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RATINGS:

Excellent + + + + +

Very Good + + + +

Good + + +

## Current Trends in Resin Composites

Over the past 50 years, resin composites have undergone tremendous improvements in strength, wear resistance, reduced polymerization shrinkage, esthetics, and handling characteristics. The addition of nanofillers to composites has resulted in better polishability, surface smoothness and translucency. Recently, new formulations of composites provide the ability for bulk filling, adhesion without a separate bonding agent, and improved flowability in a universal composite.

This issue of THE DENTAL ADVISOR describes current trends in resin composites including bulk-fill, self-adhesive and universal flowable composites and recommends highly rated products.

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# Current Trends in Resin Composites

## Classification of Composites

*The most common classification system for resin composites considers the distribution and average particle size of the composite filler. Most resin composites can be classified into three main categories: microfills, microhybrids, and nanofills.*

### MICROFILLS

Particle size:  
0.02-0.04  $\mu\text{m}$

Microfilled composites work best for anterior restorations due to their translucency and high luster polish (due to small particles). However, because they are less filled than other composites, they lack strength and should not be used in heavy stress-bearing areas. Microfills are declining in popularity due to advances in microhybrid and nanohybrid composites.

### MICROHYBRIDS

Particle size:  
0.4-1.0  $\mu\text{m}$

Microhybrids have the needed strength and wear for posterior composites due to their particle size and filler load. They have the polish and esthetic characteristics for anterior restorations but these properties are not sustained long term. They are the most opaque of all composites and, therefore, are great for supporting a microfill layer. Microhybrids are considered a universal composite that can be used in anterior and posterior teeth.

### NANOFILLS

Particle size:  
0.01-0.10  $\mu\text{m}$

Nanofills contain the smallest particles and are the most recently introduced composite. The two types, nanofills and nanohybrids, are composed of various nano-sized particles and fillers. They share the excellent wear and strength properties of microhybrid composites. They are superior to microhybrids in surface smoothness and polish. Nanofills and nanohybrids continue to gain popularity and acceptance due to their excellent strength, wear resistance and polishability.

**Q:** What type of composites should I use in direct composite veneering procedures?

**A:** The best composites for anterior bonding are nanofills because of their strength and high polishability. Products that have a greater shade selection and can be layered with dentin and enamel shades are ideal. We recommend products like **Venus Diamond** (Heraeus), **Venus Pearl** (Heraeus), **Beautifil II** (SHOFU DENTAL CORPORATION), **Estelite Sigma Quick** (Tokuyama Dental America), **Esthet.X HD High Definition Micro Matrix Restorative** (DENTSPLY Caulk), and **3M ESPE Filtek Supreme Plus Universal Restorative System** (3M ESPE). All of these products have the above characteristics and have received very high ratings from our clinical consultants. Please see our Product Comparison Tables on our website for more information.

# Innovations in Resin Composites

## I. Bulk-fill Composites

All resin composites exhibit some degree of polymerization shrinkage. To reduce the amount of shrinkage, incremental layering during placement is recommended. Voids or gaps in the restoration can occur if the technique is not done properly, leading to postoperative sensitivity or secondary caries. Curing between layers also adds additional time to the procedure.

To address the issues with incremental layering, some manufacturers have developed bulk-fill flowable composites (*SureFil SDR flow*, *DENTSPLY Caulk*; **Venus Bulk Fill**, *Heraeus*). Another approach is a bulk-fill composite utilizing sonic technology (*SonicFill*, *Kerr Corporation*). The high translucency of these materials allows for high light penetration, ensuring a deep depth of cure.

### Bulk-fill Flowable Composites

These composites can be used as a bulk-fill base (up to 4 mm in depth), a timesaving feature. The high viscosity allows for good adaptation to walls and proximal boxes. A shortcoming is that these composites are not highly filled and exhibit low wear resistance; therefore, they must be layered with a stronger composite.

To view a video on polymerization shrinkage, visit the Heraeus YouTube Channel at [www.youtube.com/HeraeusKulzerLLC](http://www.youtube.com/HeraeusKulzerLLC)

## II. Self-adhesive Flowable Composites

Traditional composite restorations require the application of an adhesive system to the tooth before the placement of the composite. While a two-step procedure works well in a majority of cases, there are some situations where a one-step composite restoration would be beneficial, especially when working with pediatric patients where you need to work quickly. In recent years, two manufacturers have introduced self-adhesive composites (*Fusio Liquid Dentin*, *Pentron Clinical*; *Vertise Flow*, *Kerr Corporation*). These composites bond to tooth structure without the need of a separate bonding agent, thus reducing the number of steps, saving time, and potentially reducing postoperative sensitivity. Self-adhesive composites are ideal for use as a liner under larger restorations, as pit and fissure sealants, and as small Class I and Class II restorations.

## III. Universal Flowable Composites

Traditional flowable composites are known to adapt well to cavity preparations and are easy to place. Unfortunately, some flowable composites lack strength and wear resistance due to their low filler content and have primarily been used as a base or liner or for minimally invasive restorations.

Recently, manufacturers have developed a new generation of highly filled flowable composites indicated for Class I-V restorations (**Venus Diamond Flow**, *Heraeus*, *BEAUTIFIL Flow Plus*, *SHOFU DENTAL CORPORATION*; *G-aenial Universal Flo*, *GC America*; *GrandioSO Heavy Flow*, *VOCO America*). The high filler content increases strength and wear resistance, lowers polymerization shrinkage, and allows the material to be stacked. The addition of nanofill particles assists in creating highly esthetic restorations.

## IV. What's New in Composite Technology?

The *ET 3000* (*Brasseler USA*) is an oscillating composite instrument that increases the flow of resin composites and reduces stickiness. The instrument is lightweight, cordless, portable, and has an extensive selection of titanium nitride-coated tips that mimic the shapes of the most popular composite placement instruments. *ET 3000* utilizes a lithium ion battery and operates for hours on a single charge.

## Composites

Product	Company	Type	Clinical Rating
Venus Bulk Fill	Heraeus	Bulk Fill	91%
Venus Diamond	Heraeus	Nanohybrid	91%
Venus Diamond Flow	Heraeus	Nanohybrid	91%
Venus Pearl	Heraeus	Nanohybrid	91%

**Q:** If there is a layer of adhesive between a composite restoration and the underlying enamel or dentin, how does the fluoride released in the composite reach tooth structure?

**A:** Resin composites release very little fluoride, even though it may be included in their composition. Their chemistry is very different than glass ionomers, which truly do release fluoride into the surrounding tooth structure. Bonding agents would block fluoride uptake from the tooth structure below. However, glass ionomers do not need bonding agents to bond to tooth structure. Therefore, if you are truly interested in fluoride release, you should think about lining the base of the preparation with a glass ionomer liner before placing the bonding agent and subsequent composite. Another option is to use a fluoride-containing bonding agent.

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*This special edition reprint from THE DENTAL ADVISOR provides clinically relevant information on our highly rated, award winning, dental restorative products.*

*THE DENTAL ADVISOR reports objective clinical evaluations, product comparisons, clinical performance studies, and unbiased results.*

## A company of firsts.

*Heraeus is proud of its reputation for superior materials technology and product innovation in the dental industry, leading the way in key product categories including:*

- Composites
- Whitening & Oral Care
- Impression
- Bonding
- Desensitizers
- Hygiene
- Provisional
- Denture Teeth

## Venus Diamond®

### Description

**Venus Diamond** is a low stress, light-cured, radiopaque, nano-hybrid composite that is suitable for anterior and posterior applications. It is indicated for adhesively bonded, tooth colored restorations including: direct restoration of Class I-V cavities; direct composite veneers; shape corrections of teeth; splinting of teeth; indirect restorations; restoration of primary teeth; core buildup; and repairs of porcelain and composite restorations in combination with an adequate repair system. **Venus Diamond** is available in both 4 g syringes and 0.25 g unit dose (PLT) delivery in 23 shades. It should be light cured 20 - 40 seconds per 2 mm increment with a halogen or LED light. The **Venus Diamond** PLT Basic Kit contains 10 PLTs each of six shades; Supra Polisher; iBOND Total Etch, **Venus Diamond** Shade Guide; manufacturer's instructions and illustrated guides; and MSDS. **Venus Diamond** was evaluated by 26 consultants in 641 uses. It received a 91% clinical rating.

### Suggested Retail Cost

<b>Venus Diamond</b> ® PLT Basic Kit (10 x 0.25g each of shades A1, A2, HKA2.5, A3, A3.5, B1; Shade Guide; iBOND® Total Etch samples; and Venus® Supra samples)	\$473.09
<b>Venus Diamond</b> ® PLT Refill (10 x 0.25g)	\$62.65
<b>Venus Diamond</b> ® PLT Refill \$62.65 (20 x 0.25g)	\$126.06
<b>Venus Diamond</b> ® Syringe Basic Kit (1 x 4gm each of shades A1, A2, HKA2.5, A3, A3.5, B1; Shade Guide; iBOND® Total Etch samples; and Venus® Supra samples)	\$485.96
<b>Venus Diamond</b> ® Syringe Refill (1 x 4gm)	\$102.34

### Product Features

Consultants reported that **Venus Diamond** has nice esthetics with easy polishing. Handling in posterior applications provides adequate packability. When sculpting the surface of the composite, the material is rather sticky to the instrument and

## Venus® Pearl

### Description

**Venus Pearl** is a light-cured, universal, radiopaque, nano-hybrid composite based on the urethane monomer chemistry of **Venus Diamond**. According to the manufacturer, **Venus Pearl** provides the same combination of low shrinkage stress and increased durability as **Venus Diamond** with a creamier consistency for fine detailed work with excellent sculptability and polishability. **Venus Pearl** is suitable for all classes of anterior and posterior restorations. **Venus Pearl** is designed to produce a durable, highly esthetic result with a long-lasting high luster polish. **Venus Pearl** is available in both syringe and unit dose (PLT) delivery in 27 shades including two new shades: GUM, a pink translucent shade for gingival recession areas, and CORE, a green core build up material for easy identification with a 3 mm depth of cure. **Venus Pearl** should be light cured 20-40 seconds per 2 mm increment. The basic kits contain either 60 PLT's or six syringes of composite, a 2 mL bottle of *iBond Total Etch* and accessories. The master's kit contains all 27 shades. **Venus Pearl** was evaluated by 28 consultants in 833 uses. This universal composite received a 91% clinical rating.

### Suggested Retail Cost

<b>PLT Basic Kit</b> (10 x 0.2g PLT's of shades A1, A2, HKA2.5, A3, A3.5, A4; 1 x 2ml bottle of <i>iBond Total Etch</i> ; Venus Pearl Layering Wheel; Pictorial Card)	\$378.47
<b>Syringe Basic Kit</b> (1 x 3g syringe of shades A1, A2, HKA2.5, A3, A3.5, A4; 1 x 2ml bottle of <i>iBond Total Etch</i> ; Venus Pearl Layering Wheel; Pictorial Card)	\$364.47
<b>PLT Master's Kit</b> (10 x 0.2g PLT's of shades A1, A2, HKA2.5, A3, A3.5, A4; 5 x 0.2g PLT's of shades HKA5, B1, B2, B3, C1, C2, C3, D3, CL, AM, CO, YO, OLC, OMC, ODC, OXDC, BL, BXL, OB, GUM; 5 x 0.3g PLT's of the CORE shade; 2 x 1.8g Venus Diamond Flow syringe in Baseline shade; Venus Family Shade Guide; Venus Pearl Layering Wheel; Pictorial Card)	\$844.47
<b>PLT Refill</b> (20 x 0.2g)	\$100.85
<b>PLT Refill</b> (10 x 0.2g)	\$50.12
<b>Syringe Refill</b> (1 x 3g)	\$76.76

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### Consultants' Comments

- "Final esthetics is smooth and beautiful – composite blends well with tooth."
- "Composite polishes nicely."
- "**Venus Diamond** has the consistency that I prefer in a composite- firm."
- "Very dentin like in opacity."
- "The shade guide with actual composite was a welcome addition."
- "It has a chameleon effect."

drags, making contouring a challenge. The body shades provided in the basic kit were a little too opaque to be used alone for high esthetics. Twenty-five percent of consultants reported that **Venus Diamond** was better than their current composite and 54% reported it was equivalent. Fifty-eight percent would switch to **Venus Diamond** and 81% would recommend it.

### Clinical Tip

- Wet your instrument with bonding agent for easier contouring with less stickiness. ■

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### Consultants' Comments

- "Good consistency and esthetic results."
- "Very radiopaque."
- "Material gains translucency upon light curing."
- "Polishes to a high luster."
- "Opacity is good for masking stained dentin but limits blending with enamel."
- "A little soft for packing into posterior preparations."

### Product Features

**Venus Pearl** is a very good universal composite that may be used in single shades or layered when desired. The consistency is softer than **Venus Diamond**, which was viewed as a good expansion to the Venus line of composites for dentists who like a lower viscosity, especially for anterior restorations. Handling was rated very good. Shades provided in the basic kit are somewhat opaque; however, the full range of shades available offers three levels of translucency including incisal shades. Finishing is easily accomplished with an excellent quality of the final polish. Thirty-two percent of consultants rated **Venus Pearl** better than other universal composites they had used and 43% rated it to be equivalent. Forty-six percent would switch to it and 79% would recommend it to a colleague.

### Clinical Tip

- Venus Pearl** handles well with a brush to manipulate the surface of the material. ■

## Venus Diamond® Flow

### Description

**Venus Diamond Flow** is a low stress, light-cured, radiopaque, nano-hybrid flowable composite. It is indicated for enlarged fissure sealing, cavity lining - as the first layer for Class I and II cavities; Class V fillings, minimally invasive Class I and II fillings in areas not subject to masticatory forces, minimally invasive Class III fillings; small repairs of direct and indirect restorations; and splinting of mobile teeth. **Venus Diamond Flow** is available in 1.8 g syringes and 0.2 g unit-dose (PLT) in 12 shades. All shades must be polymerized for 20 seconds using halogen or LED light-curing units that produce at least 550 mW/cm<sup>2</sup>. The **Venus Diamond Flow** Syringe Assortment contains 1.8 g syringes of shades A1, A2, A3 and baseliner with 20 intraoral tips; mixing pad; manufacturer's instructions; and illustrated cards. **Venus Diamond Flow** was evaluated by 29 consultants in 798 uses. It received a 91% clinical rating.

### Suggested Retail Cost

<b>Venus Diamond® Flow</b> Syringe Assortment (1 x 1.8g each of shades A1, A2, A3, and Baseline)	\$122.70
<b>Venus Diamond® Flow</b> Syringe Refill (1 x 1.8g)	\$35.73
<b>Venus Diamond® Flow</b> PLT Assortment (10 x 0.2g each of shades A1, A2, A3, and Baseline)	\$190.46
<b>Venus Diamond® Flow</b> PLT Refill (20 x 0.2g)	\$95.12

### Product Features

**Venus Diamond Flow** is a medium-viscosity flowable composite that is easy to use. The composite wets the tooth well, and consultants observed few bubbles and voids. Most consultants liked the viscosity of the composite, although others preferred one with more or less flow. **Venus Diamond Flow** stacks well, staying where placed with minimal slumping. The kit evaluated contained a convenient assortment of shades. Intra-oral tips fit securely on the syringes. The baseliner shade provides visual contrast to the dentin. **Venus Diamond Flow** has adequate radiopacity and very good final esthetics. Twenty-four percent of consultants reported that **Venus Diamond Flow** was better than their current flowable resin composite and 52% reported it was equivalent. Fifty-five percent would switch to **Venus Diamond Flow** and 76% would recommend it.

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### Consultants' Comments

*"The composite was easy to use."*

*"I did not experience any voids or bubbles – composite wet the tooth well."*

*"The baseliner shade is easy to distinguish from tooth structure."*

*"Final esthetics was beautiful."*

*"The composite flowed more than I would like."*

### Clinical Tip

- Use the baseliner shade to block out discolored dentin. ■



## iBOND® Total Etch

### Description

**iBOND Total Etch** is a light-cured, 5<sup>th</sup>-generation etch-and-rinse bonding agent indicated for bonding of direct composite restorations, bonding of indirect restorations in combination with light-cured luting cements, and for sealing of hypersensitive areas of teeth. It contains nanofillers in an ethanol solvent and can be applied in one coat. Light curing time is 20 seconds. **iBOND Total Etch** is available in both 4 mL bottles and single-dose delivery. The bottle kit evaluated contains one bottle of **iBOND Total Etch**, 50 applicator tips, mixing well, pictorial card, and manufacturer's instructions. **iBOND Total Etch** was evaluated by 27 consultants in 647 uses. It received a 94% clinical rating.



### Suggested Retail Cost

<b>iBOND® Total Etch</b> Bottle Value Pack (3 x 4ml)	\$374.89
<b>iBOND® Total Etch</b> Single Dose Value Pack (100 Single Dose, 100 Application tips)	\$366.81

\*Kits containing iBOND 35% Gel Etchant are also available.

## Venus® Bulk Fill

### Description

**Venus Bulk Fill** is a low stress, flowable posterior composite used as a base in Class I and II restorations. The product can be placed in 4 mm increments and is used in conjunction with a universal restorative material as the surface layer. The composite is a radiopaque nano-hybrid composite. **Venus Bulk Fill** has self-adapting characteristics to enable the material to adapt to the cavity walls. It is available in 1.8 g syringes and 0.25 g unit-dose (PLT) in a universal shade. Halogen and LED light-curing units must produce at least 550 mW/cm<sup>2</sup> for curing in 20 seconds. **Bulk Fill** was evaluated by 30 consultants in 609 uses. It received a 91% clinical rating.

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### Suggested Retail Cost

<b>Venus® Bulk Fill</b> PLT Intro Kit (15 x 0.25 gm; 5 x 0.25gm Venus Diamond® PLT's - Shade A2; 1 x 2ml iBOND® Self Etch or Total Etch bottle)	\$152.53
<b>Venus® Bulk Fill</b> PLT Refill (10 x 0.25gm)	\$69.55
<b>Venus® Bulk Fill</b> Syringe Intro Kit (3 x 1.8 gm; 5 x 0.25gm Venus Diamond® PLT's - shade A2; 1 x 2ml iBOND® Self Etch or Total Etch bottle)	\$152.53
<b>Venus® Bulk Fill</b> Syringe Refill (1 x 1.8gm)	\$32.29

### Consultants' Comments

*"Easy to use and easy to place."*

*"Flows nicely – adapts well to cavity preparation."*

*"I like the ability to fill cavity in 4 mm increments, a real time saver."*

*"Material is translucent; cannot use for anterior restorations."*

*"May flow outside of the matrix band unless tightly adapted."*

### Product Features

Consultants reported that **Venus Bulk Fill** was easy to place. The composite wets the tooth surface and adapts to the cavity preparation well with no visible bubbles. The 4 mm depth of cure is useful in deep restorations. The low viscosity of the composite allows self-leveling but can also slump and flow out of the matrix if light curing is delayed. **Venus Bulk Fill** is highly translucent and will not mask stained dentin. Thirty-seven percent of consultants reported that the **Venus Bulk Fill** was better than their current bulk-fill resin composite and 50% reported it was equivalent. Seventy percent would switch to the **Venus Bulk Fill** and 83% would recommend it.

### Clinical Tips

- Use a sectional matrix for the best interproximal contact.
- Keep the tip submerged during dispensing to minimize formation of air bubbles. ■

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### Product Features

**iBOND Total Etch** is easy to dispense in single, well-controlled drops from the 4 mL bottle. Consultants commented on the good wettability of tooth surfaces and low film thickness. They liked the one-coat application and low level of odor. Consultants suggested that etchant be provided for a more complete kit. Thirty percent of consultants reported that **iBOND Total Etch** was better than their current bonding agent and 59% reported it was equivalent. Seventy-eight percent would switch to **iBOND Total Etch** and 96% would recommend it.

### Clinical Tips

- Rub it into tooth surface and look for a glossy surface.
- Apply with smallest possible tip into the line angles and blow away excess.
- Material evaporates quickly; re-dispense bonding agent for multiple restorations. ■

### Consultants' Comments

*"Good surface wettability – only one application needed."*

*"No need to refrigerate."*

*"No post-operative sensitivity."*

*"The green bottle of iBOND Total Etch is easy to differentiate from the self-etch version in a red bottle."*

*"Curing time is too long."*

*"Provide the etchant in the kit."*

## iBOND® Self Etch

### Description

**iBOND Self Etch** is a light-curing, self-etching, one-component bonding agent (7<sup>th</sup>-generation) for use in combination with adhesive restorations. Separate conditioning (etching) of the enamel and dentin is not required; however, use of an additional etching gel on the enamel before application of **iBOND Self Etch** will not have a negative influence on the bond strength. **iBOND Self Etch** is indicated for bonding of direct light-cured composite restorations, indirect restorations (porcelain and composite inlays, onlays, veneer, crowns) in combination with a light-curing luting cement, and for sealing hypersensitive areas of teeth. Light curing time is 20 seconds. No refrigeration is required after the product is opened for first use. **iBOND Self Etch** is available in both 4-mL bottles and single-dose delivery. The bottle assortment kit contains one 4-mL bottle of **iBOND Self Etch**, 50 application tips, mixing well, pictorial card, and manufacturer's instructions. **iBOND Self Etch** bottle kit was evaluated by 26 consultants in 648 uses. It received a 96% clinical rating.

### Suggested Retail Cost

<b>iBOND® Self Etch</b> Bottle Value Pack (3 x 4ml)	\$374.89
<b>iBOND® Self Etch</b> Single Dose Value Pack (100 Single Dose, 100 Application tips)	\$366.81

### Product Features

Consultants reported that **iBOND Self Etch** was easy to dispense from the plastic bottle and apply to the tooth. The clinical procedure is easy to follow with a minimal number of steps. Most consultants commented that the 20-second curing time is too long for a bonding agent. The viscosity of the adhesive allows complete coating of tooth surfaces without running or pooling, with a low film thickness after air drying. Some consultants and patients noticed a slight odor from the acetone component of the adhesive. Thirty-five percent of consultants reported that the **iBOND Self Etch** was better than their current bonding agent and 62% reported it was equivalent. Eighty-one percent would switch to **iBOND Self Etch** and 96% would recommend it.

### Clinical Tip

- Make sure to scrub the material on the enamel. ■



### Consultants' Comments

*"Easy to dispense and use."*

*"Viscosity was great – low film thickness."*

*"The red bottle distinguishes iBOND Self Etch from the total-etch version in a green bottle."*

*"Material comes out of bottle quickly."*

*"There was a slight odor."*

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