### Enamel/Dentin

1. **Ultra-Etch 35%**  
   Ultradent

2. **Uni-Etch with BAC**  
   Bisco

3a. **Etch-37**  
   Bisco

3b. **Etch-Rite**  
   Pulpdent

4a. **Etch-37 with BAC**  
   Bisco

4b. **Gel Etchant**  
   sds/Kerr

4c. **Scotchbond Etchant**  
   3M ESPE

4d. **Uni-Etch**  
   Bisco

5a. **EnamelEtch**  
   Cosmedent

5b. **Gluma Etch 35**  
   Heraeus Kulzer

5c. **Matrixx Acid Etch**  
   Discus

5d. **Super Etch**  
   SDI

5e. **Sure Etch**  
   Danville

5f. **Vococid**  
   Voco

6a. **Ecusit Etch**  
   DMG/Zenith

6b. **37% Etching Gel**  
   Pentron

7. **Tooth Conditioner Gel Etchant**  
   Dentsply/Caulk

### Porcelain

1. **Porcelain Etch**  
   Ultradent

2. **Porcelain Etch Gel**  
   Pulpdent

3. **PorcelEtch**  
   Cosmedent

4. **Oral Ceram-Etch**  
   Gresco

5. **Porcelain Etchant**  
   Bisco

6. **Oral Comp-Etch**  
   Gresco
## Etchants

<table>
<thead>
<tr>
<th>Enamel/Dentin</th>
<th>Cost/ml</th>
<th>Concentration %</th>
<th>Color</th>
<th>Contains Silica</th>
<th>Contains Antibacterial</th>
<th>Shelf Life (years)</th>
<th>Flow</th>
<th>Bond Strength (MPa) Enamel</th>
<th>Bond Strength (MPa) Dentin</th>
<th>Supplied Syringe Tips/ml</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Ultra-Etch 35% Ultradent</strong></td>
<td>$1.77–$5.00</td>
<td>$1.43–$3.54</td>
<td>35</td>
<td>Royal Blue</td>
<td>Yes</td>
<td>No</td>
<td>4</td>
<td>5.0</td>
<td>27.3</td>
<td>35.1</td>
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<tr>
<td><strong>Uni-Etch with BAC</strong></td>
<td>$2.32–$3.47</td>
<td>$1.14–$2.25</td>
<td>32</td>
<td>Turquoise</td>
<td>No</td>
<td>Yes, Benzalkonium Chloride</td>
<td>2</td>
<td>4.5</td>
<td>22.8</td>
<td>31.3</td>
</tr>
<tr>
<td><strong>Etch-37</strong></td>
<td>$1.90</td>
<td>$0.90</td>
<td>37</td>
<td>Light Green</td>
<td>No</td>
<td>No</td>
<td>2</td>
<td>3.5</td>
<td>23.5</td>
<td>24.7</td>
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<tr>
<td><strong>Etch-Rite</strong></td>
<td>$3.53</td>
<td>$0.56</td>
<td>38</td>
<td>Medium Blue</td>
<td>Yes</td>
<td>No</td>
<td>2</td>
<td>5.0</td>
<td>24.9</td>
<td>23.8</td>
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<tr>
<td><strong>Etch-37 with BAC</strong></td>
<td>$2.32</td>
<td>$1.14</td>
<td>37</td>
<td>Aqua</td>
<td>No</td>
<td>Yes, Benzalkonium Chloride</td>
<td>2</td>
<td>4.0</td>
<td>24.6</td>
<td>28.4</td>
</tr>
<tr>
<td><strong>Gel Etchant sds/Kerr</strong></td>
<td>$3.84</td>
<td>N/A</td>
<td>37.5</td>
<td>Deep Purple</td>
<td>Yes</td>
<td>No</td>
<td>2</td>
<td>5.0</td>
<td>26.3</td>
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<tr>
<td><strong>Scotchbond Etchant</strong></td>
<td>$5.83</td>
<td>$4.74</td>
<td>35</td>
<td>Blue</td>
<td>Yes</td>
<td>No</td>
<td>3</td>
<td>5.0</td>
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<td>24.0</td>
</tr>
<tr>
<td><strong>Uni-Etch</strong></td>
<td>$1.90</td>
<td>$0.90</td>
<td>32</td>
<td>Light Green</td>
<td>No</td>
<td>No</td>
<td>2</td>
<td>4.0</td>
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<td>34.6</td>
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<tr>
<td><strong>EnamelEtch</strong></td>
<td>$3.00</td>
<td>N/A</td>
<td>37</td>
<td>Aqua</td>
<td>Yes</td>
<td>No</td>
<td>1.5</td>
<td>4.0</td>
<td>26.3</td>
<td>25.7</td>
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<tr>
<td><strong>Gluma Etch 35</strong></td>
<td>$5.15</td>
<td>N/A</td>
<td>35</td>
<td>Blue</td>
<td>Yes</td>
<td>No</td>
<td>3</td>
<td>5.0</td>
<td>29.1</td>
<td>24.0</td>
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<tr>
<td><strong>Matrixxx Acid Etch</strong></td>
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<td>N/A</td>
<td>38</td>
<td>Blue</td>
<td>Yes</td>
<td>No</td>
<td>2</td>
<td>5.0</td>
<td>27.1</td>
<td>22.7</td>
</tr>
<tr>
<td><strong>Super Etch</strong></td>
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<td>$1.38–$2.07</td>
<td>37</td>
<td>Blue</td>
<td>Yes</td>
<td>No</td>
<td>3</td>
<td>5.0</td>
<td>24.6</td>
<td>23.8</td>
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<tr>
<td><strong>Sure Etch</strong></td>
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<td>37</td>
<td>Blue</td>
<td>Yes</td>
<td>No</td>
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<td>5.0</td>
<td>22.8</td>
<td>22.6</td>
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<td><strong>Vococid</strong></td>
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<td>N/A</td>
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<td>Turquoise</td>
<td>Yes</td>
<td>No</td>
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<td>5.0</td>
<td>24.1</td>
<td>21.4</td>
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<td><strong>Ecusit Etch</strong></td>
<td>$13.07</td>
<td>N/A</td>
<td>37</td>
<td>Blue</td>
<td>Yes</td>
<td>No</td>
<td>3</td>
<td>4.5</td>
<td>23.6</td>
<td>22.6</td>
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<tr>
<td><strong>37% Etching Gel</strong></td>
<td>$5.75</td>
<td>N/A</td>
<td>37</td>
<td>Blue</td>
<td>Yes</td>
<td>No</td>
<td>2</td>
<td>4.0</td>
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<td>30.9</td>
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<tr>
<td><strong>Tooth Conditioner Gel Etchant</strong></td>
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<td>$1.43</td>
<td>34</td>
<td>Blue</td>
<td>Yes</td>
<td>No</td>
<td>2</td>
<td>5.0</td>
<td>29.2</td>
<td>25.0</td>
</tr>
</tbody>
</table>
Etching tooth structure prior to applying an adhesive is as routine as using a handpiece to prepare a cavity. While enamel etching is a time-honored procedure, there is still some limited opposition to etching dentin. However, with the surge of self-etching adhesives, there are some in the profession preaching doom and gloom for more conventional etchants. Nevertheless, with the inability of many self-etch products to be effective on unprepared enamel, conventional etchants are still the products of choice for most dentists.

**Composition**  30%-40% phosphoric acid, which will optimally etch both enamel and dentin in 15-20 seconds.

**Viscosity**  Gels are favored over liquids due to our ability to exercise more control over the application of a gel. But not all gels are created equal. It should have enough flow to get into line angles and between tooth structure and tight matrices, but not be excessively fluid. An etchant gel should also have a smooth consistency and not be jelly-like. We have included a flow test for these products.

**Color**  Allows you to see where you applied the gel. Should be intense enough for easy visibility, but should not discolor any base material or tooth structure.

**Silica vs. No Silica**  Silica thickeners may deposit silica particles on the dentin surface and could interfere with bonding. However, our tests found no advantages as far as bond strength is concerned regardless of whether the etchant contained silica or not.

**Antimicrobial Additives**  We have only seen two studies on this subject, one saying you do need it and the other casting doubt on that need. The latter study found no difference in zones of inhibition around dentin/enamel discs that had been treated with etchants containing or not containing an antimicrobial, all of which were then placed in contaminated agar. The antimicrobial in this study was benzalkonium chloride (BAC).

**Handling and Packaging**  Should be easy to apply and easy to wash off. A syringe with a fine needle tip definitely simplifies application.

**Application**

**Step 1: Apply for 15 seconds**

Apply etchant to enamel, keeping it off dentin if possible. On enamel, there is a wide range of acceptable etching times, from 15–60 seconds. Our tests also show dentin may not be as etch-sensitive as we may have thought. With OptiBond Solo plus, bond strengths were highest when dentin was etched 5, 10, or 15 seconds, while 30 or 60 seconds were lower but still seemingly high. For other products, our tests showed that 5 or 10 seconds were optimal, with 30 seconds still acceptable. For self-etch products, our tests showed that 60 seconds were the optimal time, but 30 seconds were also acceptable. In all cases, when etching dentin, the time has been reduced from 60 seconds to 5, 10, or 15 seconds.
acceptable. The two-minute etch was the worst. For Prime & Bond \( NT \), bond strengths dropped off after 15 seconds, while two minutes was again definitely the worst. Therefore, 15 seconds continues to be our recommended etching interval for dentin and never etch for longer than 60 seconds.

**Step 2: Lightly agitate the etchant**
Flow the etchant over the dentin and immediately start to time 15 seconds. Use a disposable brush or applicator tip, if necessary, to push the etchant into any restricted areas of the cavity. Lightly agitating the etchant during this brief application period may also be beneficial just to make sure the entire preparation is properly coated with etchant.

**Step 3: Rinse for 5 seconds**
Have the air-water syringe and suction ready to go. Begin rinsing as soon as the 15 seconds is up. Rinse well for five seconds, which had significantly higher bond strengths than when a 10-second rinse was tested. However, the five-second guideline is contingent on all the etchant being rinsed off the teeth in that time period. Otherwise, continue rinsing until this goal is accomplished.

**Bond Strength**
Our tests have shown very small differences between the products. These values can be found in each product's narrative.
syringes. The expiration date is printed on the label of the IndiSpense container.

A conventional Ziploc bag holds the unit dose syringes, which are individually sealed in small clear plastic bags. The syringes themselves are miniature versions of the conventional ones and already have a mini-Inspiral tip attached. To activate, you rotate the Inspiral tip about a quarter-turn.

**Composition**
32% polymer-thickened gel without silica, with antibacterial benzalkonium chloride (BAC).

**Consistency and Handling**
4.5 Medium viscosity, but tends to be on the gooey side.

**Colors**
Turquoise.

**Bond Strength (MPa)**
- Enamel: 22.8
- Dentin: 31.3

**Syringes**
Cost: $39.00/16.8ml ($2.32/ml)
Includes:
- 4 syringes (5g/4.2ml ea)
- 60 disposable syringe tips (3.6/ml)
- Total material = 20g/16.8ml

**EZ-DOSE**
Cost: $59.00/100 ($3.47/ml)
Includes:
- 100 EZ-DOSE tips (0.2g/0.17 ml ea)
- Total material = 20g/17ml

**EZ-DOSE Syringe**
Cost: $6.00

**Economy Bottle**
Cost: $34.00/18g/15.12ml ($2.25/ml)

**Bulk Bottle**
Cost: $67.00/70g/58.8ml ($1.14/ml)

**Packaging**
Non-resealable plastic bags contain syringes with labels that are moisture-resistant and include the expiration date, as do the bags. Metal syringe tips come already bent.

**EZ-Dose Tips**
Plastic tube holding these small, squeezable plastic cannulas with long, thin necks whose tips are scored to allow the contents to be dispensed without needing to be cut with scissors. You can either use the cannulas by themselves or you can insert one in a small plastic syringe. Either way, you have good control over the amount dispensed. There is no identification at all, however, on the cannulas. If you are using several products with this type of packaging and forget which is which, you’d have to go back to the original packaging to prevent mix-ups.

**Directions**
Plain paper foldout with seven black and white photos and illustrations. Straightforward and easy to follow. Contains wise precautionary message to check the flow of the etchant away from the patient and to never apply excessive pressure to the plunger to overcome a possible clogged tip. Recommends using EtchArrest on adjacent restorations and/or tissues. We agree with this step if you are using a more aggressive etchant such as hydrofluoric acid, but consider this overkill with phosphoric acid. Also advised to dry after etching, but what if you are using an adhesive that requires a wet tooth?
**Composition**

37% polymer-thickened gel without silica.

**Consistency and Handling**

3.5 Low-medium viscosity, but tends to be on the runny side.

**Color**

Light green.

**RAVES & RANTS**

- Bottle is very inexpensive
- If you want more flow, this is it
- Can be difficult to see on tooth
- Not enough syringe tips

---

**Etch-37**

**Bisco**

**Syringes**

Cost: $32.00/16.8ml ($1.90/ml)

Includes:

- 4 syringes (6g/4.2ml ea)
- 60 disposable syringe tips (3.6/ml)
- Total material = 20g/16.8ml

**Bulk Bottle**

Cost: $53.00/58.8ml ($0.90/ml)

**Shelf life:** 2 years

**MSDS:** Included

**Bond Strength (MPa)**

Enamel 23.5
Dentin 24.7

**Packaging**

Syringes come in a non-resealable plastic bag. Labels on syringes are moisture-resistant and include the expiration date, as do the bags. Metal syringe tips come already bent. Bottle comes in clear plastic tube.

**Directions**

Plain paper foldout in 12 languages, includes MSDS. Gives good information about not allowing a tooth to dry out after etching.

---

**Etch-37**

**Bisco**

**Syringes**

Cost: $16.95/4.8ml ($3.53/ml)

Includes:

- 4 syringes (1.2ml ea)
- 8 syringe tips (1.7/ml)

**Refills:**

Cost: $27.97/50ml ($0.56/ml)

Includes:

- 2 syringes (25ml ea)

**Shelf life:** 2 years

**MSDS:** Included

**Color**

Medium blue.

**Bond Strength (MPa)**

Enamel 24.9
Dentin 23.8

---

**Etch-37**

**Bisco**

**Syringes**

Cost: $32.00/16.8ml ($1.90/ml)

Includes:

- 4 syringes (6g/4.2ml ea)
- 60 disposable syringe tips (3.6/ml)
- Total material = 20g/16.8ml

**Bulk Bottle**

Cost: $53.00/58.8ml ($0.90/ml)

**Shelf life:** 2 years

**MSDS:** Included

**Bond Strength (MPa)**

Enamel 23.5
Dentin 24.7

**Packaging**

Syringes come in a non-resealable plastic bag. Labels on syringes are moisture-resistant and include the expiration date, as do the bags. Metal syringe tips come already bent. Bottle comes in clear plastic tube.

**Directions**

Plain paper foldout in 12 languages, includes MSDS. Gives good information about not allowing a tooth to dry out after etching.

---

**Etch-Rite**

**Pulpdent**

**Least expensive**

**Least runny**

**Viscosity too thick for some**

**Only eight syringe tips—why even bother?**

**Composition**

38% gel with silica thickener.

**Consistency and Handling**

3.5 Thick but easy to handle, good consistency, easy to rinse.

---

**Etch-Rite**

**Pulpdent**

**Syringes**

Cost: $16.95/4.8ml ($3.53/ml)

Includes:

- 4 syringes (1.2ml ea)
- 8 syringe tips (1.7/ml)

**Refills:**

Cost: $27.97/50ml ($0.56/ml)

Includes:

- 2 syringes (25ml ea)

**Shelf life:** 2 years

**MSDS:** Included

**Color**

Medium blue.

**Bond Strength (MPa)**

Enamel 24.9
Dentin 23.8
**Composition**
37% polymer-thickened gel without silica and with antibacterial benzalkonium chloride (BAC).

**Consistency and Handling**
4.0 Medium viscosity, but tends to be on the gooey side.

| **Colors** | Aqua |

<table>
<thead>
<tr>
<th><strong>Bond Strength (MPa)</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Enamel</td>
<td>24.6</td>
</tr>
<tr>
<td>Dentin</td>
<td>28.4</td>
</tr>
</tbody>
</table>

**Packaging**
Syringes come in a clear plastic tray with a cardboard lid that slides right or left to allow access to the contents. Printing on the syringes is moisture-resistant and includes the name and identification as 38% phosphoric acid, but does not have the expiration date. However, a sticker on the bottom of the box has the expiration date. There are only eight syringe tips in this kit, which would be barely enough for one syringe. The bulk syringes come in a cardboard box. Their moisture-resistant labels include the expiration date, which is also on the box.

**Directions**
Cardboard inside lid in eight languages. Straightforward, easy to understand. Curiously, the top of the directions state that it can be used for dentin, enamel, and glass ionomer cement, yet there is no mention about glass ionomer anywhere else. And, while it tells you to leave the surface wet or dry depending on your adhesive, it states in the very next sentence that “etched enamel should appear chalky white”. How do you see chalky white enamel if you leave the tooth wet?

---

**Etch-37 with BAC**

<table>
<thead>
<tr>
<th><strong>Syringes</strong></th>
<th>Cost: $39.00/16.8ml ($2.32/ml)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Includes:</td>
<td>4 syringes (5g/4.2ml ea)</td>
</tr>
<tr>
<td></td>
<td>60 disposable syringe tips (3.6/ml)</td>
</tr>
<tr>
<td></td>
<td>Total material = 20g/16.8ml</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Bulk Bottle</strong></th>
<th>Cost: $67.00/58.8ml ($1.14/ml)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Shelf life:</strong></td>
<td>2 years</td>
</tr>
<tr>
<td><strong>MSDS:</strong></td>
<td>Included</td>
</tr>
</tbody>
</table>

**Packaging**
Syringes come in a non-resealable plastic bag. Labels on syringes are moisture-resistant and include the expiration date, as do the bags. Metal syringe tips come already bent. Bottle comes in clear plastic tube.

**Directions**
Plain paper foldout in 12 languages, includes MSDS. Gives good information about not allowing a tooth to dry out after etching. There is a card in the EZ-Dose syringe bag that tells you how to use it, but not how to sterilize it.
**Composition**
37.5% gel with silica thickener.

**Consistency and Handling**
5.0 Thick, but handles well, good consistency, flows well, but not runny, easy to rinse.

---

**Gel Etchant**
**sds/Kerr**

---

**RAVES & RANTS**
- Rinses easily
- Distinctive color
- Too thick for some
- Rinsing time is overkill

**Color**
Deep purple.

**Bond Strength (MPa)**
- Enamel: 26.3
- Dentin: 29.8

**Packaging**
Small cardboard box. Syringe tips are pre-bent and in 3 separate sealed bags of 10 each. The printing on the syringe resists disinfection and includes the expiration date.

**Directions**
Plain paper, 16 languages, annoying foldout design. Recommends rinsing for 15 seconds, which is overkill.

---

**Scotchbond Etchant**
**3M ESPE**

---

**RAVES & RANTS**
- Not runny
- Easy to rinse
- Directions do not even mention etching dentin
- Tendency to dry out in syringe

**Color**
Blue.

**Bond Strength (MPa)**
- Enamel: 27.3
- Dentin: 24.0

**Packaging**
Non-resealable plastic bag with push-type syringes loose inside. Expiration date is on the bag and the moisture resistant labels of the syringes. Needle syringe tips are not prebent, but you get the second most in this category for the volume of etchant supplied.
**Etchants**

**Uni-Etch**  
Bisco  
4d

---

**Syringes**  
Cost: $32.00/16.8ml ($1.90/ml)  
Includes:  
- 4 syringes (5g/4.2ml ea)  
- 60 disposable needles (3.6ml)  
- Total material = 20g/16.8ml  

**Bulk Bottle**  
Cost: $53.00/58.8ml ($0.90/ml)  
**Shelf life:** 2 years  
**MSDS:** Included

---

**RAVES & RANTS**

- Leaves dentin surface clean  
- High dentin bond strength  
- Somewhat difficult to see  
- Tends to be runny

---

**Composition**  
32% polymer-thickened gel without silica.

**Consistency and Handling**  
4.0

--

**Color**  
Light green, which is sometimes hard to see on the tooth.

**Bond Strength (MPa)**

<table>
<thead>
<tr>
<th>Material</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enamel</td>
<td>28.4</td>
</tr>
<tr>
<td>Dentin</td>
<td>34.6</td>
</tr>
</tbody>
</table>

---

**Packaging**

Non-resealable plastic bags contain syringes with labels that are moisture-resistant and include the expiration date, as do the bags. Metal syringe tips come already bent. Plastic squeeze bottles come in clear plastic containers with a white plastic top that pops up for dispensing. Labeling on the bottle is moisture-resistant and contains the expiration date.

**Directions**

Plain paper foldout in 12 languages, includes MSDS. Gives good information about not allowing a tooth to dry out after etching.

---

**EnamelEtch**  
Cosmedent  
5a

---

**Composition**  
37% organic gel thickened with silica.

**Consistency and Handling**  
4.0

---

**Color**  
Aqua blue.

---

**RAVES & RANTS**

- Leaves no residue  
- As simple packaging as it gets  
- No tips provided  
- Can’t it also etch dentin?

---

**Syringe**  
Cost: $ 7.50/2.5ml ($3.00/ml)  
**Includes:**  
- 1 syringe (2.5ml)  

**Shelf life:** 1.5 years  
**MSDS:** Not included

---

**Composition**  
37% organic gel thickened with silica.

**Consistency and Handling**  
4.0

---

**Color**  
Aqua blue.

---

**Directions**

Plain paper foldout, 12 languages, in annoying foldout design. Still restricts use to enamel — there is absolutely nothing stated about dentin, even though this product is also packaged with Adper Scotchbond Multi-Purpose Plus adhesive!
**Gluma Etch 35**

*Heraeus Kulzer*

**RAVES & RANTS**
- Just about best enamel bond strength
- Good supply of syringe tips
- Relatively expensive
- Rinsing time is an overkill

**Composition**
35% gel with silica thickener.

**Consistency and Handling**
5.0 Thick, but handles well, good consistency, flows well but is not runny, easy to rinse.

**Colors**
Blue.

**Bond Strength (MPa)**
- Enamel: 26.3
- Dentin: 25.7

**Packaging**
Simple push-type syringe in a Ziploc bag. Moisture resistant label includes the expiration date.

**Directions**
None.

---

**Matrixx Acid Etch**

*Discus*

**RAVES & RANTS**
- Flows, but not runny
- Least expensive syringe kit
- Dentin bond strength relatively low
- Why only five syringe tips?

**Composition**
38% gel with silica and xantham gum thickener.

**Bond Strength (MPa)**
- Enamel: 26.3
- Dentin: 25.7

**Packaging**
Simple push-type syringe in a Ziploc bag. Moisture resistant label includes the expiration date.

**Directions**
None.
**Consistency and Handling**

5.0 Thick, but handles well, good consistency, flows well but is not runny, easy to rinse.

<table>
<thead>
<tr>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
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<tbody>
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</table>
| **LEAST FLOW**

**Color**

Blue.

**Bond Strength (MPa)**

- **Enamel**: 24.6
- **Dentin**: 23.8

**Packaging**

Clear sealed plastic bag with five syringe tips in their own sealed bag inside. Expiration date printed on the bag, but not the syringe. Cap on syringe is very difficult to remove.

**Directions**

None specifically for this product. Directions included are for its companion adhesive, Cabrio, and are on a small coated paper sheet.

---

**Composition**

37% gel with silica thickener.

**Consistency and Handling**

5.0 Low-medium viscosity but not runny, easy to rinse. The Mini Kit material, although still well within the expiration date, had completely dried out.

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</tbody>
</table>
| **LEAST FLOW**

**Color**

Blue.

**Bond Strength (MPa)**

- **Enamel**: 27.1
- **Dentin**: 22.7

**Packaging**

Expiration dates are printed on boxes and moisture resistant labels of syringes.

**Mini Kit**

- **Cost**: $12.70/4.8ml ($2.65/ml)
- **Includes**:
  - 4 syringes (1.2ml ea)
  - 20 disposable syringe tips (4.2/ml)
  - $49.60/200 ($0.25 each)

**Bulk Syringe**

- **Cost**: $16.50/12ml ($1.38/ml)
- **Includes**:
  - 1 syringe
  - 25 dispensing tips (8.1ml)
- **Shelf life**: 3 years
- **MSDS**: No

**Mini Kit**

Mauve cardboard box with white plastic tray securing the syringes and tips, the latter of which are under a clear plastic seal.

**Bulk Syringe Kit**

White hard plastic case in a cardboard sleeve. Syringes and tips are in Ziploc bags.

**Bulk Syringe**

Clear plastic molded container with mauve cardboard backing.

**Directions**

Plain paper foldout in eight languages. Tells you to etch enamel for at least 30 seconds, which is an overkill in most situations.

---

**Super Etch**

NEW

**Raies & Rants**

+ Small, medium, and large syringes—you get to choose
+ Relatively inexpensive
- Small syringes were totally dried up
- 30 seconds for etching enamel is an overkill in most situations
**Sure Etch**

**Danville Materials**

**Composition**
37% gel with glycerin and silica thickener.

**Consistency and Handling**
5.0 Thick, but handles well, good consistency, flows well but is not runny, easy to rinse.

**Color**
Blue.

**Bond Strength (MPa)**
- Enamel: 22.8
- Dentin: 22.6

**Packaging**
Clear hard plastic tube with syringe loose and tips in a Ziploc bag. Labeling is moisture resistant and includes the expiration date.

**Directions**
Coated paper. Suggests etching both enamel and dentin for 30 seconds, which is an overkill for both.

---

**Vococid**

**Voco**

[www.voco.com/usa](http://www.voco.com/usa)

**Composition**
34.5% gel with silica thickener.

**Consistency and Handling**
5.0 Thick, but handles well, good consistency, flows well but is not runny, easy to rinse.

---
Composition
37% gel with silica thickener.

Consistency and Handling
4.5 Good flow, not runny, rinses off easily and cleanly.

Use
Dispensed using a unique applicator called an Ecu-Pen. The unit dose etchant comes in plastic tips with bendable ends. These tips fit into a slot in the front end of the Ecu-Pen, whose plunger is activated by rolling the serrated wheel on its top surface. The Ecu-Pen itself measures 12.8cm in length which increases to 17.5cm with a tip. It is called Ecu-Pen since it is designed to be held like a pen.

If the plunger is extending into the slot for the tip of etchant, retract it into the Ecu-Pen by rolling the plunger forward. Insert a tip of etchant into the slot, bend the end of the tip to a convenient angle, remove the tip cover, and roll the wheel with your index finger toward you to extrude the material. This is an easy movement (almost no learning curve) and allows fairly precise delivery of the etchant. Unfortunately, it is difficult to clean the wheel due to all its nooks and crannies. This problem seems to get worse after repeated autoclaving. (Autoclavable for 100 cycles.)

Packaging
Blue cardboard box with syringe and tips loose on the inside. Box and syringe label have expiration date, but the latter disintegrates upon disinfecting. There are two absurdly long (1.6in/4.0cm) needle syringe tips, which are evidently not even meant to be used intraorally, since two tips will not take you very far.

Directions
Plain paper, two languages. English translation is quite rough. For example, it is to be used to prepare teeth for “sealing for caries prophylaxis”. In addition, you are supposed to rinse for the overkill time of 15-30 seconds.

Color
Medium blue. At least two evaluators thought its color should be more intense for easier visibility.

Bond Strength (MPa)
Enamel 23.6
Dentin 22.6

Packaging
Ecusit Cardboard box with two sealed foil pouches, each having a plastic bag with the tips, which are clear plastic with white covers over the ends. Expiration date is on a sticker attached to the box of tips and on each foil pouch. The tips are convenient for sealants (for which they were originally intended), but there is not enough etch in each tip for large restorative cases.

Ecu-Pen Cardboard box.

Directions
Small, plain paper, foldout pamphlet with five good, clear, color clinical photographs illustrating the application steps. Curiously, it is stated that this material is only indicated for etching enamel. How about dentin?
**Etchants**

**37% Etching Gel**

**Pentron**

**RAVES & RANTS**

- Very good dentin bond strength
- Best supply of syringe tips
- Very expensive
- Unidose would be nice

**Composition**

37% gel with silica thickener.

**Consistency and Handling**

4.0 Has optimal consistency for a gel etchant. Good flow but not runny. Rinses easily and completely.

**Color**

Blue.

**Bond Strength (MPa)**

- Enamel: 26.8
- Dentin: 30.9

**Packaging**

Non-resealable plastic sealed bag with white side containing all the labeling information and the other side is clear. Tips are in separate sealed bags of 10 each and syringes are loose. Expiration dates are on the syringes and on the labeling of the bag. Labels are moisture resistant.

**Directions**

Single sheet of plain paper in 12 languages. Instructions are brief, but up-to-date.

**Cost:** $11.50/2ml ($5.75/ml)

**Includes:**
- 2 syringes (1ml ea)
- 2 bags of syringe tips (10 ea)(10/ml)

**Shelf life:** 2 years

**MSDS:** Included

---

**Tooth Conditioner Gel Etchant**

**Dentsply/Caulk**

**RAVES & RANTS**

- Good enamel bond strengths
- Has stood the test of time
- Plunger on syringe not very sturdy
- Still recommends calcium hydroxide

**Composition**

34% gel with silica thickener.

**Consistency and Handling**

5.0 Good consistency, flows easily but not runny, very easy to rinse off.

**Color**

Blue.

**Bond Strength (MPa)**

- Enamel: 29.2
- Dentin: 25.0

**Packaging**

Cardboard box contains either syringes and tips or bottles. The clear plastic syringe labels on the syringes are moisture-resistant.

**Syringes**

**Cost:** $25.70/6ml ($4.28/ml)

**Kit includes:**
- 2 syringes (3ml ea)
- 25 Applicator tips (4.2/ml)

**Bottles**

**Cost:** $17.20/12ml ($1.43/ml)

**Includes:**
- 2 btsls (6ml ea)

**Shelf life:** 2 years

**MSDS:** Included
and include its name and identification as 34% phosphoric acid, and the expiration date, which is also on the box. Bottles also have the expiration date on stickers, but these are not moisture resistant.

**Directions**
Small plain paper booklet in three languages, up-to-date except for the advice to place calcium hydroxide over deep parts of preparation.

---

**Porcelain**

Etchants applied to ceramic materials are used to create micromechanical retention on the inside of indirect restorations and on intraoral repair sites. Resin cement or restorative materials can then flow into these etched surfaces and form a strong bond to the porcelain, similar to the bond of resin to etched enamel.

It has also been suggested that these products can also increase bond strength to composite. However, our tests suggest there is no advantage to treating composite with one of these products compared to using 35% phosphoric acid.

**Composition** 4%–10% hydrofluoric acid, which will optimally etch sandblasted porcelain in one minute.

**Viscosity** Only gels are applicable for intraoral use. But not all gels are created equal. It should have enough flow to adequately wet the restorative material, but not be excessively fluid.

**Color** Allows you to see where you applied the gel. Should be intense enough for easy visibility, but should not discolor the restorative material you are etching.

**Handling and Packaging** Should be easy to apply and easy to wash off. A syringe with a fine needle tip definitely simplifies application.

**Safety** A rubber dam should be used whenever possible. If you cannot place a rubber dam, reliable soft tissue protection should be employed.

**Application**

**Step 1**
Place rubber dam, if possible. If you are repairing a restoration adjacent to the gingiva and you are unable to place a rubber dam, cover the tissue with a resin block-out material or a special gel some manufacturers include in their kits for this purpose. Apply wax or a resin block-out material to any area of the restoration you do not want to etch.

**Step 2**
Sandblast area to be etched, assuming the area to be etched is not very fragile. If you are repairing a ceramic restoration with a thin section of porcelain, skip the sandblasting step.

**Step 3**
Carefully apply HF gel on the porcelain you want to etch with a fine brush or straight from the syringe, if the gel is packaged in that form. One area that has not been investigated is the effect of HF gels on enamel or dentin. There are times when it is extremely difficult to keep the HF gel off the adjacent tooth structure. There is no doubt that the HF gel will etch tooth structure. However, since these gels are typically placed for at least one minute, it has to be assumed that the adjacent tooth may be overetched during this time. However, our tests suggest HF has minimal, if any, effect on bond strengths. Nevertheless, until we know the biological effect of HF on tooth structure, we continue to advise doing your best to keep it off the adjacent tooth structure.

If you are etching the inside of an indirect restoration, be sure to cover the entire surface, including the margins. It is always better to flow the etchant slightly over the margin rather than taking a chance part of the margin is not properly etched.

**Step 4**
With intraoral repairs, applying EtchArrest to neutralize the HF prior to rinsing seems to be a prudent procedure if you are not using a rubber dam. Place the EtchArrest directly on the HF, stir to mix, and then rinse well. However, our tests suggest that EtchArrest has a slight negative effect on bond strength, so it should only be used if necessary. Otherwise, rinse forcibly for 10 seconds with an air-water syringe. With indirect restorations, wash off the HF at the sink, using a soft brush to facilitate the washing process. Be sure to cover the drain of the sink, just in case the restoration slips out of your hands.

**Bond Strength**
Our tests found all products produced bond strengths that exceeded the cohesive strength of the porcelain specimens.
Porcelain Etch

**Ultradent**

(4.5)

---

### Composition
9.5% HF gel.

### pH
2.8

### Consistency and Handling
4.0 Excellent viscosity, with just enough flow, but slightly runny.

---

### Color
Yellow. Does not usually stain composite or resin cement, but can still leave a residue.

### Packaging
Clear plastic tray with clear plastic cover. Expiration date is on the box label and etched into the syringe. The syringes identify the fact that this is 9% HF, not 9.5% as indicated on all the other packaging, including the MSDS. Syringe labeling is encoded and moisture resistant.

### Directions
Plain paper foldout that combines this product and silane. Includes black and white photos and SEMs. Advises an application time of one minute and the use of EtchArrest (See MISCELLANEOUS).

---

Porcelain Etch Gel

**Pulpdent**

www.pulpdent.com

---

### Cost:
$33.50/4.8ml ($6.98/ml)

**Includes:**
- 4 syringes (1.2ml ea)
  - $18.70/3ml ($6.23/ml)
- 8 syringe tips (1.7/ml)

**Shelf life:** 2 years

**MSDS:** Included

---

### RAVES & RANTS
- Nice syringe
- Relatively nonstaining
- No expiration date on syringe
- Slightly gooey
**Composition**
9.5% HF gel.

**pH**
3.0

**Consistency and Handling**
4.0 Good viscosity, with just enough flow, but not runny.

**Color**
Yellow. Does not stain composites.

**Packaging**
Syringes come in a clear plastic tray with a slide-off cardboard lid. Direct printing on the syringes clearly marks the product as “9.6% Hydrofluoric Acid” for safety. Expiration date is on the bottom of the plastic tray, but not on the syringes.

**Directions**
Inside cardboard lid, seven languages. Recommended etching time is two minutes.

**Syringe**
Cost: $12.50/2.5ml/syringe ($4.80/ml)

**Bottle**
Cost: $21.00/7ml/btl ($3.00/ml)

**Shelf life:** 1.5 years

**MSDS:** Not included

---

**Composition**
9.6% HF gel.

**pH**
3.0

**Consistency and Handling**
4.0 Good viscosity, slightly gooey.

**Color**
Yellow. Does not stain composites.

**Packaging**
Syringes come in a clear plastic tray with a slide-off cardboard lid. Direct printing on the syringes clearly marks the product as “9.6% Hydrofluoric Acid” for safety. Expiration date is on the bottom of the plastic tray, but not on the syringes.

**Directions**
Inside cardboard lid, seven languages. Recommended etching time is two minutes.

**Raves & Rants**

- Good viscosity
- Minimalist packaging
- Stains composites
- No expiration date

**PorcelEtch**
Cosmedent

3

**Composition**
9.5% HF gel.

**pH**
2.5

**Consistency and Handling**
4.5 Good viscosity, with just enough flow, but not runny.

**Color**
Light green. Stains composite. Therefore, we do not recommend its use on porcelain repairs where resin cement is exposed.

**Packaging**
Ziploc bag with loose syringes. The label on the syringe is moisture-resistant and identifies the product as 9.5% HF, but it is not very prominent and there is no expiration date. Also available in 7ml plastic dropper bottle. Bottles also come in a Ziploc bag.

**Directions**
None supplied.
Oral Ceram-Etch
Gresco

**RAVES & RANTS**

- Original HF gel
- Can’t miss color
- Strange directions
- Can stain

**Composition**
9.5% HF gel.

**pH**
2.9

**Consistency and Handling**
4.0 Good consistency, which allows precise placement without worry about running to adjacent surfaces.

---

Porcelain Etchant
Bisco

**RAVES & RANTS**

- Rinses clean
- Lower concentration for more safety
- Syringe tips are much too large
- Runny

**Composition**
4% HF gel.

**pH**
2.6

**Consistency and Handling**
0 Runny, but rinses off easily.

---

**Color**
Orange-red. Stains composite. Therefore, we do not recommend its use on porcelain repairs where resin cement is exposed.

**Packaging**
Non-resealable plastic bags contain syringes with labels and 12 dispensing needles in a Ziploc bag. Metal syringe tips come already bent. Labels on syringes are moisture-resistant, include a caution about containing HF and are imprinted with the expiration date.

**Directions**
Single sheet of plain paper with recommended intraoral porcelain etching at five minutes while lab etching is eight minutes. The manufacturer states that the difference between these two times is due to the room temperature being cooler in the lab than the temperature in the mouth. There is, however, no validation for this claim.

---

**Porcelain Etchant**

- **Kit**
  - Cost: $18.00/4ml ($4.50/ml)
  - Shelf life: 2 years
  - Includes:
    - 2 syringes (2ml ea)
    - 12 dispensing needles (3.0/ml)
  - MSDS: Not included

- **Syringe**
  - Cost: $12.00/4.2ml ($2.86/ml)

- **Bottle**
  - Cost: $12.00/7g/5.9ml ($2.03/ml)
  - Shelf life: 3 years
  - MSDS: Included

**Color**
Orange. Does not stain composites.

**Packaging**
Non-resealable plastic bag contains syringe with label that is moisture-resistant and includes the expiration date, as does the bag. The kit contains Bisco Barrier Gel, which is a water soluble gel designed to protect adjacent tooth structure and gingiva from the etchant. The label on the syringe also identifies the gel as 4% HF,
and warns to avoid contact with soft tissue, skin, and eyes. But the black plastic syringe tips are too large and not nearly as precise for dispensing as small gauge metal ones.

**Composition**
9.5% HF gel.

**pH**
2.8

**Consistency and Handling**
4.0 Allows precise placement without being too runny or viscous.

**Color**
Clear. Does not stain composites.

**Packaging**
Non-resealable plastic bags contain syringes with labels and 12 dispensing needles in a Ziploc bag. Dispensing needles come already bent. Labels on syringes are moisture-resistant, include a caution about containing HF and are imprinted with the expiration date.

**Directions**
Plain paper foldout combined with MSDS. Recommended etching time is 3-4 minutes.

---

**Oral Comp-Etch**

**Gresco**

- **Cost:** $18.00/4ml ($4.50/ml)
- **Includes:**
  - 2 syringes of HF gel (2ml ea)
  - 12 dispensing needles (3.0/ml)
- **Shelf life:** 2 years
- **MSDS:** Not included

**Raves & Rants**

- Good viscosity
- No chance of staining anything
- Name doesn’t reflect versatility
- Strange directions

---

**Composition**
9.5% HF gel.

**pH**
2.8

**Consistency and Handling**
4.0 Allows precise placement without being too runny or viscous.

**Color**
Clear. Does not stain composites.

**Packaging**
Non-resealable plastic bags contain syringes with labels and 12 dispensing needles in a Ziploc bag. Dispensing needles come already bent. Labels on syringes are moisture-resistant, include a caution about containing HF and are imprinted with the expiration date.

**Directions**
Plain paper foldout combined with MSDS. Recommended etching time is 3-4 minutes.
ENAMEL/DENTIN

**Ultra-Etch 35%**, with its high quality syringe, choice of tips, almost ideal viscosity for application and rinsing off cleanly, and good contrast color, continues to top this category. It also recorded the highest dentin bond strength. It's difficult to get an etchant better than this one. And now it even has unit dose syringes. However, its directions are somewhat outdated.

**Uni-Etch with BAC** offers extra peace of mind by including a proven antimicrobial along with no silica as a thickener. Although it does leave the dentin cleaner than those etchants with silica, this does not seem to offer any clinical benefits. However, it was tied for the lowest enamel bond strengths.

**Etch-Rite** comes the closest to matching Ultra-Etch 35% with its small syringes, consistency, and good contrast color. With its large syringes, it is the least expensive in this group. However, it had relatively low dentin bond strengths. And its directions need to be improved.

**Etch-37 with BAC** also offers the same benefits as its sibling Uni-Etch with BAC (including relatively high dentin bond strength), but it gives you an extra 5% boost in acid concentration. However, it is moderately runny and difficult to see on the tooth.

**Etch-37** also offers the same benefits as its sibling Uni-Etch, but it gives you an extra 5% boost in acid concentration. It is also quite inexpensive. However, it is moderately runny and difficult to see on the tooth.

**Uni-Etch** does not use silica as a thickener. Although it does leave the dentin cleaner than those etchants with silica, this does not seem to offer any clinical benefits. Its handling could be improved and its color could be more intense, but it produced the second highest dentin bond strength.

**EnamelEtch**, named for a simpler era, is effective and has a cool color, but is slightly gooey and its name seems to indicate that it can't etch dentin, which, of course, it can. It was also the only product that did not supply syringe tips with its syringe.

**Gluma Etch 35** provides perhaps more color contrast than others, has one of the highest enamel bond strengths in this group, and provides an adequate supply of syringe tips, but the directions need much better translation.

**Matrixxx Acid Etch** is a competent product with good handling and a relatively high enamel bond strength, but its dentin bond strength is on the other end of the continuum and the five tips that come with the syringe are woefully inadequate.

**Super Etch** gives you the most options when it comes to preloaded syringes and at a reasonable cost, but our kits of the small syringes had totally dried out well before their expiration date and the enamel etching time of “at least” 30 seconds is an overkill for most preparations.

**Sure Etch** has a very nice, non-runny consistency, but it is relatively expensive. In addition, the enamel and especially dentin etching time of 30 seconds is an overkill for most preparations.

**Vococid** handles very well and has a very enticing color, but it had the lowest dentin bond strength and only two ridiculously long needle syringe tips.

**Ecusit Etch** has the most unique dispenser and unit dose packaging, allowing fairly precise delivery of the material, but it is difficult to clean the Ecu-Pen and its price is scary.
37% Etching Gel has one of the highest dentin bond strengths, the best supply of syringe tips, and medium viscosity that wets the tooth well, but it is relatively expensive.

Tooth Conditioner Gel is another old standby and certainly will produce acceptable results, especially on enamel, where it produced the highest bond strength.

**PORCELAIN**

Porcelain Etch combines a superior delivery system with the best supply of syringe tips and a reasonably nonstaining, excellent handling gel. However, it's the most expensive in this group.

Porcelain Etch Gel has a similar viscosity, delivery system, and color compared to the top product from Ultradent, but the worst supply of syringe tips in this category.

PorcelEtch has a good viscosity, but can stain composite if you choose to use it that way and it is the only product in this group that does not supply syringe tips.

Oral Ceram-Etch is the product that started the whole trend toward HF gels. Its orange-red color will definitely allow you to see where it is placed, but we did not find its recommended etching time of five minutes to be necessary.

Porcelain Etchant has a lower percentage of HF for those who are worried about the higher concentrations. It is also nonstaining and the least expensive in this group. However, it is also the most runny by far and its delivery suffers in comparison to others.

Oral Comp-Etch, being clear, eliminates any chance that it will stain the restorative material, but the lack of tint also means it is more difficult to see where you placed it.

**OTHER PRODUCTS IN THIS CATEGORY**

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<th>Onyx LG</th>
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<td>Dental Technologies</td>
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<td>Bisco</td>
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<td>Gluma Etch 20</td>
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