUMA Comfort Bond + Desensitizer) according to manufacturer's instructions for use to the entire cavity surface.
- Remove excess amount of adhesive and evaporate the solvent by using a gentle air blast. Solvent is evaporated, if surface film stops moving during air blasting.
- The whole cavity must be uniformly shiny after this step.
- Light cure for 20 sec.

4. Applying Venus

- Only work on one tooth at a time.
- Apply either the enamel or dentin shade or a combination of both.
- Use a rigid, transparent matrix to shape the composite.
- Light cure for 20 sec. (40 sec. for darker and opaque shades).
- Use one of the translucent shades (T1, T2, T3) for the translucent incisal area.

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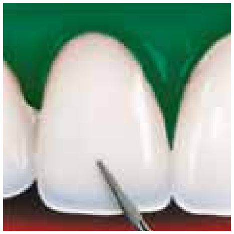

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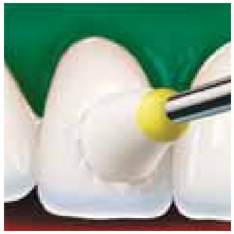

5. Finishing

- Remove excess composite and contour the anatomical shape using a fine-bladed tungsten carbide cutter or diamond finisher.
- Translucent shades (T1, T2, T3) can also be used if the incisals are very transparent.

6. Polishing

- Use a suitable polishing technique (e.g. iPol from Heraeus Kulzer) which progresses gradually from rough prepolishing to a fine high-lustre polish.
- Check the occlusion.

Class I and Class II restorations

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2

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4


1. Selecting the shade
- Select the matching shade tab from the Venus 2-Layer shade guide.
- Instructions for layering are provided on the back of the shade guide.
- Layering enamel and dentin shades is recommended for veneers. If that area of the tooth being restored is highly transparent or very opaque, the restoration may be fabricated without layering.

2. Preparing
- Prepare the cavity according to the principles of adhesive dentistry.
- Round off the inner line angles and point angles to prevent trapped air when applying the composite.
- Insert a suitable lining in cavities close to the pulp.
- With Class II cavities place a matrix and wedge it.

3. Etching
- Apply GLUMA Etch 20 to the whole cavity starting with the enamel and leave it for 30 sec.
- Afterwards apply GLUMA Etch 20 to the exposed dentin and leave it for 15 sec.
- Rinse GLUMA Etch completely with water for at least 30 sec.
- Dry cavity with oil-free air. Do not dessicate dentin!
- If you are using a self-etch bonding system drop this step!

4. Bonding
- Apply adhesive (e.g. iBOND, GLUMA Comfort Bond + Desensitizer) according to manufacturer's instructions for use to the entire cavity surface.
- Remove excess amount of adhesive and evaporate the solvent by using a gentle air blast. Solvent is evaporated, if surface film stops moving during air blasting.
- The whole cavity must be uniformly shiny after this step.
- Light cure for 20 sec.

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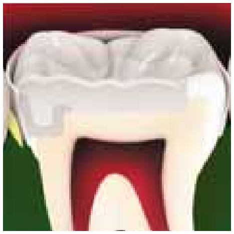

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5. Optional: Applying flowable composite

- Apply a layer of Venus flow (Baseliner) composite approx. 0.5 mm thick over the entire surface of the cavity. This prevents air becoming trapped in the inner line angles and point angles. By using Baseliner buttom of cavity is additionally marked.
- Light cure for 20 sec. (Cure darker and opaque shades for 40 sec.)

6. Applying Venus

- Apply either the enamel or dentin shade or a combination of both.
- Apply Venus in layers of maximum 2 mm and cure each layer for 20 sec.
- Cure darker and opaque shades for 40 sec.

7. Finishing

- Remove excess composite and contour the anatomical shape using a fine-bladed tungsten carbide cutter or diamond finisher.

8. Polishing

- Use a suitable polishing technique (e.g. iPol from Heraeus Kulzer) which progresses gradually from rough prepolishing to a fine high-lustre polish.
- Check the occlusion.

Class IV restorations

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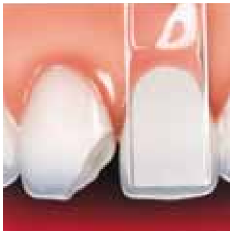

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1. Selecting the shade

- Select the matching shade tab from the Venus 2-Layer shade guide.
- Instructions for layering are provided on the back of the shade guide.
- Layering enamel and dentin shades is recommended for veneers. If that area of the tooth being restored is highly transparent or very opaque, the restoration may be fabricated without layering.

2. Preparing and etching

- Prepare the entire margin both labially and palatally with a sufficiently deep chamfer.
- Apply GLUMA Etch 20 to the whole cavity starting with the enamel and leave it for 30 sec.
- Afterwards apply GLUMA Etch 20 to the exposed dentin and leave it for 15 sec.
- Rinse GLUMA Etch completely with water for at least 30 sec.
- Dry cavity with oil-free air. Do not dessicate dentin!
- If you are using a self-etch bonding system drop this step!

3. Bonding

- Apply adhesive (e.g. iBOND, GLUMA Comfort Bond + Desensitizer) according to manufacturer’s instructions for use to the entire cavity surface.
- Remove excess amount of adhesive and evaporate the solvent by using a gentle air blast. Solvent is evaporated, if surface film stops moving during air blasting.
- The whole cavity must be uniformly shiny after this step.
- Light cure for 20 sec.

4. Applying Venus

- Apply either the enamel or dentin shade or a combination of both.
- Apply Venus in layers of maximum 2 mm and cure each layer for 20 sec.
- Cure darker and opaque shades for 40 sec.

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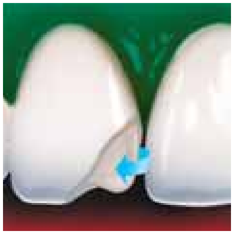

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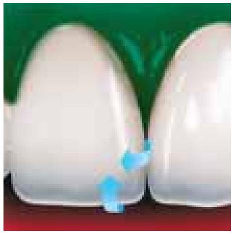

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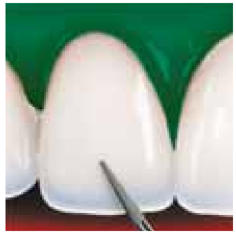

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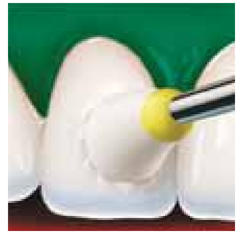

5. Applying Venus

- Use a transparent matrix as an aid for shaping the restoration.

6. Applying Venus

- Use one of the translucent shades (T1, T2, T3) for the translucent incisal area.

7. Finishing

- Remove excess composite and contour the anatomical shape using a fine-bladed tungsten carbide cutter or diamond finisher.

8. Polishing

- Use a suitable polishing technique (e.g. iPol from Heraeus Kulzer) which progresses gradually from rough prepolishing to a fine high-lustre polish.
- Check the occlusion.

Class V restorations

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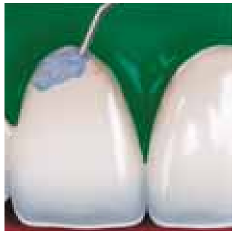

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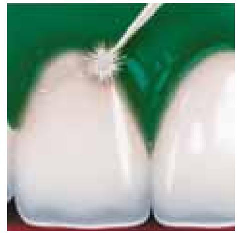

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1. Selecting the shade

- Select the matching shade tab from the Venus 2-Layer shade guide.
- Instructions for layering are provided on the back of the shade guide.
- Layering enamel and dentin shades is recommended. If that area of the tooth being restored is highly transparent or very opaque, the restoration may be fabricated without layering.

2. Preparing and etching

- Clean the cavity using a prophy cup, water and pumice.
- Bevel the junction between the cavity and the tooth surface.
- Apply GLUMA Etch 20 to the whole cavity starting with the enamel and leave it for 30 sec.
- Afterwards apply GLUMA Etch 20 to the exposed dentin and leave it for 15 sec.
- Rinse GLUMA Etch completely with water for at least 30 sec.
- Dry cavity with oil-free air. Do not dessicate dentin!
- If you are using a self-etch bonding system drop this step!

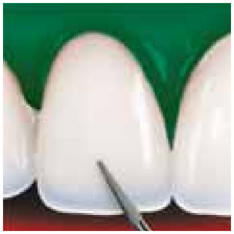
3. Bonding

- Apply adhesive (e.g. iBOND, GLUMA Comfort Bond + Desensitizer) according to manufacturer's instructions for use to the entire cavity surface.
- Remove excess amount of adhesive and evaporate the solvent by using a gentle air blast. Solvent is evaporated, if surface film stops moving during air blasting.
- The whole cavity must be uniformly shiny after this step.
- Light cure for 20 sec.

4. Applying Venus

- Apply either the enamel or dentin shade or a combination of both.
- Cure each layer for 20 sec.
- Cure darker and opaque shades for 40 sec.
- Use one of the translucent shades (T1, T2, T3) for the translucent incisal area.

5



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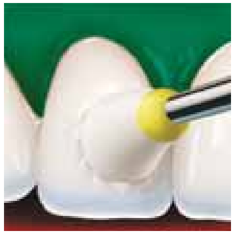


5. Finishing

- Remove excess composite and contour the anatomical shape using a fine-bladed tungsten carbide cutter or diamond finisher.

6. Polishing

- Use a suitable polishing technique (e.g. iPol from Heraeus Kulzer) which progresses gradually from rough prepolishing to a fine high-lustre polish.
- Check the occlusion.

Clinical tips
Preparing, shaping and contouring

The following section gives some useful tips and clinical advice on producing highly aesthetic restorations with Venus.

As previously mentioned, composites exhibit different viscosities. Venus, a medium viscosity material, has been adapted for shaping, contouring and preparing almost all clinical restorations. At room temperature Venus is positionally stable, does not stick to the instrument and can be applied very easily using plastic or plasma-coated instruments. Metal instruments become worn with age and develop small scratches and surface defects, in which composite residue gathers. This generally has a detrimental effect on the working properties of composites and increases their stickiness. Special metal instruments, such as the Plasmacoat from Heraeus Kulzer or Teflon-coated instruments, have been specifically developed for working with composites and are resistant to this kind of wear and tear. With proper care they will also retain their non-adhesive properties over longer periods of use.

If Venus begins to stick to any instruments, these should be replaced, though a temporary solution would be to coat them with a solvent-free bonder (e.g. Gluma Solid Bond Sealer). Lightly coating an instrument tip with bonder does not normally impair the shade or physical behaviour of the material. Bonders containing solvents such as ethanol or acetone should not be used for coating instruments. An increase in room temperature reduces viscosity and increases the stickiness of composites. Storing the material in a cool place prevents this.

Restoring the approximal contact

One of the most difficult tasks during filling treatment is to restore the approximal contact. Three main matrix systems are used for restoring the tooth contour and contact surfaces:

plastic matrices, Tofflemire matrices and sectional matrices.

Plastic matrix strips and bands are recommended for the anterior region, but are unsuitable for use in the posterior region. Plastic matrices are rarely precontoured and are normally thicker than metal matrices. Their thickness and natural resilience make it difficult to adapt them to the adjacent teeth. Though Tofflemire matrix holders and bands were developed for use with amalgam, they can be used with the majority of composites. They are especially suitable for use with condensable composites such as Solitaire 2 from Heraeus Kulzer.

Tofflemire systems form a conically shaped matrix band when they are placed and tightened round the tooth. Matrix bands made from soft metal and precontoured matrices for the Tofflemire holder are useful aids. There are, however, still some negative points. The conical shape of the band produces a flat, non-anatomical approximal surface which converges apically. The contact area is often at the junction of the occlusal surface, is indefinite and forms a large, triangular interdental space (see X-ray). This interdental space provides a niche for food debris which promotes periodontal damage and further caries.

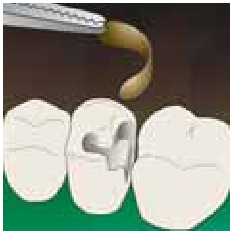
Recommended matrix techniques

	Plastic matrices	Tofflemire	Sectional matrix system
Anterior region	■	Not recommended	Not recommended
Posterior region	■	■	■

A sectional matrix system with precontoured bands made from soft metal is best for posterior teeth. These sectional bands guarantee a tight, anatomically accurate contact. They are sometimes so well adapted that they can only be removed with difficulty.

Recommended matrix technique

1



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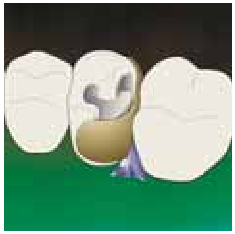

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3 A

1. Isolate the tooth using rubber dam.

2. Prepare the tooth according to the general principles for a Class II restoration. Ensure that the approximal contact with the adjacent tooth is removed to facilitate placing the sectional matrix band.

3. Select the appropriate size and shape of sectional matrix band.

4. Carefully place the contoured sectional matrix band in position. Avoid distorting the band when placing it (Figure 1).

5. Wedge the band cervically to adapt it to the tooth and to avoid an excess of filling material (Figure 2).

6. Position the retention ring with the ring forceps or rubber dam clamp forceps (Figure 3).

If the cavity is small, the tips of the forceps can be placed directly on the matrix band (Figure 3A).

If the cavity preparation is very large or extends well beyond the approximal area, the wedge should be between the matrix and the tips of the forceps (Figure 3B).

3 B

4

7. Curve the matrix band towards the adjacent tooth to achieve optimum contact (Figure 4).

8. Restore the tooth as described above using Venus and an appropriate adhesive system.

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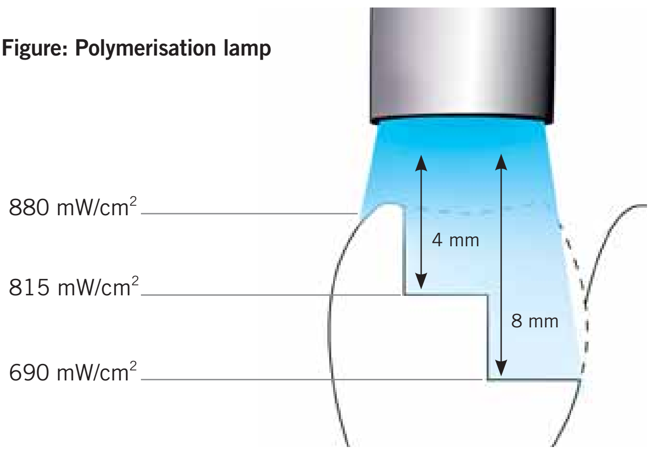
Curing and layering

Venus uses camphor quinone as a photoinitiator, so it can be polymerised using any standard light-curing unit with an adequate output (halogen lamp, plasma arc, LED unit). Camphor quinone has a maximum absorption of 468 nm.

The light output should be at least 400 mW/cm² to ensure optimum polymerisation. If your light-curing lamp does not have an integrated testing unit, the light output should be regularly tested using a portable testing unit. This is particularly relevant with halogen lamps, as the output of halogen bulbs reduces over time.

The light-emission window of the polymerisation lamp should be placed as close as possible to the surface of the material to be cured, as the light intensity greatly decreases the further the material is from the light source.

Figure: Polymerisation lamp



Light intensity is also reduced if curing is carried out at an angle to the surface of the filling or through a cusp. If you begin curing from these positions, remember to complete curing by placing the light-emission window in direct contact with the surface of the composite.

Venus restorations should always be built up in layers with a maximum thicknes of 2.0 mm to ensure optimum polymerisation and the best possible physical properties.

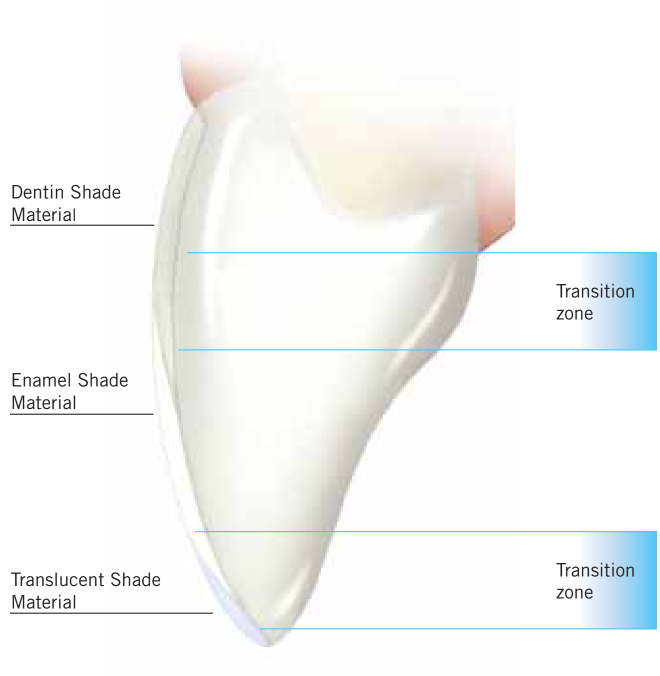
As Venus has excellent optical properties due to its Color Adaptive Matrix, the completed filling blends in with the surrounding tooth structure. Use the build-up technique described below for anterior teeth to benefit fully from these properties. With posterior teeth, build up the cusp slopes of the restoration to the dentino-enamel junction using the appropriate dentin or enamel shade. Complete the restoration by building up the incisal edges and cusp tips with a layer of translucent T1 (greatest translucency/cool blue), T2 (medium translucency/neutral) or T3 (low translucency/warm yellow).

Clinical build-up technique for the anteriors

All variations of natural tooth layering can be copied exactly using Venus shades. Opaque dentin shades exhibit the greatest depth of shade and are ideal for building up areas of lost enamel structure which require their shade or lightness to be masked. This includes, for example, the dentin core when building up point angles in the anterior area. Dentin shades are also recommended for use in the cervical area (from the cemento-enamel junction to the vestibular surface curvature).

These areas normally exhibit higher opacity and depth of shade. If required by the clinical situation, dentin shades can be used on their own without additional layering. Enamel shades exhibit a medium depth of shade and are available in a wide range of popular shades. Like dentin shades they can be used on their own. A natural appearance is achieved by layering with enamel, dentin and translucent shades.

It is best to begin by building up a core using the dentin shade. The core, which should correspond in size to the lost dentin, is completely covered with a uniform layer of enamel shade. The T1, T2 and T3 translucent shades exhibit the least depth of shade and the highest translucency. T1 has a cool hue and is suitable for whitened teeth as well as for copying highly translucent incisal edges. T2, a neutral shade, and T3 exhibit a warm hue and are ideal for normal tooth shades.



Preventing postoperative hypersensitivity

There are various causes of postoperative hypersensitivity with adhesive filling techniques. Movement of liquid in the dentinal tubules is arguably the most common cause of postoperative complaints. This can occur if the dentin surface has not been properly sealed with bonder. Working carefully with the use of a rubber dam is always recommended to prevent contamination of the operating area.

Possible problems in the techniques used for adhesive filling treatment:

Overetching the dentin
The longer the dentin is etched, the more exposed the woven collagen fibrils become. The adhesive should penetrate into these fibrils. If the dentin is etched for too long, the bonder cannot fully permeate the etched area, resulting in hydrolysis of the non-impregnated woven collagen fibrils.

Dehydrateing the dentin
After etching, the decalcified area of the dentin is mainly made up of a layer of loose collagen fibrils, which is supported by the stored water. If the dentin is overdried after etching and rinsing, this collagen matrix collapses to a dense, matted layer. These collapsed woven fibrils prevent the adhesive penetrating the exposed collagen matrix. GLUMA Desensitizer can be used after etching and rinsing to prevent this. GLUMA Desensitizer revitalises the collapsed woven collagen fibrils.

Inadequate marginal seal
Inadvertent saliva contamination during filling treatment can cause marginal gaps. The use of a rubber dam is therefore recommended to prevent the cavity from becoming contaminated by saliva and blood.

Exceeding the expiry date
Adhesives exhibit a limited shelf life, particularly if they contain chemical compounds for self-curing. The materials should be stored according to instructions to ensure an optimum shelf life. Dispose of the materials immediately after the expiry date.

Failure of the dentin bonder
Using unsuitable products and ignoring the manufacturer's recommendations, e.g. with regard to times and working procedure, can impair the dentin bond possibly resulting in pain. Also ensure that the practice personnel adhere to the correct working procedure.

Problems when light curing
Inadequate light output from the polymerisation lamp, e.g. due to an old bulb, a contaminated fibre optic or deterioration in the performance of the filter, can have a negative effect on the quality of polymerisation and consequently on the quality of the whole restoration. Check the output of the polymerisation unit regularly.

Contamination caused by moisture or oil
Lubricating oil from the compressor or handpieces can contaminate a preparation and prevent a successful bond. The air used for drying the tooth structure and adhesive should not contain any oil or moisture. To check that the air does not contain any oil, test the air jet on a sheet of filter paper.

Placing cavity linings
Cavity linings (e.g. fabricated from glass ionomer cement) can detach from the dentin under the filling, after the filling has been placed. This can result in microcracks, which lead to problems with the occlusion. Applying a suitable bonder normally eliminates the need for additional cavity lining.

One of the most popular and simplest ways of reducing or eliminating postoperative hypersensitivity is by applying a desensitizer such as GLUMA Desensitizer from Heraeus Kulzer. GLUMA Desensitizer is applied to the entire cavity surface after it has been etched, rinsed and dried. After application, GLUMA Desensitizer is dried briefly with an air jet before the adhesive is applied and polymerised according to the manufacturer's instructions.

iBond adhesive contains components of the well tried and tested GLUMA Desensitizer (Reality Five Star Award 2002).

The active substance of GLUMA Desensitizer promotes effective, long-term reduction of postoperative hypersensitivity even during treatment. The active substance penetrates directly into the dentinal tubuli, produces protein coagulation in the depths of the tubuli and stops movement of the tubular fluid by forming a septum.

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