
## 2.Contents of the kit

①Monomer ---------- 10mL
②Catalyst V ---------- 0.7mL
③Polymer (L-Type Clear) ---------- 3g
④Polymer (L-Type Radiopaque) ---------- 5g
⑤Red Activator ---------- 5mL
⑥Green Activator ---------- 5mL
⑦Dispensing Dish ---------- 1
⑧Sponge(L・S) ---------- 1
⑨Measuring Spoon (Standard) ---------- 1
⑩Measuring Spoon (Small) ---------- 1
⑪Brush Handle (Straight) ---------- 1
⑫Brush Handle (Bent) ---------- 1
⑬Brush Tips (Blue) 〈for Bulk-mix〉 ---------- 10×2
⑭Brush Tips (White・L) 〈for Brush-dip〉 ---------- 10
⑮Brush Tips (White・S) 〈for Brush-dip〉 ---------- 10

■**Attached documents:**
Instructions / Data and References / Questions and Answers / Pictorial Instruction Card

## 2.Composition du coffret

①Liquide monomère
②Catalyseur V
③Poudre Polymère (L-TypeTransparente)
④Poudre Polymère (L-Type Radiopaque)
⑤Activateur Rouge
⑥Activateur Vert
⑦Godet de Mélange
⑧Eponges(L・S)
⑨Cuillère Mesure (Standard)
⑩Cuillère Mesure (Petite)
⑪Manche pour brossette (Droit)
⑫Manche pour brossette (Courbé)
⑬Brossettes (Bleu) 〈pour le mélange classique〉
⑭Brossettes (Blanc・L) 〈pour la technique du pinceau〉
⑮Brossettes (Blanc・S) 〈pour la technique du pinceau〉

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⑪Brush Handle (Straight) ---------- 1
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⑬Brush Tips (Blue) 〈for Bulk-mix〉 ---------- 10×2
⑭Brush Tips (White・L) 〈for Brush-dip〉 ---------- 10
⑮Brush Tips (White・S) 〈for Brush-dip〉 ---------- 10

■**Documents annexes:**
Instructions / Données et References / Questions et Réponses / Carton Illustré



## 2.Inhalt der Packung

①Monomer
②Katalysator V
③Polymer (L-Typ Klar)
④Polymer (L-Typ Radiopak)
⑤Roter Aktivator
⑥Grüner Aktivator
⑦Dappenglas
⑧Schwämmchen (L・S)
⑨Meßlöffel (Standard)
⑩Meßlöffel (Klein)
⑪Pinselhalter (Gerade)
⑫Pinselhalter (Gebogen)
⑬Pinselspitzen (Blau) 〈für Bulk-Mix-Technik〉
⑭Pinselspitzen (Weiß・L) 〈für Pinsel-Tauch-Technik〉
⑮Pinselspitzen (Weiß・S) 〈für Pinsel-Tauch-Technik〉

①Monomer ---------- 10mL
②Catalyst V ---------- 0,7mL
③Polymer (L-Type Clear) ---------- 3g
④Polymer (L-Type Radiopaque) ---------- 5g
⑤Red Activator ---------- 5mL
⑥Green Activator ---------- 5mL
⑦Dispensing Dish ---------- 1
⑧Sponge(L・S) ---------- 1
⑨Measuring Spoon (Standard) ---------- 1
⑩Measuring Spoon (Small) ---------- 1
⑪Brush Handle (Straight) ---------- 1
⑫Brush Handle (Bent) ---------- 1
⑬Brush Tips (Blue) 〈for Bulk-mix〉 ---------- 10×2
⑭Brush Tips (White・L) 〈for Brush-dip〉 ---------- 10
⑮Brush Tips (White・S) 〈for Brush-dip〉 ---------- 10

■**Beigefügte Dokumente:**
Gebrauchsanweisung / Daten und Hinweise / Fragen und Antworten / Bebilderte Anleitungskart

## 2.Contenuto della dotazione

①Monomero
②Catalizzatore V
③Polimero (L-Tipo Trasparente)
④Polimero (L-Tipo Radiopaco)
⑤Attivatore Rossa
⑥Attivatore Verde
⑦Vaschetta di Miscelazione
⑧Spugnette (L・S)
⑨Misurino (Standard)
⑩Misurino (Piccolo)
⑪Manico del pennello (Diritto)
⑫Manico del pennello (Curvo)
⑬Punte del pennello (Blu) 〈per Bulk-mix〉
⑭Punte del pennello (Bianche・L) 〈per Brush-dip〉
⑮Punte del pennello (Bianche・S) 〈per Brush-dip〉

①Monomer ---------- 10mL
②Catalyst V ---------- 0,7mL
③Polymer (L-Type Clear) ---------- 3g
④Polymer (L-Type Radiopaque) ---------- 5g
⑤Red Activator ---------- 5mL
⑥Green Activator ---------- 5mL
⑦Dispensing Dish ---------- 1
⑧Sponge(L・S) ---------- 1
⑨Measuring Spoon (Standard) ---------- 1
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⑪Brush Handle (Straight) ---------- 1
⑫Brush Handle (Bent) ---------- 1
⑬Brush Tips (Blue) 〈for Bulk-mix〉 ---------- 10×2
⑭Brush Tips (White・L) 〈for Brush-dip〉 ---------- 10
⑮Brush Tips (White・S) 〈for Brush-dip〉 ---------- 10

■**Allegati:**
Istruzioni / Dati e Riferimenti / Domande e Risposte / Scheda di istruzioni illustrata

## 2. Contenido de la caja

①Monómero
②Catalizador V
③Polímero (Tipo L Transparente)
④Polímero (Tipo L Radioopaco)
⑤Activador rojo
⑥Activador verde
⑦Vaso Dappen
⑧Esponja (L・S)
⑨Cucharilla dosificadora (estándar)
⑩Cucharilla dosificadora (pequeña)
⑪Mango pincel (recto)
⑫Mango pincel (curvado)
⑬Puntas pincel (azules) 〈técnica mezcla de componentes〉
⑭Puntas pincel (blancas・L) 〈técnica aplicación con pincel〉
⑮Puntas pincel (blancas・S) 〈técnica aplicación con pincel〉

①Monomer ---------- 10mL
②Catalyst V ---------- 0,7mL
③Polymer (L-Type Clear) ---------- 3g
④Polymer (L-Type Radiopaque) ---------- 5g
⑤Red Activator ---------- 5mL
⑥Green Activator ---------- 5mL
⑦Dispensing Dish ---------- 1
⑧Sponge(L・S) ---------- 1
⑨Measuring Spoon (Standard) ---------- 1
⑩Measuring Spoon (Small) ---------- 1
⑪Brush Handle (Straight) ---------- 1
⑫Brush Handle (Bent) ---------- 1
⑬Brush Tips (Blue) 〈for Bulk-mix〉 ---------- 10×2
⑭Brush Tips (White・L) 〈for Brush-dip〉 ---------- 10
⑮Brush Tips (White・S) 〈for Brush-dip〉 ---------- 10

■**Documentos adjuntos:**
Instrucciones de uso / Especificaciones y observaciones / Preguntas y respuestas / Ficha de instrucciones ilustradas

# 3.Precautions

**Read all instructions thoroughly before use.**

## 3-1 Safety

**Please keep the following precautions for safe use.**
(Regarding Catalyst V, read 3-2 additionally.)

**①Applications**
Use Super-Bond C&B only for the applications recommended in this publication.

**②Past history of sensitivity**
Super-Bond C&B should not be used by clinicians or on patients who are methacrylic monomer-sensitive.

**③Symptomatic irritation**
Cease using Super-Bond C&B immediately, if signs of irritation such as rashes appear, and see a physician.

**④Avoid contact**
Avoid contact with soft tissue, skin or eyes. A rubber dam is recommended for intraoral use. Dentist should use rubber or PVC dental gloves. Contaminated skin or mucosa should be wiped off immediately with alcohol and then thoroughly rinsed with running water, otherwise symptoms such as swelling may appear. If Super-Bond C&B enters the eye, immediately rinse thoroughly with running water. The patient should be examined by an ophthalmologist. When the cured adhesive contacts soft tissue, polish the adhesive surface.

**⑤Be careful of acidity**
As the Red Activator and Green Activator are acid, avoid contact with soft tissue, skin or eyes, and do not allow patients swallow them during application or rinsing.

**⑥Pulp protection**
If the preparation approaches the pulp, apply a protective base.

**⑦Give care to flammability**
Catalyst V and Monomer are flammable. Do not store where they may be exposed to open flame.

## 3-2 Precautions on Catalyst V

**Catalyst V reacts with air and water to generate heat and lose activity. Please abide by the following.**

**①Storage conditions**
Avoid high temperature, high humidity and direct sunlight. The Catalyst should **NOT** be refrigerated. (The repeated temperature changes may shorten the Catalyst's shelf-life by causing the syringe to aspirate air.)
*After a long storage, the first drop of the Catalyst may be inactive, though the rest of the material remains active.
*The syringe is made of glass, therefore it must be handled with care to prevent shock, dropping, and other physical damage.

**②Cap closure**
The cap simply slides on and off. Recap the syringe immediately after each use. Air (oxygen and humidity) deactivates the Catalyst. Do not leave the cap off during the bonding procedure.

**③Screwing**
If the Catalyst does not come out of the syringe because of the tight screw, do not try too hard to trun it. The content may splash as the syringe breaks.

**④After use**
Unscrew the male-screw two turns counter-clockwise after each use to relieve pressure on the Catalyst. (Pressure buildup can cause leakage of the Catalyst or a crack of the syringe.)

**⑤Clean spilled Catalyst immediately with wet towels**
The Catalyst reacts with oxygen. If absorbed by a flammable material, it may raise the temperature enough to cause smoldering. If the Catalyst is spilled, wipe it up immediately with a **WET(not dry)** disposable towel. Then rinse the towel to kill the Catalyst thoroughly in running water.

**⑥Cleaning of the tip of the syringe**
Wipe the tip of the syringe with a dry gauze after each use to prevent residue buildup. Then rinse the gauze with water to kill any remaining activity. Buildup of the residue may prevent the cap from seating properly.



## 3-3 Storage

**Please take the following precautions to maintain the quality.**

**①Storage conditions**
As in the case of the Catalyst V, store the Monomer, Polymer, Red Activator and Green Activator in a cool, dark location. High temperature, high humidity and direct sunlight will shorten their shelf-life.

**②Volatility**
Monomer is highly volatile. Recap the bottle immediately.

**③Contamination**
Do not mix the bottle caps.

**④Dispensing dish cleaning**
After each use, wipe the dispensing dish with a solvent such as acetone before storing. (Alternatively, soak the dish in water. Then wash and dry.)

**⑤Brush cleaning**
The Brush Tips in the kit are for one-time use. Dispose of them after use. If any other multi-use brush is used, clean the brush immediately after each use with a solvent such as acetone before the resin has cured completely. Dry with paper tissue. If necessary, reshape the bristles so they will dry to a fine point.

## 3-4 To Get the Best Results with Super-Bond C&B

**①Create and maintain a clean surface**
Oil, blood, saliva and biofilm will lower the bond strength. Clean the tooth and prosthesis thoroughly before cementing. After cleaning, take care to avoid re-contamination.

**②Dry the surfaces and prevent moisture contamination**
After cleaning, dry the surface adequately. A rubber dam is highly recommended, as it will reduce the chance of contamination by saliva, humid breath or blood.

**③Avoid eugenol-containing bases and cements**
Eugenol is a polymerization inhibitor. Therefore, eugenol-contained bases and cements should not be used with resin cements. To avoid cross-contamination, reserve a mixing dish exclusively for Super-Bond C&B. Do not use the same mixing dish for other adhesives.

**④Time constraints**
Super-Bond C&B's working and setting times are very different from those of traditional cements. Follow the instructions carefully to get the best results.

**⑤Do not re-use Polymer**
After using Super-Bond C&B in the Brush-dip technique, dispose of any excess Polymer left in the mixing dish. Do not return it into the container, as it has become contaminated with the Monomer.

**⑥Prosthesis Design**
To avoid stress concentration which encourages debonding regardless of the actual bond strength, design a prosthesis, such as wings of a bonded bridge, without thin unsupported area, which may flex during mastication.

***As in any dental treatment, the patient's individual constitution and the unique requirements of clinical case at hand must be considered before selecting materials and conditions for use.***

## 4-1 How to handle the containers, etc.

### Catalyst Syringe

**1. Decapping**
Pull off the Cap ① to open.

**2. Holding vertically**
Hold the Syringe vertical while expressing the catalyst to assure uniform drop size.

**3. Screwing**
Turn the screw ⑤ clockwise to express the catalyst.

**4. Relieving pressure**
Turn the screw ⑤ counter-clockwise two turns.

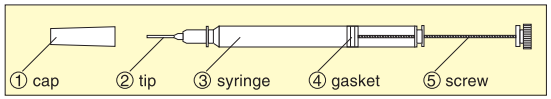
**5. Recapping**
Wipe the tip of the syringe with a dry gauze and replace the Cap ① immediately.
*See 3-2 Precautions on Catalyst V

### Brush Handle

**Attaching a Brush Tip**

There are 2 types of Brush Handles, the Brush Handle (Straight) and the Brush Handle (Bent). Both brush handles can be used with any of the brush tip (Blue), the brush tip (White・L) and the brush tip (White・S).

### The structure of the Catalyst Syringe




■Plastic capsule over the refill Catalyst Syringe
The refill Catalyst Syringe comes in a plastic capsule to prevent breakage during transportation. Before use, please remove and dispose of the capsule.

### Monomer Bottle

**1. Decapping**
Unscrew the cap.

**2. Holding vertically**
Hold the bottle vertical while expressing the drops.

**3. Squeezing**
Squeeze the bottle to express drops.

**4. Recapping**
Recap immediately after use.
*See 3.3 ② Precaution against volatility.

### Polymer Jar

**1. Decapping**
Unscrew the cap.

**2. Opening aluminum seal**
Open the aluminum inner seal. (Only at initial use)

**3. Scooping powder**
Using the supplied spoon, scoop the Polymer powder.

**4. Leveling scoop**
Level the Polymer in the scoop using the cross-bar inside the jar.

**5. Recapping**
Replace the cap.

## 4-2 Operation Steps

**Super-Bond C&B can be used either with the Bulk-mix technique or the Brush-dip technique. Choose the appropriate technique by referring to the table below.**

### Comparison of Techniques

| | Bulk-mix technique | Brush-dip technique |
|---|---|---|
| Outline of technique | Polymer powder is mixed directly to the activated liquid*. | The powder/liquid ball is formed at the tip of a brush by dipping the tip first into the activated liquid* and then touching the Polymer powder. |
| Comparison of the two techniques | Use the powder/liquid mixture immediately. | The activated liquid must be used up within 5 minutes. |
| | Applicable to comparatively wide area. | Applicable to comparatively narrow area only. |
| | As the powder/liquid ratio is lower than that of Brush-dip technique, the working time is comparatively long but the curing is slow. | As the powder/liquid ratio is higher than that of Bulk-mix technique, the working time of mixed ball is comparatively short and the curing is fast. |

*Mixture of 4 drops of Monomer and 1 drop of Catalyst V

## Surface Preparation

It is essential that all surfaces to be bonded with Super-Bond C&B should be properly prepared. Preparation varies depending on the nature of the materials.

### Tooth Surface

**Moisture control**
Isolation by rubber dam or cotton roll is recommended.
*Remove scales beforehand

**Cleaning**
Remove contaminants and stains using a polishing brush and oil-free, fluoride-free pumice. Rinse thoroughly and dry.

**Surface treatment**
Apply the appropriate Activator using a sponge pledget or brush.

**Treatment time**

| Activator | Green | Red |
|---|---|---|
| Dentin | 5-10 sec | — |
| Enamel | — | 30 sec |

Do not use Red Activator on dentin. Alternatively, enamel may be prepared with Green Activator for 30-60 seconds.
(See Answers to Questions 8-13 in "Questions and Answers".)

**Washing and drying**
Rinse thoroughly with water and dry.

### Porcelain Surface

**Cleaning**
Remove contaminants and stains from the porcelain surface. Depending on the case at hand, cleaning may require abrasive wheels and points, or a prophy cup and fluoride-free, oil-free pumice.
(Applying the Red Activator will also help remove surface contaminants.)

**Washing and drying**
Rinse thoroughly and dry.
(Use of an ultrasonic cleaner is also effective.)

**Application of Porcelain Liner M**
Following the instructions that come with the liner, apply a single coat of Porcelain Liner M.
(See Answer to Question 17 in "Questions and Answers")

**Heat treatment**
If possible, after applying Porcelain Liner M, heat the surface with a blow dryer* to enhance the bond strength.
*80 -120℃ 2-3 min.
(See Answer to Question 18 in "Questions and Answers" and Table 1 in "Data and References".)

### Metal Surface

**Cleaning**
Remove contaminants and stains.
Depending on the case at hand, cleaning may require abrasive wheels and points, or a prophy cup and fluoride-free, oil-free pumice.

**Sandblasting**
Air-abrade the surface with 50μm aluminum oxide.
*Rinse thoroughly and dry.
*After blasting, take care to avoid re-contamination. If the surface has become contaminated by oil or grease, the metal may be cleaned in an ultrasonic cleaner.
*If sandblasting is precluded (as, for example, in an intraoral repair), roughen the surface with an abrasive point.

**Protection of adjacent surfaces**
To facilitate removing the excess cement, apply a metal separating agent to surfaces that should not be bonded ... or protect the surfaces by wrapping with film.
(See Answer to Question 24 in "Questions and Answers".)

**Application of V-PRIMER**
When bonding to precious metal, brush a thin coat of V-PRIMER onto the surface before applying Super-Bond C&B.
V-PRIMER does not enhance the bond to base metal alloys.
(See Answer to Question 19 in "Questions and Answers".)

## 4-2 Operation Steps (Contd.)

## BULK-MIX TECHNIQUE

### Cooling the Dispensing Dish

Keep the Dispensing Dish in the refrigerator so it will be chilled when you use it. The recommended temperature range of the dish is 10 - 16℃.

*If condensation forms on the dish when you remove it from the refrigerator, dry the well using an air syringe. (See Answers to Questions 26,27,28 in "Questions and Answers".)

### Surface preparation

Surface preparation procedure varies depending on the materials being bonded (tooth,metal,or porcelain.) (See "Surface Preparation" in the previous page.)

### Preparation of the Activated Liquid

**Dispensing the Monomer**

Hold the Monomer bottle vertical,and dispense the appropriate number of drops into the chilled Dispensing Dish.

**Dispensing the Catalyst V**

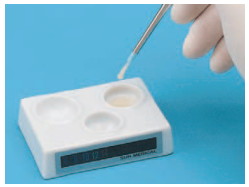
Hold the Catalyst syringe vertical, and turn the screw to dispense the proper number of drops to the Monomer. Stir lightly with a brush. This mixture is called "Activated Liquid" (See Answer to Question 30 in"Questions and Answers".)

### Mixing the Polymer

Using the supplied measuring spoon (either Spoon (Standard) or Spoon (Small)* depending on the selected Polymer/Monomer ratio), add the Polymer powder to the Activated Liquid. Stir lightly with a brush. (See Answers to Questions 31, 32 and 34 in "Questions and Answers".)

*An optional Measuring Spoon (Large) with cups of 1.2 and 2.4 sizes is separately available.

### Application of the adhesive



Immediately after mixing, use a brush to apply the cement to the surface being bonded. (See Answer to Question 33 in "Questions and Answers".)

### Seating the restoration

Insert the restoration immediately. After confirming that it is completely seated, hold in position until the cement sets. (See Answer to Question 35 in "Questions and Answers".)

*Curing time is 8～10 min. at 37℃ for standard Polymer/Monomer ratio. The time varies with temperature,the Polymer type and the Poly-mer/Monomer ratio. ( See Table 8 of "Data and References".)

### Post treatment

Remove the excess cement. To facilitate this, protect beforehand unbonded surface properly and remove the excess resin timely. (Refer carefully to Answer to Question 36 in "Questions and Answers".)

Clean the Dispensing Dish used. (See Answers to Questions 37,38 in the same.)

### Mixing ratio

| Monomer | Catalyst V | Polymer |
|---|---|---|
| 4 drops | 1 drop | 1 small cup of Measuring Spoon |
| 8 drops | 2 drops | 1 large cup of Measuring Spoon |

The Measuring Spoon (Standard) gives the standard Polymer/Monomer ratio.
The working time and the curing time can be controlled by changing the Polymer/Monomer ratio. (See Table 8 of "Data and References" and Answer to Question 32 "Questions and Answers")
To change the Polymer/Monomer ratio, use an appropriate Measuring Spoon, which sizes are shown in the Table on the right.

### Relative volumes

1 corresponds to 0.2mL

| Measuring Spoon | Small cup | Large cup |
|---|---|---|
| Small | 0.75 | 1.5 |
| Standard | 1 | 2 |
| Large | 1.2 | 2.4 |

To increase the working time of a normal type of Polymer, use the Measuring Spoon (Small).
To shorten the curing time using L-Type Polymer, use a Measuring Spoon (Large). The Measuring Spoon (Large) is sold separately. (See Answer to Question 32 "Questions and Answers".)

### Key points to achieve good seating

**Work quickly, and seat the restoration before the mixture begins to gel.**

① Keep the Dispensing Dish chilled in the refrigerator. The recommended temperature: 10-16℃.
② Mix Super-Bond C&B at the last moment before bonding.
③ In case you want to increase the working time further, use an L-Type Polymer and/or reduce the Polymer/Monomer ratio to 0.75 using a Measuring Spoon (Small). (See Table 8 of "Data and References")
④ In case you want to shorten the curing time while assuring the reasonable working time, use an L-Type Polymer and increase the Polymer/Monomer ratio to 1.2. (See Table 8 of "Data and References") A Measuring Spoon (Large) with large cups (1.2 / 2.4) is available separately. (See Table 2 of "Data and References")

## BRUSH-DIP TECHNIQUE

### Dispensing the Polymer

Dispense an appropriate amount of Polymer powder into the well "P" of the Dispensing Dish.

### Surface preparation

Surface preparation procedures vary depending on the materials being bonded (tooth, metal, or porcelain.) (See 4-2 "Surface Preparation".)

### Preparation of the Activated Liquid

**Dispensing the Monomer**

Hold the Monomer bottle vertical and dispense the appropriate number of drops into well "L" of the Dispensing Dish.

**Dispensing the Catalyst V**

Hold the Catalyst syringe vertical, and turn the screw to dispense the proper number of drops into the Monomer. Stir lightly with a brush. This mixture is called "Activated Liquid" (See Answer to Question 30 in "Questions and Answers".)

### Mixing ratio

| Monomer | Catalyst V |
|---|---|
| 4 drops | 1 drop |
| 8 drops | 2 drops |

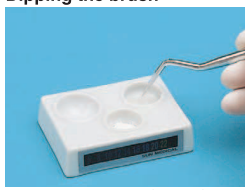
### Application of the Activated Liquid

Brush the liquid onto the surface to be bonded. (See Answer to Question 33 in "Answers and Questions".)

*The Activated Liquid decomposes gradually and loses activity. Use it within 5 min. after preparation.

### Brush-dip Procedure

**Dipping the brush**



Dip the Brush Tip (White) into the Activated Liquid in the well "L". Eliminate excessive liquid by touching the brush tip to the edge of the well.

*When you repeat the procedure, clean up the brush with gauze before you dip it.

**Forming the ball**

Touch the brush to the Polymer powder in the well "P". A small ball of powder will be picked up on the wet tip of the brush.

**Applying the ball**

Brush the powder ball onto the pre-wet surface being bonded. As soon as it touches the surface, the powder will spread out to create a creamy, homogeneous layer. If necessary, repeat the procedure until the entire surface is covered with the cement.

### Seating the restoration

Insert the restoration immediately. After confirming that it is completely seated, hold in position until the cement sets. (See Answer to Question 35 in "Questions and Answers".)
*Curing time is 5～6 min. at 37℃.

### Post treatment

Remove the excess cement. To facilitate this, protect any adjacent surfaces you will not be bonding, and remove the excess resin before it sets. (Refer carefully to Answer to Question 36 in "Questions and Answers".)
Clean the Dispensing Dish used. (See Answers to Questions 37,38 in "Questions and Answers".)

# Data and References

### Table 1 : Super-Bond Series

| Product name | Super-Bond C&B |
|---|---|
| Main use | Dental adhesive resin cement |
| Method of use | Bulk-mix technique and Brush-dip technique |
| Characteristics | (1)Self-curing dental adhesive cement based on MMA,"4-META" (bonding monomer) and "TBB" (polymerization catalyst).<br>(2)Excellent bond strength to dentin, enamel, metal, porcelain and resins for dental use.<br>(3)Super-Bond C&B forms "Hybrid layer" with dentin. This layer produces ① protection against recurrent caries and ② isolation of the pulp from outer stimuli. |

| Product name | V-PRIMER | Porcelain Liner M |
|---|---|---|
| Main use | Adhesive primer for precious metal alloys | Adhesive primer for porcelain |
| Method of use | Single liquid application | Application of the mixture of two liquids |
| Characteristics | (1)One component adhesive primer for precious metal alloys.<br>(2)Based on "VTD", a derivative of triazine dithiol.<br>(3)A single coat of V-PRIMER improves remarkably the durability of Super-Bond C&B to precious metal alloys.<br>This primer eliminates the need for other bond-enhancing steps, such as heat treatment or tin plating. | (1)Two-component adhesive primer for porcelain.<br>(2)Application of Porcelain Liner M improves remarkably the bond strength of Super-Bond C&B to porcelain and its durability. |

### Table 2 : List of Major Components and Accessories

**Components**

| Components | Major constituents | In the kit |
|---|---|---|
| Catalyst V | TBB, Hydrocarbon | Yes |
| Monomer | MMA, 4-META | Yes |
| Quick Monomer* | MMA, 4-META | Optional |
| Polymer | | |
| Clear | PMMA | Optional |
| Esthetic | PMMA, pigments | Optional |
| Opaque Ivory | PMMA, pigments | Optional |
| Opaque Pink | PMMA, pigments | Optional |
| L-Type Clear | PMMA | Yes |
| L-Type Esthetic | PMMA, pigments | Optional |
| L-Type Radiopaque | PMMA, radiopaque pigments | Yes |
| Red Activator | Phosphoric acid | Yes |
| Green Activator | Citric acid, $FeCl_3$ | Yes |

*Super-Bond C&B Quick Monomer is a monomer with curing time faster than Super-Bond C&B Monomer. Other features, such as working time and bond strength, are essentially the same as Super-Bond C&B Monomer.

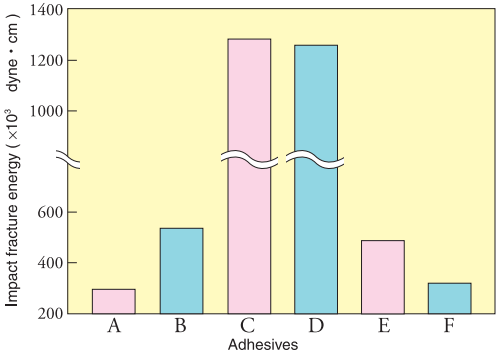
**Accessories**

| Accessories | In the kit | Remarks |
|---|---|---|
| Dispensing Dish | Yes | |
| Sponge (L・S) | Yes | For etching |
| Measuring Spoon (Standard) | Yes | Small cup 1(0.2mL) Large cup 2 |
| Measuring Spoon (Small) | Yes | Small cup 0.75 Large cup 1.5 |
| Measuring Spoon (Large) | Optional | Small cup 1.2 Large cup 2.4 |
| Brush Handle (Straight ) | Yes | |
| Brush Handle (Bent) | Yes | |
| Brush Tips (Blue) | Yes | For Bulk-mix |
| Brush Tips (White・L) | Yes | For Brush-dip |
| Brush Tips (White・S) | Yes | For Brush-dip |

### Table 3 : Physical Properties of Polymerized Super-Bond C&B

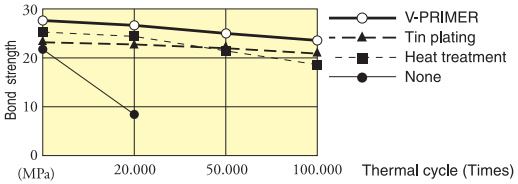
| Items | Values | Measured based on |
|---|---|---|
| Compression strength [Elastic deformation limit] | 84MPa | JIS T6602 |
| Flexural strength [Elastic deformation limit] | 67MPa | ISO4049 |
| Modulus of flexural elasticity | 18X10²MPa | ISO4049 |
| Brinell Hardness | 11 | JIS Z2243 |
| Water absorption | 31$\mu$g/mm³ | JIS T6514 |
| Solubility | 12$\mu$g/mm³ | ISO10477 |
| Film thickness<br>Standard Polymer/Monomer ratio Polymer reduced to 2/3 of the above | 20-30$\mu$m<br>15-20$\mu$m | JIS T6602<br>JIS T6602 |

### Fig. 1 : Impact Fracture Energy of Adhesives




A : Adhesive wax
B : Phosphate ester contained
C,D : 4-META contained
E : Carboxylate
F : Ionic polymer
(Adhered material is Crystalline Glass of Calcium Phosphate)
※quoted from the Quintessence Vol.4, No.2, 1985

### Fig. 2 : Durability of Bond to Precious Metals using V-PRIMER




### Table 4 : Water sorption and Solubility in water of various luting cements

| Cement | Water sorption ($\mu$g/mm³) | Solubility in water ($\mu$g/mm³) |
|---|---|---|
| EC (Zinc phosphate cement) | 419.3 | 41.3 |
| HC (Carboxylate cement) | 309.3 | 33.8 |
| FB (Glass ionomer cement) | 211.6 | 34.4 |
| BR (Resin cement) | 24.2 | 14.2 |
| ID (Resin cement) | 31.5 | 9.5 |
| PT (Resin cement) | 32.2 | 17.8 |
| Super-Bond C&B | 31.2 | 12.1 |

### Table 5 : Bond Strength to Tooth Substance

| Tooth Substance | Surface Treatment | Bond strength (MPa) |
|---|---|---|
| Enamel | Red Activator<br>Green Activator | 15<br>13 |
| Dentin | Green Activator | 17 |

### Table 6 : Bond Strength to Metals

| Metal | Surface Treatment after Sandblasting | Bond strength (MPa) |
|---|---|---|
| Gold alloy Type IV | V-PRIMER<br>400℃, 5min.<br>Tin-plating | 28<br>25<br>23 |
| Gold/Silver/Palladium alloy | V-PRIMER<br>400℃, 5min.<br>Tin-plating | 28<br>24<br>22 |
| Nickel-Chromium<br>Cobalt-Chromium<br>Hardened amalgam | -<br>-<br>- | 30<br>31<br>10 |

### Table 7 : Bond Strength to Porcelain using Porcelain Liner M

1. Bond Strength between VITA Porcelain (ground with #600 Emery paper) and Stainless Steel *1

| Thermal cycle (Times) (4℃-60℃) | Bond strength *3 (MPa) | | |
|---|---|---|---|
| | 1.000 | 5.000 | 10.000 |
| Porcelain Liner M, Super-Bond C&B | 20 | 19 | 13 |
| A bonding agent for porcelain (Imported) | 20 | 12 | 4 |
| Super-Bond C&B without Porcelain Liner M | 8 | - | - |

2. Bond Strength between VITA Porcelain(glazed surface) and Stainless Steel *2

| Thermal cycle (Times) (4℃-60℃) | Bond strength *3 (MPa) | | |
|---|---|---|---|
| | 1.000 | 5.000 | 10.000 |
| Porcelain Liner M, Super-Bond C&B | 20 | 19 | 9 |
| A bonding agent for porcelain(Imported) | 20 | 5 | 3 |

3. Bond Strength between Ceramic Bracket and Acrylic Block

| Thermal cycle (Times) (4℃-60℃) | Bond strength *3 (MPa) | | |
|---|---|---|---|
| | 1.000 | 5.000 | 10.000 |
| Porcelain Liner M, Super-Bond C&B | 20 | 11 | 10 |

Notes: *1 Bonding of VITA(559)#600 to SUS304(Sandblasted)
*2 Bonding of the glazed surface of VITA(559) to SUS304(Sandblasted)
*3 Tensile bond strength after completion of thermal cycle

### Table 8 : Effect of Polymer/Monomer Ratio on Working Time and Curing Time in Bulk-mix Technique

| Polymer | | Opacity | Working time (16℃)*1 | | | Curing time (37℃) | | |
|---|---|---|---|---|---|---|---|---|
| | | | 1.2 cup (sec.) | 1 cup (sec.) | 0.75 cup (sec.) | 1.2 cup (min.) | 1 cup (min.) | 0.75 cup (min.) |
| Normal Type | Clear Esthetic | Trans-lucent | —— | 70 | 180 | —— | 7.5 | 14.5 |
| Normal Type | Opaque Ivory Opaque Pink | Opaque | —— | 100 | 170 | —— | 8.5 | 17 |
| L-Type | L-Type Clear L-Type Esthetic | Trans-lucent | 110 | 150 | 230 | 6 | 8.5 | 15.5 |
| L-Type | L-Type Radiopaque | Radio-Opaque | 120 | 200 | 270 | 7 | 9.5 | 18 |

*1 Available time before threading starts (namely, in slurry or sol state) at 16℃

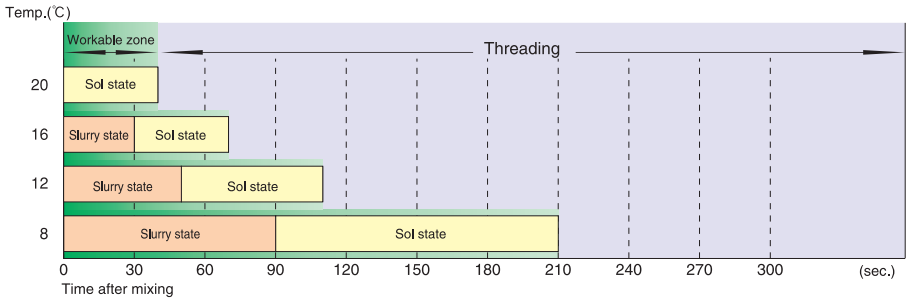
(Note) 1 cup stands for the standard Polymer/Monomer ratio. 1.2 cup means: the Polymer/Monomer ratio is 120% of the standard ratio. The same holds true for other ratios.

### Table 9 : Polymer Types and their Curing Times in Brush-dip Technique

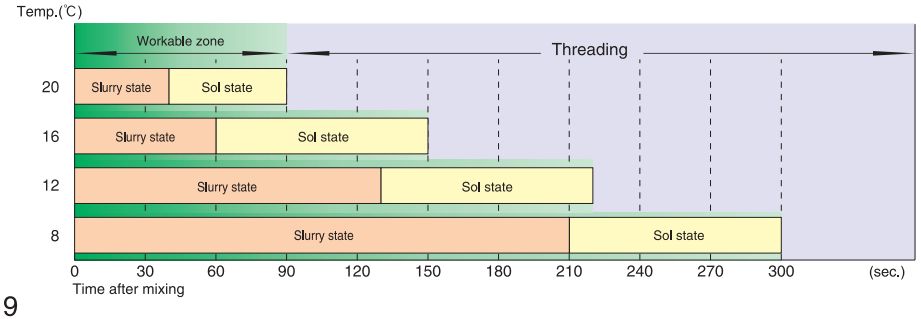
| Polymer | | Opacity | Curing time (37℃) (min.) |
|---|---|---|---|
| Normal Type | Clear Esthetic | Trans-lucent | 5 |
| Normal Type | Opaque Ivory Opaque Pink | Opaque | 5.5 |
| L-Type | L-Type Clear L-Type Esthetic | Trans-lucent | 5.5 |
| L-Type | L-Type Radiopaque | Radio-Opaque | 6 |

### Fig. 3 : Effect of Temperature on Working Time in Bulk-mix Technique

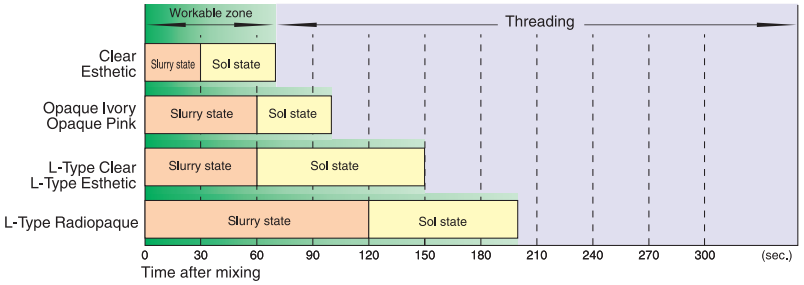
a) Clear




b) L-Type Clear




### Fig. 4 : Polymer Types and their Working Times in Bulk-mix Technique (at 16℃)




### Table 10 : Radiopacity using Polymer (L-Type Radiopaque)

| Material | Technique | Ratio to Standard Polymer/Monomer Ratio | Radiopacity*1 (%) |
|---|---|---|---|
| Super-Bond C&B using Polymer L-Type Radiopaque | Bulk-mix technique | 1.2 | 260 |
| | | 1 | 210 |
| | | 0.75 | 160 |
| | Brush-dip technique | | 330 |
| Enamel | | | 180 |
| Dentin | | | 120 |

*1 Radiopacity of Aluminium is regarded as 100% (Test Method is based on ISO 4049)

### Table 11 : Interaction of Porcelain Liner M and V-PRIMER

| Base material | Primary coating | Secondary coating | Bond strength (MPa)* |
|---|---|---|---|
| Gold/Silver/Palladium alloy | V-PRIMER | —— | 25 |
| | Porcelain Liner M | V-PRIMER | 24 |
| | V-PRIMER | Porcelain Liner M | 25 |
| Porcelain | Porcelain Liner M | —— | 22 |
| | Porcelain Liner M | V-PRIMER | 12 |
| | V-PRIMER | Porcelain Liner M | 16 |

*Composite resin is bonded with Super-Bond C&B after coating of the Primer(s) and bond strength is measured after 1,000 times of thermal cycles

### Table 12 : Effect of Heat Treatment Condition of Porcelain Liner M Coated Surface on Bond Strength

| Heating condition | Treatment time (min.) | Bond strength (MPa) |
|---|---|---|
| Not heat treated | — | 13 |
| Heat treated with a dental blower (120-130℃) | 1 | 19 |
| | 2 | 20 |
| Heat treated with a blow dryer (70-80℃) | 1 | 17 |
| | 3 | 21 |

### Table 13 : Effect of Dentin Treatment with Sodium Hypochlorite (10% solution)

| Treatment time with Sodium Hypochlorite (sec.) | Bond strength (MPa)*1 |
|---|---|
| 0 | 17 |
| 15 | 16 |
| 30 | 13 |
| 60 | 6 |

*1: The dentin surface is treated with sodium hypochlorite and then with the Green Activator, and bonded with Super-Bond C&B

# QUESTIONS and ANSWERS

## Question 1 : What is the composition of the Polymer powder?

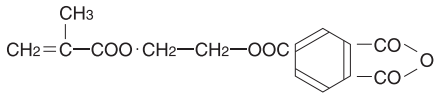
Answer : The main component of "Super-Bond C&B Polymer" is polymethyl methacrylate (PMMA). (See Table 2 in "Data and References")

## Question 2 : What is the composition of the Monomer?

Answer : The main component of "Super-Bond C&B Monomer" is methyl methacrylate (MMA). The adhesive monomer "4-META" is added to the MMA.
(The MMA is polymerized into PMMA,which is also the major component of the Polymer powder.)

## Question 3 : What is the adhesive monomer, "4-META" ?

Answer : "4-META" is an abbreviation of "4-methacryloxyethyl trimellitate anhydride." It has the structure shown below.
4-META is a derivative of MMA and is polymerized with MMA into a co-polymer. It contributes to the excellent bonding property of Super-Bond C&B. (See Answer to Question 15. )




## Question 4 : What is the composition of polymerized Super-Bond C&B? How is it different from other adhesive resins?

Answer : As mentioned in the answers to Questions 1, 2 and 3, the main component of Super-Bond C&B is PMMA/MMA, which is widely used in dental materials such as denture base resin. Once polymerized, it becomes PMMA polymer with 4-META as a co-polymer.
Virtually all other adhesive resins contain inorganic fillers such as glass and/or silica plus polyfunctional monomers such as Bis-GMA. Although Super-Bond and other adhesive resins are all classified as "adhesive resins", the compositions of the polymerized materials are entirely different.

## Question 5 : Is the mechanical strength of Super-Bond C&B lower than other adhesive resins?

Answer : Since the composition of Super-Bond C&B is different from that of composite resin type adhesive with high load of inorganic fillers, it shows lower compressive strength and hardness, but less brittleness.
It permits a tougher, more flexible bonding layer that can disperse stress and help the prosthesis endure impact and torsion without loosening or fracturing. In fact, Super-Bond C&B's unique flexibility due to its nature is an important factor contributing to its superb clinical reputation.

## Question 6 : Does water absorption reduce Super-Bond C&B's mechanical strength?

Answer : Some reports emphasize the water absorbency of Super-Bond C&B and suggest that this may affect its durability. Because it consists almost exclusively of PMMA, which contains a hydrophilic group but is basically a watertight resin, Water sorption and Water solubility values of Super-Bond are as low as those of other resin cements. These values are almost negligible, if compared with inorganic cements such as zinc phosphate cements, carboxylate cements or glass ionomer cements. (See Table 4 in "Data and References")
According to a clinical report, Super-Bond C&B exposed at the crown margin has been maintained for more than 10 years without color change. After a full decade in the mouth, the cement exhibited excellent margin seal with only minor surface abrasion.
When applied under normal seating conditions, Super-Bond C&B prevents recurrent caries and post-operative sensitivity often observed with conventional cements and generally ascribed to cement washout. Crowns cemented with Super-Bond C&B enjoy an excellent clinical prognosis.



## Question 7 : What is the "TBB" Catalyst?

Answer : Super-Bond C&B's "TBB" catalyst is crucial to the adhesive's remarkable performance.
Pure TBB (tri-n-butylborane), an organic boron component, is so reactive that it can be hazardous to use in a clinical situation. So to allow safe handling, the excessive reactivity has been reduced in the Catalyst V through partial oxidation and addition of diluents.
This modification does not reduce its effectiveness as a catalyst. The Catalyst reacts with oxygen in the air and water, and oxidizes into a peroxide. The peroxide further decomposes, forming radicals which initiate the polymerization of the MMA.
The key to the clinical success with TBB is that the reaction proceeds in the presence of oxygen and water (both of which are present in the tooth surface.) However, care should be taken when dispensing the catalyst, as unnecessary contact with air will cause gradual decomposition and degradation.

## Question 8 : Which Activator ("Red" or "Green") is appropriate for the specific tooth surface?

Answer : The "Red Activator" is a 65% aqueous solution of phosphoric acid. It is used exclusively for enamel.
The "Green Activator" is an aqueous solution of 10% citric acid and 3% ferric chloride. It can be used for both enamel and dentin. (See Answers to Questions 9-13. )

## Question 9 : How do I apply "Red Activator" and "Green Activator" to the enamel surface?

Answer : When enamel is treated with acid, it becomes decalcified. An irregular scale-like surface composed of demineralized enamel rods is formed.
Super-Bond's excellent wetting properties and superb penetration into the interprismatic surface combine to form a tenacious enamel bond.
The phosphoric acid in the "Red Activator" is a stronger decalcifier than the citric acid in the "Green Activator."
So we recommend the following selection criteria ...
"Red Activator": For enamel surfaces without tooth reduction. The "Red Activator" is particularly appropriate if the enamel has been treated with fluoride.
For enamel surfaces with shallow tooth reduction which has not exposed the dentin.
"Green Activator": For tooth surfaces in which both enamel and dentin are exposed.

## Question 10 : Is the concentration of phosphoric acid in "Red Activator" (65%) too high?

Answer : Most enamel etchants currently on the market contain between 35% and 40% phosphoric acid. Therefore, the Red Activator's 65% concentration may seem rather high.
In fact, 65% phosphoric acid is gentler to the enamel than the traditional 35%-40% etchant.
Beyond this range decalcification drops. Since Super-Bond C&B bonds tenaciously to enamel, the system requires less etching ... and that is why it includes a less-aggressive 65% solution of phosphoric acid.

## Question 11 : How long should enamel be treated?

Answer : When using the "Red Activator, " we currently recommend treating enamel for 30 seconds. Conventionally, 30 to 60 seconds is recommended for enamel preparation with phosphoric acid. However, excessive decalcification may cause problems, so we now believe the shorter time to be better.
When using the "Green Activator, " enamel should be prepared for 30 to 60 seconds.

## Question 12 : Why is the "Green Activator" used for treating dentin?

Answer : Super-Bond C&B bonds to dentin through the formation of a resin-impregnated layer. (See Answer to Question 15.)
For the best resin penetration, the surface smear layer should be removed without excessive modification of the underlying dentin.
The "Green Activator" is ideal for treating dentin because it dissolves less hydroxyapatite, and minimizes damage to dentinal collagen. Treatment for 5-10 seconds with the "Green Activator" is adequate.
"Red Activator," on the other hand, tends to excessively decalcify the dentinal hydroxyapatite and denature the remaining collagen. This is not conducive to formation of a stable resin-impregnated layer, so bond strength deteriorates.

## Question 13 : How do I treat a tooth surface that consists of both dentin and enamel?

Answer : If the areas involved are small, it may be virtually impossible to properly apply the two different activators for two different periods to their respective surfaces.
In these cases we recommend applying "Green Activator" for 10 to 30 seconds, depending on the relative size of the enamel and dentin surfaces (the more enamel involved, the longer the application.)
When enamel surrounds a cavity where the preparation breaks the DEJ, first apply "Green Activator" to the enamel. After 30 seconds, apply "Green Activator" to the dentin and allow it to remain for just 5 seconds. Then rinse the tooth with water.

## Question 14 : What is the purpose of treating dentin with sodium hypochlorite (NaOCl)? How should it be used?

Answer : a.To increase bond strength?
For some resin cements sodium hypochlorite is recommended to improve the bond strength to dentin. This is NOT true with Super-Bond C&B. In fact, if sodium hypochlorite is used after treating the dentin with the "Green Activator", the bond strength will be significantly reduced. Sodium hypochlorite should NOT be used after the dentin has been prepared with the Green Activator.

b.For endodontics
A diluted aq. solution of sodium hypochlorite (below 10%) is often used during endodontic therapy to dissolve organic materials, to decontaminate surfaces, or to stanch bleeding.

When using Super-Bond C&B on surfaces treated with sodium hypochlorite, (or acidic electrolyzed water), the following care should be taken to avoid compromising Super-Bond C&B's exceptional bond strength.

1.Do NOT apply sodium hypochlorite after acid etching. Do NOT use sodium hypochlorite higher than 10% concentration. Sodium hypochlorite will dissolve the collagen exposed by acid treatment. Therefore, the Green Activator should be applied AFTER treatment with sodium hypochlorite.

2.Limit the treatment time with sodium hypochlorite to less than 30 seconds.
Short-term treatment does not significantly affect the bond. Prolonged treatment with sodium hypochlorite, however, will significantly decrease the bond strength:

<Super-Bond C&B bonded to dentin after treatment with 10% solution of sodium hypochlorite for various time periods>

| Treatment time with sodium hypochlorite | Seconds | 0 | 15 | 30 | 60 |
|---|---|---|---|---|---|
| Tensile Bond Strength | MPa | 17 | 16 | 13 | 6 |

3. If NaOCl treatment time exceeds 30 seconds, neutralize the surface with a reducing agent before etching.

Method 1:
Apply Saforide RC™, containing 38mg/mL diamine silver fluoride ( $Ag(NH_3)_2F$ ), for a length of time 1/2nd as long as the surface was treated with sodium hypochlorite. Rinse with water and dry. Treat with the Green Activator for 10 seconds. Rinse and dry. Then apply Super-Bond C&B according to the ordinary procedures.

<The surface was treated for 60 seconds with a 10% solution of sodium hypochlorite, neutralized with Saforide RC™, and then bonded with Super-Bond C&B.>

| Treatment time with Saforide RC™ | Seconds | 30 | 60 |
|---|---|---|---|
| Tensile Bond Strength | MPa | 8 | 13 |

Caution: Saforide RC may darken tooth surfaces.

*Saforide RC™ is a product of Bee-brand Medico-dental.

Method 2:
Prepare a 10% aq. solution of ascorbic acid (or its Na or K salt). Apply the solution for a length of time 1/3rd as long as the surface was treated with sodium hypochlorite. Dry the surface. Treat with the Green Activator for 10 seconds, rinse and dry. Then apply Super-Bond C&B according to the ordinary procedures.

| Treatment time with NaOCl | Seconds | 180 | | 300 | |
|---|---|---|---|---|---|
| Treatment time with ascorbic acid | Seconds | 30 | 60 | 50 | 100 |
| Tensile Bond Strength | MPa | 7 | 16 | 6 | 17 |

4. Hydrogen peroxide ($H_2O_2$)
In alternate irrigation, a hydrogen peroxide solution is sometimes used in connection with a sodium hypochlorite solution. Hydrogen peroxide damages the dentin structure, thus compromises the bond strength, if treated for an extended period beyond 30 seconds. Consequently, the use of a hydrogen peroxide solution should be limited to 30 seconds.

5. Acidic electrolyzed water
When used on dentin, acidic electrolyzed water reduces the bond strength of Super-Bond C&B much like sodium hypochlorite (though the strength reduction is less severe.) To achieve normal bonds after the tooth surface has been treated with acidic electrolyzed water, apply the Green Activator for 30 seconds (instead of the normal 10 seconds). Rinse and dry. Then apply Super-Bond C&B according to the ordinary procedures.



## Question 15 : What is the role of the adhesive monomer, "4-META"?

Answer : As you see in the answer to Question 3, 4-META is so structured that an acid anhydride with polarity is connected to MMA. When added to MMA/PMMA resin, it enhances the bond strength. The bonding mechanisms are different for tooth substances and metals.

**Tooth Substances:**
4-META demonstrates high affinity with hard tooth tissue, and promotes monomer impregnation into the tissue of both enamel and dentin. Once the 4-META/MMA impregnates the tissue, it polymerizes in situ. This resin/dentin or resin/enamel hybrid layer (often called the "resin impregnated layer") has been identified in a number of studies as one reason for Super-Bond's extraordinary bonding properties; i.e. superior bond strength, protection against recurrent caries and isolation of the pulp from external stimuli.

**Metals:**
Because of its polarity, 4-META forms a hydrogen bond with the oxygen or the hydroxy group of the metal's oxide layer. Because precious alloys do not easily form a surface oxide without traditional pre-treatments such as heat treatment, tin-plating, etc, use of V-PRIMER (See Answer to Question 19) is recommended.

## Question 16 : What is the role of the "Catalyst V" in dentin adhesion?

Answer : In traditional adhesive systems, moisture, exudate from dentinal tubules, and the oxygen on the dentin surface inhibit polymerization.
Super-Bond's TBB catalyst is different. As explained in the answer to Question 7, instead of acting as inhibitors, moisture and oxygen act as polymerization promoters. Consequently, it is inferred that with Super-Bond C&B polymerization starts at the dentin surface where said promoters of water and oxygen exist.
So once Super-Bond's monomer (with the aid of 4-META - See Question 15) penetrates the dentin, the moisture and oxygen in the dentinal tissue react with the TBB catalyst to reliably trigger polymerization.

## Question 17 : What is the role of "Porcelain Liner M" in porcelain adhesion?

Answer : Porcelain Liner M is a unique coupling agent that includes both silane and 4-META. When the liquids A and B are mixed and brushed onto a porcelain surface, they react to form a hydrophobic molecular layer. When applied to this surface, Super-Bond C&B shows excellent bond strength and durability.

## Question 18 : What is the effect of heating the surface after application of "Porcelain Liner M"?

Answer : Heating the porcelain surface after application of Porcelain Liner M improves the bond strength, a feature commonly found with silane-based coupling agents. So try heating the surface with a blow dryer when you want to enhance the bond strength. (See Table 12 in "Data and References".)

## Question 19 : What is the role of "V-PRIMER" in promoting adhesion to precious metal alloys?

Answer : V-PRIMER is a simple, effective bond-enhancing pre-treatment for precious metal alloys, which eliminates the need for complicated heat-treatment or tin-plating. (See Table 6 and Fig. 2 in "Data and References".)
The V-PRIMER solution contains 6-(4-vinylbenzyl-n-propyl)amino-1, 3, 5-triazine-2, 4-dithiol. (The tautomer of dithiol and dithione.) The monomer's mercapto group reacts with the precious metal alloy and its vinyl group reacts with Super-Bond C&B to create strong, durable bonds.

## Question 20 : How do I use "Porcelain Liner M" with "V-PRIMER" when porcelain and precious metal are both present?

Answer : When repairing a fractured ceramometal crown etc., first apply V-PRIMER to the precious metal surface. Take care not to overrun any V-PRIMER onto the porcelain surface, as it may decrease the bond strength. (See Table 11 in "Data and References".)
Then apply Porcelain Liner M to the porcelain surface.

## Question 21 : Is Super-Bond C&B really safe for the pulp?

Answer : From the clinical history of 2 decades, Super-Bond C&B has earned a superb reputation as a safe material for vital teeth. A number of reasons have been proposed for its pulpal compatibility, and we believe that its safety is due to the synergistic effect of all or some of them.

①Compared with other polyfunctional methacrylate monomers, MMA, the main component of Super-Bond C&B, has a low potential for pulpal irritation. Furthermore, the irritation it may cause is merely transient.
②Tertiary amines (a supposed irritant) used as polymerization initiators in many other systems, are not used in Super-Bond C&B.
③The decomposition products of TBB (boric acid and butyl alcohol) and 4-META may actually help the pulp.
④MMA and 4-META have no nutritive value, so it will not support bacterial growth.
⑤The resin impregnated layer provides an impermeable membrane, which can create an exceptional marginal seal and barrier against bacteria. In traditional prosthetics, leakage at marginal defects is often cited as the leading cause of pulpitis.
⑥Super-Bond C&B's extraordinary bond strength reduces the need for creating retentive preparations. As a result, less tooth structure is removed, and the risk of pulpal inflammation due to mechanical stimulation is also reduced.

## Question 22 : Are there pathological studies regarding the biocompatibility of Super-Bond C&B?

Answer : Pathological studies on the biocompatibility of Super-Bond C&B have been carried out for 10 years. Various topics warrant further study. To date, the studies have found the following:

①Cytotoxicity Test
Super-Bond C&B shows weak toxicity up to 10 minutes after initiation of curing, and virtually no toxicity after 60 minutes. (Toxicity is less than that of other adhesive resins.)
②Mutagenecity Test of Catalyst
From the tests using Chinese hamster lung fibroblasts, it was concluded that the Catalyst would not cause mutagenic effects.
③Cell Proliferation Test
Cells do not proliferate on the cured surface of Super-Bond C&B, but they survive for more than four days. (Cells expired within a day on the surfaces coated with other adhesive resins.)
④Application to the Pulp of Rats.
Super-Bond C&B was applied to the exposed pulp surface, and after two weeks tissue similar to neogenetic dentin was observed.
⑤Application to Human Pulp (Indirect pulp capping)
When Super-Bond C&B was applied to dentin of 1-2mm thickness, secondary dentin formation was confirmed. No cellular infiltration or inflammatory changes in the pulp tissue were observed.
⑥Application to Human Pulp (Direct pulp capping)
When Super-Bond C&B was applied to vital exposures some teeth demonstrated dentin bridging ... others did not. However, even when bridging did not occur, Super-Bond C&B did not damage the pulp. The pulp tissue and adhesive remained in intimate contact.
⑦Cytotoxicity Test with the cultivated Human Cell of Periodontal Ligament
Proliferation rate of human periodontal ligament cell with Super-Bond C&B was the best among the tested 4 resin cements and equivalent to the root-planed tooth surface.
⑧Pathological study in connection with conservation of fractured teeth by bonding and replanting using Super-Bond C&B
From the *in-vivo* tests using premolars of cats in which the teeth were extracted, cut vertically, bonded together and replanted to the socket, it was shown that both inflammatory and replacement resorption by the use of Super-Bond C&B were significantly less than with other resin cements tested. At 4 weeks there was no significant difference in resorption between the control (replantation only, without cutting and rebonding) and conservation with Super-Bond C&B, suggesting Super-Bond should be effectively used in such conservation treatment causing least damages to periodontal ligament.

For further details, refer to the following references (some are written in Japanese):

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2.Inoue, T. and Shimono, M.: Dentin/Pulp Complex, Advanced Research and its Clinical Consideration, the Quintessence. Vol. 11 No. 2, 1992, p74
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## Question 23 : How do I protect the vital tooth surface before applying Super-Bond C&B?

Answer : As indicated in the answers to Questions 21 and 22, Super-Bond C&B has an excellent reputation for long term pulpal safety.
It is difficult to make a more clear-cut statement than that of the standards for safety of dental materials recommended by Japanese Association of Dental Manufacturers: "If the preparation approaches the pulp, apply a protective base." (See 3-1 ⑥ "Safety" of the instructions of Super-Bond C&B)
Nevertheless, we can find many clinical trials/uses in some countries, in which Super-Bond C&B was applied directly to the deep dentin approaching the pulp (or even to pulp direct capping) where the teeth remain asymptomatic, without pulpal complications.
This may cause confusion when pulp protection is required in addition to Super-Bond C&B. **So here are some suggestions supported by clinicians who routinely apply Super-Bond C&B to vital teeth:**

①Super-Bond C&B will not cure pulp suffering vital infection or inflammation caused by physical stimuli.
②When treating a vital tooth, care should be taken not to cause pulpal infection or inflammation. Exposed dentin should be considered a form of exposed pulp.
③The bonding operation should be started only after the pulp has been diagnosed as healthy.
④If the pulp is healthy, application of Super-Bond C&B directly to deep dentin that approaches the pulp poses no problem.
⑤Direct capping with calcium hydroxide may be considered as a temporary treatment, because over time it will modify,soften and dissolve.
⑥If the pulp is exposed, it should be capped with calcium hydroxide paste and temporized till the dentin bridge is formed.
A dentin bridge is microscopically porous, so it does not provide an effective biological shield. However, it protects the pulp from mechanical forces. If the pulp does not show signs of infection by the time the dentin bridge has been formed, it can be diagnosed as healthy.
⑦After the formation of the dentin bridge, the calcium hydroxide may be removed, and the restoration is placed using Super-Bond C&B to create a good marginal seal.
⑧Direct capping using Super-Bond C&B can be performed provided (a.) the exposure is a pinpoint (b.) the patient is young, (c.) the pulp is sufficiently vigorous, and (d.) there is no fear of infection.

## Question 24 : How do I protect the surface of the prosthesis where I don't want the adhesive to bond?

Answer : Before cementing an inlay, onlay, crown or bridge with Super-Bond C&B, all exterior surfaces should be polished and the interior surfaces sandblasted. Unfortunately, once it's allowed to cure, Super-Bond C&B will adhere tenaciously even to the highly polished exterior surfaces. Once it has completely polymerized, removing the excess with a hand scaler is extremely difficult.
To facilitate cleanup, the exterior surfaces may be (1)coated with a metal separating agent, or (2) covered with a plastic film*1. Selection of an apporopriate method depends on the shape of the prosthesis and the degree of protection required.
*1 "Parafilm" manufactured by American Can Company, designed to cover test tubes and beakers temporarily (it is recommended to use it as a cut-strip 1cm wide), or plumber's sealing tape.

## Question 25 : How much working time does Super-Bond C&B allow?

Answer : If you use Super-Bond C&B in the Bulk-mix technique, the slurry-like cement gradually increases its viscosity and begins threading.
Super-Bond C&B must be used before threading begins. Otherwise, the operation becomes quite difficult. The increase in film thickness may prevent seating of the prosthesis. Polymer L-Type is characterized by a modified particle surface that delays threading to give a longer working time without substantially changing the curing time. (See Table 8, Figures 3 and 4 in "Data and References" and Answers to Questions 26, 31 and 32. )

*Unlike conventional cement, it is not necessary to spatulate Super-Bond C&B. When using it for the first time, you may feel the mixture is too thin. Be assured that Super-Bond C&B should be used in this state.
*Super-Bond C&B undergoes the following stages from mixing to curing. For proper seating of the prosthesis, try to finish the bonding operation before the mixture has reached stage 3 (mild threading).

1. Slurry stage: The mixture is very thin, as when gypsum powder is mixed with a copious amount of water and the powder particles are still visible.
2. Sol stage: The powder particles are no longer visible, but the mixture still retains high fluidity and has not started threading.
3. Mild threading: The mixture becomes sticky and forms thin threads.
4. Threading: The viscosity further increases, and the mixture begins thick threading.
5. Rubbery stage
6. "Pitchy" stage: The mixture is broken easily when stretched.
7. Cured stage

## Question 26 : What is the reason for cooling the Dispensing Dish before use?

Answer : The curing reaction of Super-Bond C&B is influenced by temperature: The higher the temperature, the more quickly Super-Bond C&B cures. In a cooled Dispensing Dish, the curing reaction proceeds slowly so the slurry state is maintained longer (See Answer to Question 25). This will extend the working time and make the bonding operation easy. When Super-Bond C&B is used in Bulk-mix technique, use a cooled Dispensing Dish. (See Figs. 3 and 4 in "Data and References". )

## Question 27 : How cold should the Dispensing Dish be?

Answer : We used to advise cooling the Dispensing Dish to 16-22℃, as we were concerned about condensation. But recently, dentists seem to be using the Dishes cooled to below 10℃ (so long as wells are dry), without waiting for them to warm to 16℃. So we now recommend 10-16℃ (See Fig. 4 in "Data and References" and Answer to Question 28.)

## Question 28 : What should be done if condensation forms on the chilled Dispensing Dish ?

Answer : When you move the chilled Dispensing Dish from the refrigerator into the warm room, condensation may form in the mixing wells. If this is the case, immediately before mixing the cement, dry the well, using an air syringe or a tissue paper. During use, condensation may form again around the well, but this will not affect the performance.

## Question 29 : What is a "Super-Bond Station"?

Answer : A simple apparatus called a "Super-Bond Station" was proposed by Dr. Manabe. Its purpose is to cool not only the Dispensing Dish, but also the working environment around the Dispensing Dish.
To be specific: A U-shaped enclosure is created using three chilled freezer packs. The cooled Dispensing Dish is then placed inside the enclosure, and the Super-Bond C&B is mixed. According to a recently published article, when the Dispensing Dish is cooled to 12-14℃, the chilled environment provided by this station extends the working time even further and prevents condensation.

*Manabe, A: Efforts are rewarded without fail in using adhesive resin cement, Practice in Prosthodontics, VoL 27,No. 1, 1994, pp.87-95

## Question 30 : How long does the activated liquid remain active?

Answer : In contact with air, the "Catalyst" gradually decomposes and degrades.
Therefore, it is important to use the activated liquid (the mixture of Monomer and Catalyst V) as soon as possible after mixing. For the Bulk-mix technique, you should complete all the preparations for bonding before you begin preparing the activated liquid, then use it immediately.
For the Brush-dip technique, use the activated liquid within 5 minutes at the latest.

## Question 31 : How can I assure sufficient working time when using the Bulk-mix technique?

Answer : As explained in the answers to Questions 25 through 27, the first priority is to cool the Dispensing Dish and use a Polymer L-Type. If you need a longer working time, you reduce the amount of Polymer in the mixture. Lowering the Polymer/Monomer ratio will prolong the slurry state described in the answer to Question 25. (See Table 8 in "Data and References" and Answer to Question 32.)

## Question 32 : When should I change the amount of Polymer in the mix?

Answer : A. For Inger working time
Reducing the Polymer in the mix by as much as 50% will not reduce the bond strength. However, when you add less than the standard amount of Polymer, the cement takes substantially longer to cure. (See Table 8 in "Data and References".)
In most cases we recommend that you use a Polymer L-Type at the standard mix-ratio. However, in the following cases it may help to reduce the amount of Polymer:
①When the room temperature is high
②When you are not experienced in the bonding operation and need more working time
③When you need more fluidity (For example, when cementing a long, tight post or well-fitted crown, etc.)
④When you need to apply the cement at several locations almost simultaneously (For example, when cementing long-span bridges.)

B. For shorter curing time
Conversely, when you want to shorten the curing time and still assure reasonable working time, use a Polymer L-Type and increase the Polymer/Monomer ratio to 1.2. (See Table 8 of "Data and References")

C. Volumes of the Measuring Spoons
The Super-Bond C&B kit contains two Measuring Spoons: Standard and Small. A large size spoon (Large) is available separately. Each Spoon has 2 cups of different volumes. The relative volumes to the standard small cup (1=approx. 0.2mL) are inscribed.

Relative volumes

| Measuring Spoon | Small cup | Large cup |
|---|---|---|
| Small | 0.75 | 1.5 |
| Standard | 1 | 2 |
| Large | 1.2 | 2.4 |

## Question 33 : Do I have to pre-wet the surfaces being cemented with the activated liquid?

Answer : Brushing the activated liquid onto the surfaces to be bonded before cementing will assure intimate resin contact.
In the Brush-dip technique, the ball has a comparatively high Polymer/Monomer ratio, so pre-wetting the surface with the activated liquid is essential to assure maximum cement adaptation and to create the highest possible bond strength.
In the Bulk-mix technique, application of the activated liquid is not necessary, so long as you seat the prosthesis while the cement is in the slurry state. In this case, the mixture is fluid enough to assure maximum adaptation.
On the other hand, advanced-application of the activated liquid on the dentin surface is recommended to restrain the outflow of exudate from the surface of the prepared dentin and to prevent bacterial entry into the dentin tubules.

## Question 34 : What are the different types of Polymer powders for? And how do I use them?

Answer : Seven types of Polymers are available for Super-Bond C&B, including those sold separately. They can be divided into 2 basic classes, the normal type and the newly developed L-Type. Polymer L-Type is characterized by a modified particle surface that gives a longer working time without substantially changing the curing time. L-Type is also used to speed up curing by increasing the Polymer/Monomer ratio to 1.2. (See Answer B to Question 32)
Refer to the following list to select the best Polymer for your application. (See Tables 2, 8 and 9 in "Data and References".)

1. **Clear and L-Type Clear**
   Fine PMMA powder without pigment. When cured, its medium translucency and inconspicuous shade is ideal for temporary splinting of loose teeth, creation of temporary prostheses using a resin tooth or extracted tooth, or direct bonding of orthodontic brackets with the Brush-dip technique.
   When the normal Clear polymer is used in the Bulk-mix technique, the working time before threading is rather short. Here, the **L-Type Clear polymer** is preferable, because it allows more working time.
2. **Esthetic and L-Type Esthetic**
   Tooth-colored **Clear** powder. When cured, its color is ivory with some translucency and little opacity. It is used for prostheses that require an esthetic appearance. Curing time and workability are similar to that of the **Clear** powder and **L-Type Clear** powder respectively.
3. **Opaque Ivory**
   Opacity is produced by specially prepared pigments. The powder creates an extremely opaque cement film that is highly effective in masking metal surfaces. It is recommended for use when metal show-through might affect aesthetics (as when cementing inlay or adhesion bridges), or when repairing fractured prostheses with exposed metal. Its working time is slightly longer than **Clear** powder, but shorter than **L-Type Clear**.
   The **Opaque Ivory** powder is widely used for routine cementation. Due to its opacity, any excess cement is extremely visible, which facilitates removing it. (See Table 8 and Fig. 4 in "Data and References".)
4. **Opaque Pink**
   Pale pink color is added to **Opaque Ivory**. This powder was originally intended for repairing denture bases, but it can be used for the same purposes as the **Opaque Ivory**. Some dentists prefer it to the **Opaque Ivory** as its pink color reflected on the surrounding teeth produces a more natural shade. Its handling and setting properties are similar to those of the **Opaque Ivory**.
5. **L-Type Radiopaque**
   This powder contains highly radiopaque filler. When it is used in the Bulk-mix technique under the standard Polymer/Monomer ratio, the cured adhesive shows radiopacity equivalent to enamel. This Polymer combines the opacity of **Opaque Ivory** with the radiopacity of the former Radiopaque polymer. It creates a natural tooth-color and allows a longer working time for easier handling. However, it cures slightly more slowly than the **Clear** powder. For faster curing, use the Polymer/Monomer ratio of 1.2. (See Tables 8 and 10 in "Data and References".)

## Question 35 : How long does Super-Bond C&B take to cure?

Answer : Curing time depends largely on the Polymer/Monomer ratio and the temperature.
With the Brush-dip technique, the Polymer powder ratio is rather high, and it cures within 5 or 6 minutes. (See Table 9 in "Data and References".)
With the Bulk-mix technique using the standard Polymer/Monomer ratio the curing time varies between 7 and 10 minutes at 37℃. For faster curing, use Polymer L-Type at the Polymer/Monomer ratio of 1.2. If the Polymer/Monomer ratio is reduced, the curing is delayed. (See Table 8 in "Data and References".) Heating with warm air or water after bonding will accelerate curing.
Please note that it takes longer to reach the complete cure and final bond strength. Therefore, be very careful when removing excess resin before the cement has cured. It is recommended to wait about 1.5 times as long as the above curing time before starting occlusion adjustment, and to instruct a patient not to bite hard on the day of treatment.

## Question 36 : How can I remove excess resin?

Answer : When the object is seated, excess resin is expressed around the margins. If the excess resin is allowed to cure, it will bond to the surface of the prosthesis, and clean-up and polishing will be extremely difficult.
The following describes how to remove the excess resin:

①Before cementing apply as much protection as possible to surfaces that should not be bonded. (See Answer to Question 24. )
*Apply a separating agent on metal surfaces, wrap with "Parafilm," place retraction cord under the gingival margin, etc.
②Use the Opaque Polymer, as the excess resin will be more visible.
③Use a cotton pledget or a brush soaked with alcohol to remove as much excess resin as possible immediately after the prosthesis is seated (before threading begins). Resin extruded onto the interdental papilla should be removed immediately using floss, etc.
Resin spilled onto the gingiva should also be removed before it hardens.
④Using hand scalers, scrap off the residue after the threading stage is completed but before the cement is completely cured.
*Wait a while till the threading stage is completed.
*If you attempt to scrape off the excess during the threading stage, you may feel that you are removing all the cement, but a thin layer will remain bonded to the surface.
⑤If the surface was coated with a separating agent, even cured resin can be easily peeled off using hand instruments.
⑥Any remaining resin will be easily discovered by re-examination on the following day.

## Question 37 : What are the different types of Brush Tips for? And how do I use them?

Answer : The Brush Tip (Blue) is a blunt-cut type and suitable for transportation of a large amount of the slurry in Bulk-mix technique. The Brush Tip (White) has a pinpointed tip and is suitable for Brush-dip technique. The Brush Tip (White・L) is larger than (White・S). Refills of the respective types are available.
The Brush Tips in the kit are for one-time use. Dispose of them after use.
If a multi-use brush is used, clean the brush immediately after each use with a solvent such as acetone before the resin has cured completely. Dry with paper tissue. If necessary, reshape the bristles so they will dry to a fine point.

## Question 38 : How do I clean the Dispensing Dish after use?

Answer : Wipe the dish with tissue or gauze before the cement cures. If the resin inadvertently hardens in the dish, wash it with a solvent such as acetone, or immerse it overnight in water,then wipe it clean.