

kuraray

Noritake



CLEARFIL™ Universal Bond Quick

TECHNICAL INFORMATION



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INTRODUCTION

It's been 38 years since Kuraray introduced the total-etching adhesive system: CLEARFIL™ BOND SYSTEM F. Now, following extensive research and development into new adhesion technologies, Kuraray Noritake Dental has developed CLEARFIL™ Universal Bond Quick: the single layer, single application adhesive system that penetrates dentin immediately delivering a predictable, lasting and consistent result.

This technical information guide sheet provides an insight into the technologies behind the new adhesive along with the R&D results and evaluations carried out by the scientific community.

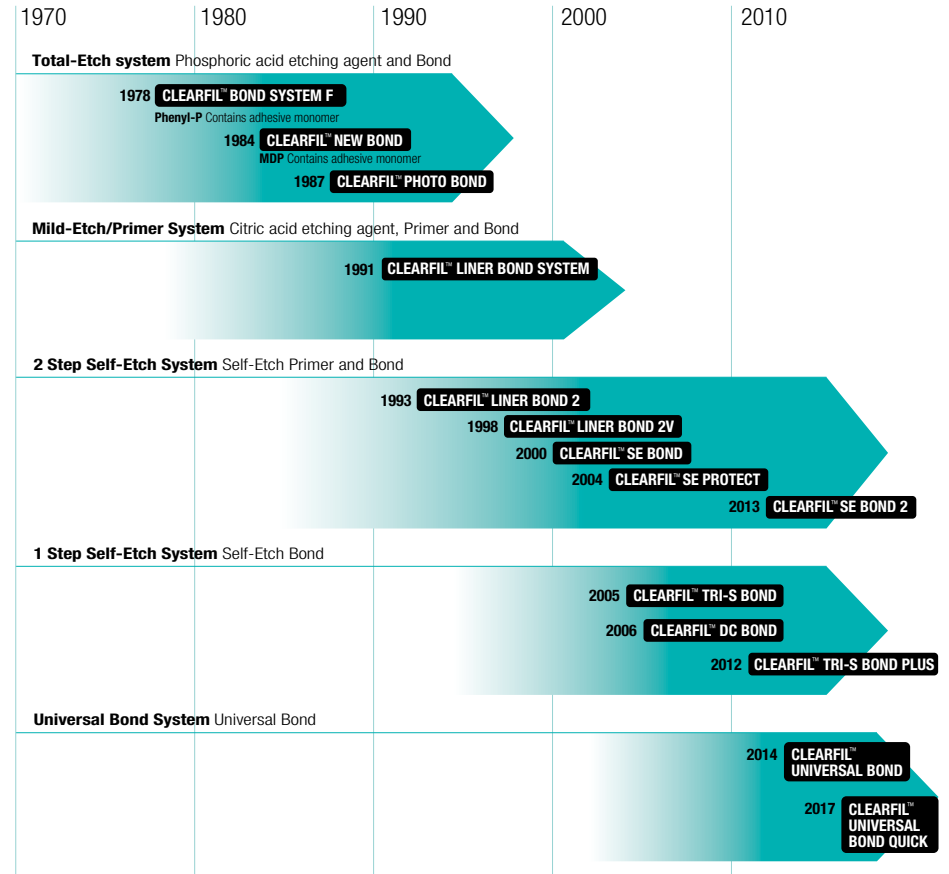


HISTORY OF OUR ADHESIVE TECHNOLOGY

Kuraray founded its dental business in Japan in the early 70s. Our first product was the GK-101 system, which selectively removes carious tooth structure without pain, using a chemical solution. At that time, we started to establish our first adhesive and composite which were designed to adhere to tooth tissue directly, enabling a minimal invasive approach.

The development of functional monomer technologies was central to the launch of our first adhesive system where the connection between the adhesive and hydroxyapatite is made on a molecular level. Several more years of development led to the invention of the phosphate ester monomer: Phenyl-P.

Phenyl-P wasn't the only technology needed to bond to enamel and dentin; good polymerization is also an essential factor in adhesion. Unfortunately the conventional BPO/amine polymerization initiator system wasn't compatible with acidic functional monomer Phenyl-P because the acidic monomer neutralized the effectiveness of the amine. After testing several variations, one extra initiator was selected. Tertiary polymerization initiator (a salt of aromatic sulfinic acid) was added to the mix. With this tertiary polymerization initiator, the BPO/amine polymerization initiator system worked to cure the adhesive. Together these curing technologies and functional monomer Phenyl-P formed the first batch of technologies in our adhesive products making it possible to launch the total-etching adhesive system: CLEARFIL™ BOND SYSTEM F.



A brief history of the development of bonding materials by Kuraray Noritake Dental

STRONG, STRONGER. FUNCTIONAL MONOMER RESEARCH

After the success of CLEARFIL™ BOND SYSTEM F, a new R&D goal was set: to develop a monomer that performed better than Phenyl-P, making it possible to achieve higher bond strengths and, as a result, long lasting composite restorations. To begin with, the chemical composition of Phenyl-P was analyzed in depth. Each of the three main parts of this functional monomer was then studied in detail (see Fig. 1), in other words the polymerizable group, spacer and reactive group. One study involved variations in the length of the spacer while the other parts remained the same. The results showed the length of the spacer was clearly influencing the bond strength to human dentin and Ni-Cr alloy.

A similar test was carried out by varying the reactive group (see Fig. 2. and Fig. 3.). These researchers gave valuable insights into the composition of the ideal functional monomer. The results from our countless tests were as follows:

- * The spacer must be a hydrophobic group with 4 or more carbon atoms.
- * The reactive group must be a divalent phosphate group.
- * There must be a radical polymerizable group.

Figure 4 shows the order of the possible reactive groups, both for bonding to dentin and Ni-Cr-alloy. (Fig.4)

Applying these lessons to hundreds of functional monomer variations led to the development of a functional monomer still in use today: Methacryloyloxydecyl Dihydrogen Phosphate (MDP). We like to call it 'The Original MDP Monomer' (Fig. 5).

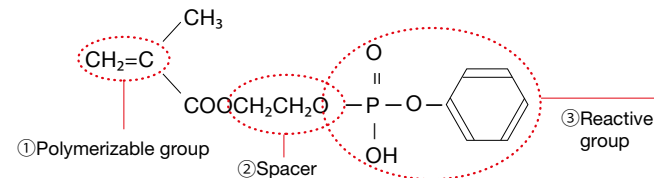


Fig. 1 The chemical structure of adhesive monomer (Phenyl-P)

Effect on the bond strength to dentin

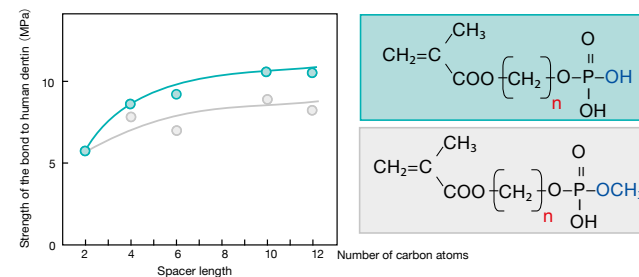


Fig. 2 Optimizing the chemical structure of the adhesive monomer

Effect on the bond strength to Ni-Cr alloy

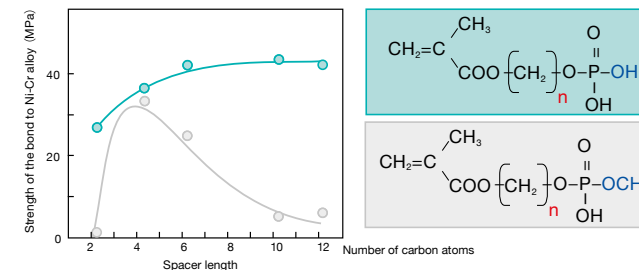


Fig. 3 Optimizing the chemical structure of the adhesive monomer

The Chemical structure of the reactive group

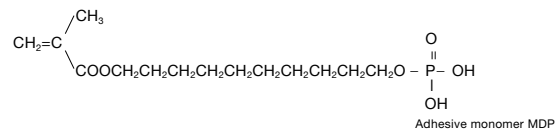
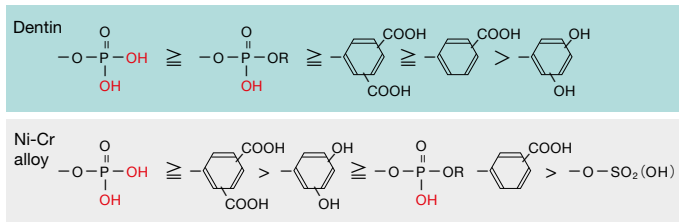
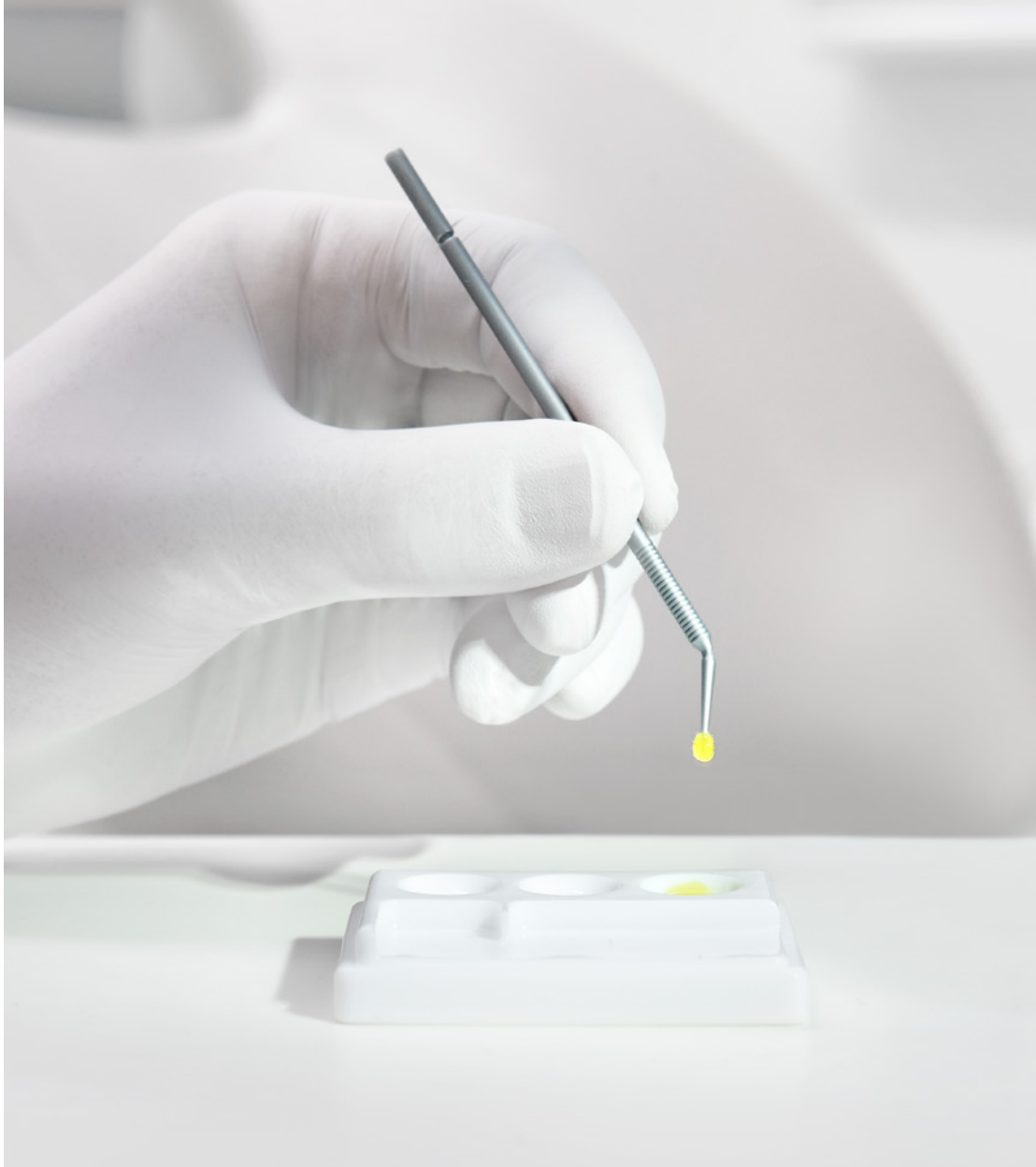


Fig. 4 Optimizing the chemical composition of an adhesive monomer



THE ORIGINAL MDP MONOMER IS THE SECRET BEHIND CLEARFIL™ AND PANAVIA™ PERFORMANCE

Kuraray applied a patent* on The Original MDP Monomer in 1981. It was used in the first composite cement PANAVIA™ EX (launched in 1983). The Original MDP Monomer in PANAVIA™ connected the cement to hydroxyapatite and metals at the same time. The Original MDP Monomer is the secret behind the global success of PANAVIA™ and has been used in all CLEARFIL™ adhesives and PANAVIA™ cements ever since.

Over time it became clear that The Original MDP Monomer also bonded to metal oxides like zirconia and alumina making it an exceptionally versatile functional monomer. As a result it delivered a strong bond to tooth structures (e.g. dentin, enamel), metals (e.g. gold alloy, silver alloy, titanium, Ni-Cr alloy), metal oxides (e.g. zirconia, alumina) and composite resins that include inorganic fillers.

All of this is due to its unique structural formula: a polymerization group, a dihydrogen phosphate group and a long carbon chain spacer. But what does the science say? The solubility of the calcium salt of the adhesive monomer has been studied extensively. The presence of a lower solubility in water indicates that a highly stable chemical bond is formed with the hydroxyapatite surface. Studies conducted using atomic absorption spectroscopy have demonstrated major differences between the adhesive monomers with The Original MDP Monomer outperforming the others¹. The solubility stability of the calcium salt of The Original MDP Monomer (6.79 mg/L) is about 200 times greater than that of the 4-MET monomer (1.36 g/L). The calcium salt created from The Original MDP Monomer is thus hardly soluble in water and highly effective in chemically bonding to dentin and enamel.

1) Yoshida et al., J Dent Res 83, 2004

* JP-A-Sho-58-21607
JP-A-Sho-58-21687
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US4612384(A)
US4650847(A)

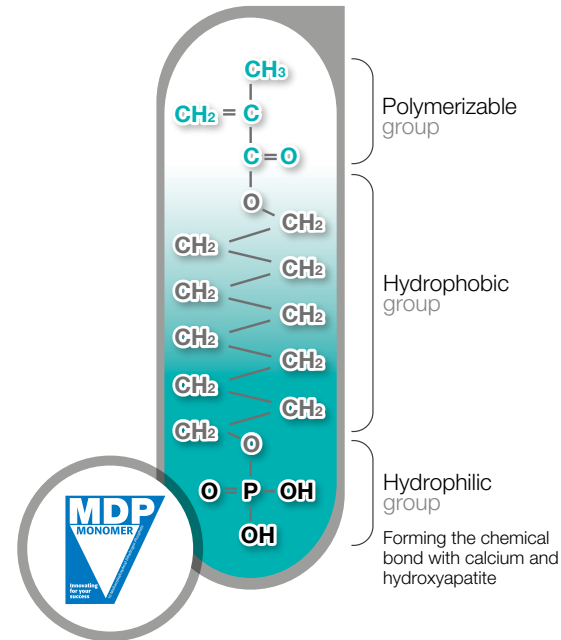


Fig. 5 The structure of MDP monomer

Other manufacturers have been started using MDP in their adhesive products. However it is one of the most difficult ingredients to produce. Incorporating the adhesive elements is also a complicated process. In recent years research has shown the remarkable effect of purity and impurity of the different MDP solutions². The study, conducted with three different MDP monomers provided by three different manufacturers, revealed that MDP produced by Kuraray Noritake Dental was of a higher purity and demonstrated superior hydrolytic stability. In addition, adhesives containing The Original MDP Monomer resulted in significantly higher bond strength. (see Fig. 6).

Kuraray Noritake Dental has more than 30 years of experience in the use of The Original MDP Monomer which is why it's a key component of CLEARFIL™ Universal Bond Quick.

2) Yoshihara et al., Adhes Dent Vol. 33 No. 4 2015

Micro-tensile bond strength to dentin with experimental adhesives with MDP*

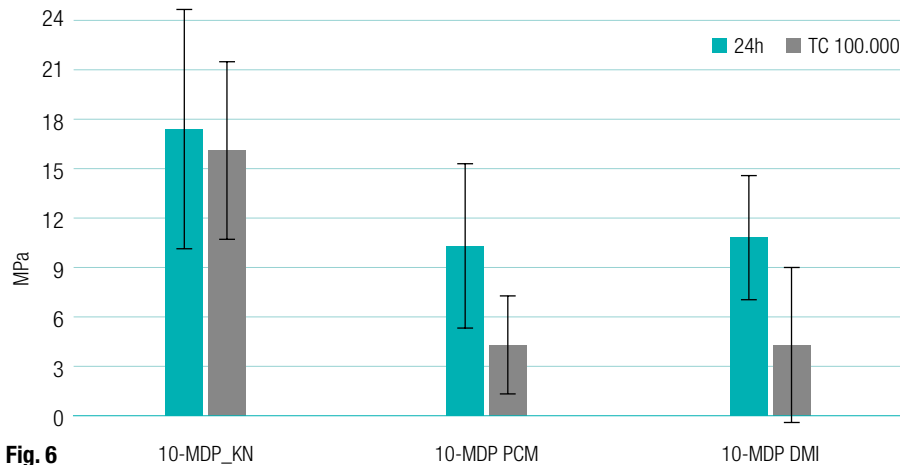


Fig. 6

* The experimental adhesives were prepared consisting of 15 % wt. 10-MDP functional monomer provided by three different sources: KN (Kuraray Noritake Dental Inc.), PCM (PCM Products GmbH) and DMI (Designer Molecules, Inc.). The experimental primer was applied for 20s followed by gently air-drying, after which the bonding agent of CLEARFIL™ SE BOND was applied, and subsequently air-thinned and light-cured.

To summarize the benefits of The Original MDP Monomer

- This high chemical bonding capacity to hydroxyapatite results in good adhesion to the enamel even without the use of a phosphoric acid etching agent.
- MDP is mildly acidic. Giving The Original MDP Monomer an opportunity to bond to some remaining hydroxyapatite in the dentin hybrid layer.
- Its chemical structure contains a unique hydrophobic long carbon chain and a hydrophilic phosphate group, which allows for easy penetration into dentin due to its superior surface-active property.
- A chemical bond with hydroxyapatite is established quickly. A stable adhesive bond is thus created directly during clinical application.
- The solubility of the calcium salt that is formed is extremely low. This significantly improves the long-term adhesive effect to enamel and dentin.
- The Original MDP Monomers not only has excellent adhesion durability to enamel and dentin but also to metals, metal oxides, and composites.

REAL ADHESIVE DENTISTRY STARTED WITH TOTAL-ETCH

Modern adhesives are developing at a fantastic pace. Today they are more simple, versatile and stronger than ever, and the speed of development seems to be increasing.

Across the world, research institutions including our own have developed bonding systems to improve bonding to teeth and to simplify the bonding procedure.

All bonding system adhesives must fulfil the following functions: (1) demineralize the tooth structure; (2) penetrate into the tooth structure; and (3) polymerize. However the adhesive performance varies greatly from system to system, in particular bonding to dentin which includes collagen, hydroxyapatite and water, and which is a challenge to bond to.

A total etching system first etches the tooth surface with a phosphoric acid etching agent. Then a primer/bonding agent is applied to the treated tooth surface. Even though the acidity of the phosphoric acid damages the dentin by removing much of the hydroxyapatite and exposing the collagen, the total-etching technique is still widely used today.

In order to reduce the damage caused to the tooth structure by the etching agent, we developed the CLEARFIL™ LINER BOND SYSTEM in the mid-80's which included a mild etching agent that contained citric acid and calcium chloride which are milder than phosphoric acid.

Around 1990 while the total-etch system was gaining popularity on the global market we began to develop a self-etch system. The objective was to improve the bond strength to dentin and to create a simpler bonding procedure. Our self-etch system consisted of a self-etch primer that etched and primed the tooth structure with a separate bonding agent that had excellent curing properties.

As its main ingredients Kuraray's self-etch primer includes an acidic monomer, water and a hydrophilic monomer. As a result both demineralizing and priming take place simultaneously. With this self-etch system a dense high quality of 'resin-impregnated layer' is created between the tooth structure and the bonding agent resulting in an ideal bonding situation.

Development of one step self-etch

In 2005 Kuraray developed the first one-step self-etch adhesive CLEARFIL™ TRI-S BOND the aim of which was to deliver ease of use. This simplified adhesive didn't cause phase separation meaning that the adhesive mixture stayed homogenous over time. Thanks to a unique proprietary technology both primer and bonding agent functions of CLEARFIL™ SE BOND were incorporated into one bottle.

The even more advanced CLEARFIL™ TRI-S BOND PLUS was the successor of CLEARFIL™ TRI-S BOND, incorporating a new photo-initiator for enhanced curing and sodium fluoride for fluoride release. This self-etching adhesive demonstrated an improved bond strength and physicochemical quality. Moreover in addition to direct restorations it can also be used without a separate activator for core build-up restorations in combination with CLEARFIL™ DC CORE PLUS.

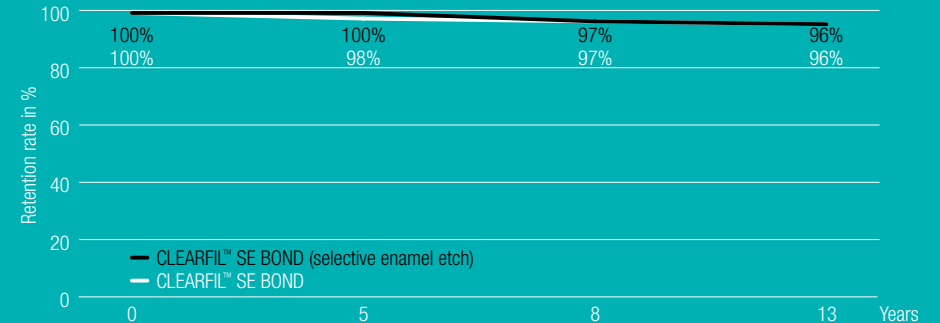
Universal adhesive

Kuraray Noritake Dental developed its first universal adhesive CLEARFIL™ Universal Bond in 2014 for all direct and indirect restorations in combination with all etching techniques (Total-Etch, Self-Etch or Selective-Etch). The adhesive can also be used for the surface treatment of zirconia and silica-based glass ceramics (e.g. lithium disilicate). Moreover, CLEARFIL™ Universal Bond can be used directly in combination with CLEARFIL™ DC CORE PLUS and PANAVIA™ SA Cement Plus for core build-up restorations and cements.

CLEARFIL™ SE BOND: THE SELF-ETCH STANDARD

Kuraray Noritake Dental's adhesive CLEARFIL™ SE BOND is recognized across the world as being a standard for self-etch adhesives. The clinical study of Marleen Peumans et al. demonstrates its clinical performance over 13 years. Never before has an adhesive showed a retention rate of 96% after 13 years of class V restorations in situ (Graph 6).

Graph 6: CLEARFIL™ SE BOND self-etch vs. selective enamel etch



M. Peumans, J. De Munck, K Van Landuyt, B. Van Meerbeek. Thirteen-year randomized controlled clinical trial of a two-step self-etch adhesive in non-carious cervical lesions. KU Leuven-BIOMAT, department of oral Health sciences, KU Leuven & Dentistry, University Hospitals Leuven, Leuven, Belgium

From one step to universal

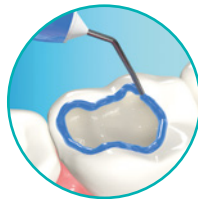
To simplify the usage of adhesives, manufacturers have introduced one-step bonding agents. Total etch one step bonding agents already exist over a longer period. After the year 2000, the first self-etch one step systems were introduced to the market. Since several years, the market has seen a steady flow of new or renewed one-step self-etching adhesives.

The latest development can be found in the development of the universal bonds. In general, a universal bond can be qualified as a system that:

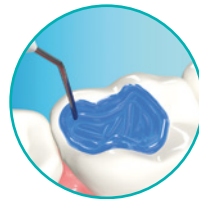
1. Can be used as self-etch, selective etch or total-etch
2. Contains surface conditioning materials for the priming of indirect materials
3. Can be used with or without a special activator for those indications where polymerisation light cannot be used, like placement of posts or certain indirect restorations.
4. Is a one bottle system.



Self-etch
(no phosphoric acid)



Selective-etch
(phosphoric acid on enamel)



Total-etch
(phosphoric acid on enamel and dentin)

Kuraray Noritake Dental has introduced several successful bonding agents in the one-step or universal bond segments with CLEARFIL™ TRI-S BOND PLUS and CLEARFIL™ Universal Bond.

Basic handling of adhesives

In bonding technology, we have seen the reduction of components in the total-etch and self-etch segment. In spite of this reduction of the basic handling of adhesives stays the same. Rubbing or waiting or refreshing liquid or application of multiple layers are still required. Dentists still have to follow specific instructions for use to avoid a reduction in quality of the restoration. This means a thorough understanding of the instruction for use and to follow these instructions exactly. We have developed CLEARFIL™ Universal Bond Quick to offer an adhesive which is:

1. Less technique sensitive than existing one-step materials on the market.
2. Offers long lasting sealing of the cavity and durability
3. Has high bond strengths
4. Offers all other advantages of a Universal bond

With **CLEARFIL™ Universal Bond Quick** we take the next step into bonding agents.

Since CLEARFIL™ Universal Bond Quick does not need any waiting, multiple layers or extensive rubbing, it created the possibility for uniform results and optimum adhesion, treatment after treatment.



* Please follow the Instructions for Use

** APPLY with a rubbing motion AND PROCEED

CLEARFIL™ Universal Bond Quick

CLEARFIL™ Universal Bond Quick is our latest and most innovative bonding agent.

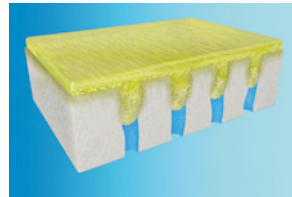
We qualify this as a universal bonding that works instantly. Just apply, dry and light cure. That's all. No waiting, no multiple layers, no extensive rubbing time. Instead CLEARFIL™ Universal Bond Quick uses Kuraray Noritake Dental's rapid bond technology to achieve lasting bond strength in one simple procedure. Uniform results, optimum adhesion.

CLEARFIL™ Universal Bond Quick reliably bonds all direct restorations, core build-ups and even indirect restorations and repairs. Unlike other one-bottle universal adhesives which utilize 'slow monomers' which need time to penetrate, there's no need to wait for it to penetrate the dentin before you proceed.



Prepared dentin with smear layer.

Due to its hydrophilicity we need a very hydrophilic bonding to be able to optimally penetrate the dentin.



Dentin bonded with CLEARFIL™ Universal Bond Quick.

During curing CLEARFIL™ Universal Bond Quick creates a highly cross linked polymer network. As a result of this, the bonding has a very low water absorption which gives a long lasting restoration.

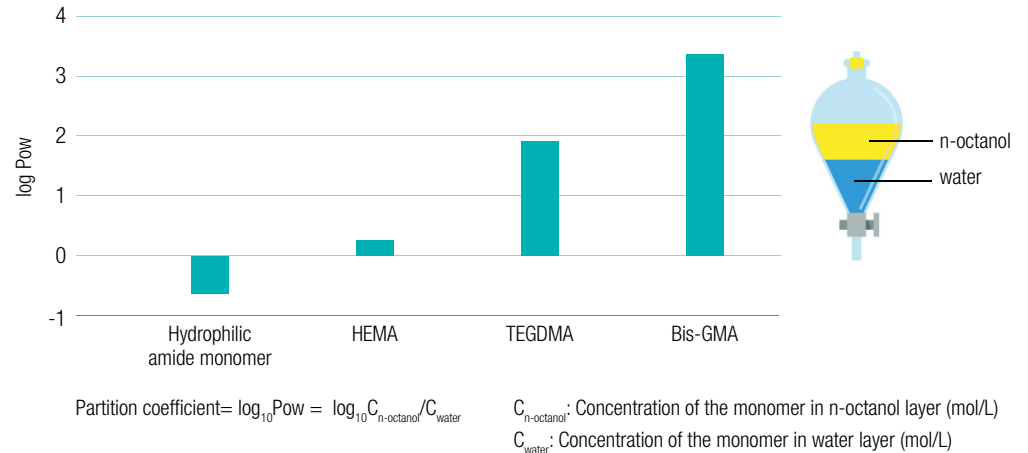
Rapid bond technology

Our rapid bond technology combines The Original MDP Monomer with new hydrophilic amide monomers which work together to deliver optimal stability and resistance to moisture for a lasting result. MDP creates a strong chemical bond to hydroxyapatite. Having been in use for more than 20 years, MDP has a proven excellence in adhesion.



Kuraray Noritake Dental's new hydrophilic amide monomer is one of the key factors to develop the rapid bond technology. Bonding to dentin isn't easy; the adhesive solution needs to be able to penetrate the wet dentin. CLEARFIL™ Universal Bond Quick uses our new hydrophilic amide monomer technology to penetrate the dentin. It has extremely high hydrophilicity compared to hydrophilic HEMA-monomer.

Graph 8. Amide monomer hydrophilicity (Partition coefficient; log Pow)

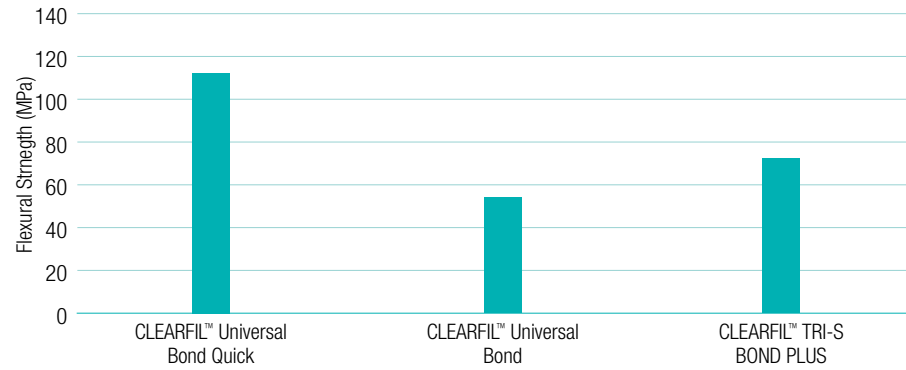


Source: Kuraray Noritake Dental Inc.

Flexural strength

Our new hydrophilic amide monomers have a high cross-linking property as well as the high hydrophilicity, and offer optimal mechanical strength and stability due to its highly cross linked polymer network after curing.

Graph 9. Flexural strength of cured adhesives.



Source: Kuraray Noritake Dental Inc.

* Trademarks are property of their respective owners.

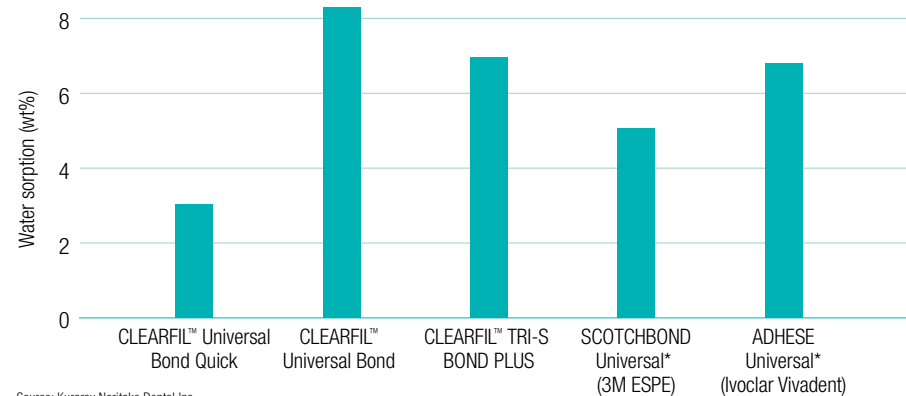
Samples (beam shape; 25 x 2 x 2 mm): The solvents of each material were removed by blowing mild air prior to the test.

Water Sorption

Having low water sorption is one of the most significant characteristics of adhesives. The organic matrix of the adhesive absorbs water in the long term. High water sorption of adhesives is cited as a factor in the deterioration of physical characteristics and secondary caries.

CLEARFIL™ Universal Bond Quick showed the lowest water sorption among the tested materials, even though it contains highly hydrophilic amide monomers. It could be attributed to a high cross-linking property of our new hydrophilic amide monomers.

Graph 10. Water sorption after curing the adhesives.



Source: Kuraray Noritake Dental Inc.

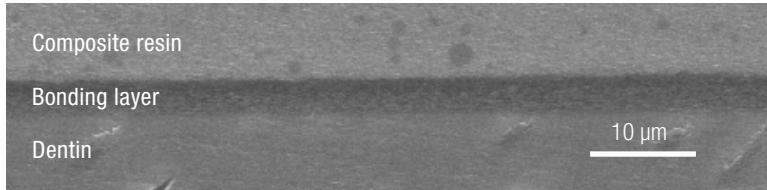
* Trademarks are property of their respective owners.

Samples (disk-shaped; diameter:15 mm, thickness: 1.0 mm): The solvents of each material were removed by blowing mild air prior to the test.

Esthetics

CLEARFIL™ Universal Bond Quick comprises a thin film layer of just 5 to 10 µm making it aesthetically pleasing even in the most demanding anterior restorations. Its innovative new amide monomers create many crosslinks to improve the stability of the thin film layer.

This in turn delivers a superior bonding layer which is resistant to moisture and it shows good esthetics along the margin of anterior restorations.

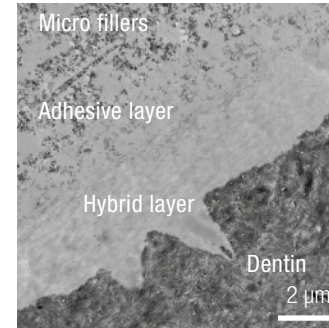


Source: Kuraray Noritake Dental Inc.

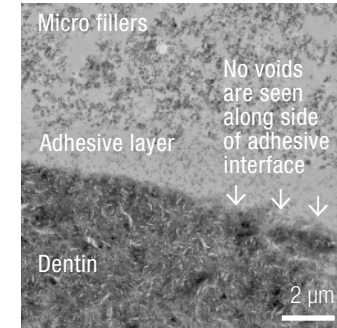
Optimal dentin bonding

By introducing rapid bond technology we are assured of a quick developing and tight bonding to the materials we want to bond to. Especially to dentin, being the most challenging substrate. Rapid bond technology used in CLEARFIL™ Universal Bond Quick is proven to be very effective. A tight seal of the dentin without any voids is the result.

Using either self-etch or total etch a tight interaction zone between the bonding and the dentin is present. No voids were seen.



Etch and rinse mode TEM



Self-etch mode TEM

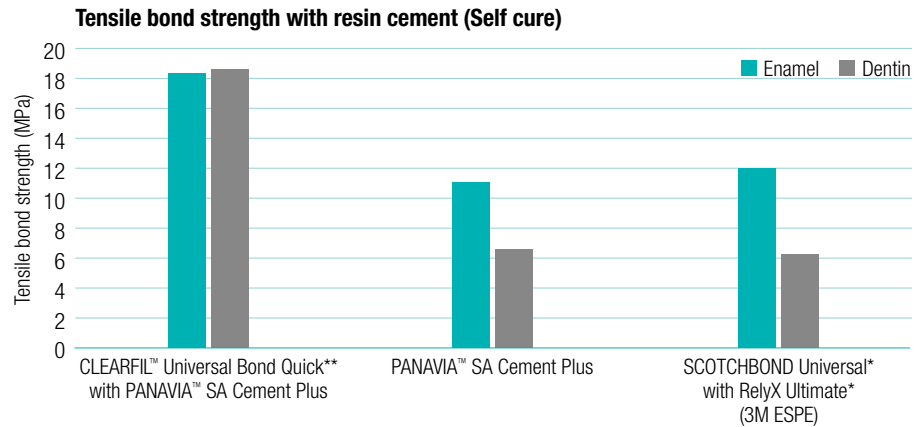
TEM pictures courtesy of Dr. Kumiko Yoshihara and Dr. Noriyuki Nagaoka, Okayama University, Japan

COMPATIBLE WITH SELF & DUAL-CURE

CLEARFIL™ Universal Bond Quick may be used with PANAVIA™ SA Cement Plus or CLEARFIL™ DC CORE PLUS as a self or light-cure adhesive.

The bond strength of PANAVIA™ SA Cement Plus to tooth structure is highly enhanced when used in combination with CLEARFIL™ Universal Bond Quick.

And CLEARFIL™ Universal Bond Quick not only bonds to the root canal dentin, it also bonds to your post. The self-curing feature of the core build-up composite CLEARFIL™ DC CORE PLUS ensures solid curing around the whole post. No CLEARFIL™ DC CORE PLUS available? Just mix one drop of the all-new CLEARFIL™ DC Activator with one drop of CLEARFIL™ Universal Bond Quick in order to get a sound curing around any other favorite core build-up composite.



Source: Kuraray Noritake Dental Inc.

* Trademarks are property of their respective owners.

** In this research, CLEARFIL™ Universal Bond Quick is applied with rubbing motion for 3 seconds



PROCEDURAL FREEDOM

CLEARFIL™ Universal Bond Quick also has excellent curing properties, enabling a highly cross linked polymer network inside the bonding. The result is a strong adhesive that creates a lasting, durable bonding layer that has a very low water absorption.






Unlike traditional dental bonding agents that require waiting time, extensive rubbing time and multiple layers in order to deliver an optimum result, with CLEARFIL™ Universal Bond Quick your restorative procedures are carried out to the exceptionally high standards.

Exceptional levels of adhesion also result in a bond that lasts with minimal risk of remedial work in the future. And, because there's no need to wait before you proceed, procedures take less time than with most other available bondings, benefiting both patient and practitioner.

DIRECT COMPOSITE RESTORATIONS*



UNIVERSAL adhesives

	CLEARFIL™ Universal Bond Quick Kuraray Noritake Dental	APPLY with a rubbing motion AND PROCEED	Blowing mild air for more than 5 seconds	Light cure for 10 seconds**
	Scotchbond Universal*** 3M ESPE	Apply and rub it in for 20 seconds	Gentle stream of air for about 5 seconds	Light cure for 10 seconds
	Prime & Bond active*** Dentsply	Apply and slightly agitate for 20 seconds	Dry air for at least 5 seconds	Light cure for 10-20 seconds
	Xeno Select*** Dentsply	Agitate the adhesive for 20 seconds	Dry air for at least 5 seconds	Light cure for 10 seconds
	Adhese Universal*** Ivoclar Vivadent	Scrub for at least 20 seconds	Disperse with compressed air until a glossy, immobile layer results	Light cure for 10 seconds

* Please follow the Instructions for Use for detailed technique and instructions

** 5 seconds for high power LED (Light intensity more than 1500mW/cm²)

*** Trademarks are property of their respective owners

Data compiled from respective manufacturer's instruction for use.

DIRECT COMPOSITE RESTORATIONS*

TOTAL-ETCH adhesives



CLEARFIL™ Universal Bond Quick
Kuraray Noritake Dental

APPLY with a rubbing motion AND PROCEED

Blowing mild air for more than 5 seconds

Light cure for 10 seconds**



Adper Scotchbond 1 XT***
3M ESPE

Apply 2-3 coats, agitate for 15 seconds with gentle agitation

Gently air thin for 5 seconds

Light cure for 10 seconds



OptiBond Solo Plus***
Kerr

Apply for 15 seconds, using light brushing motion

Air thin for 3 seconds

Light cure for 20 seconds



ExiTE F***
Ivoclar Vivadent

Apply and agitate for at least 10 seconds

Disperse to a thin layer with a weak stream of air

Light cure for 10 seconds



Prime&Bond NT***
Dentsply

Apply and remain undisturbed for 20 seconds

Gently drying with clean, dry air from a dental syringe for at least 5 seconds

Light cure for 10 seconds

DIRECT COMPOSITE RESTORATIONS*

SELF-ETCH adhesives



CLEARFIL™ Universal Bond Quick
Kuraray Noritake Dental

APPLY with a rubbing motion AND PROCEED

Blowing mild air for more than 5 seconds

Light cure for 10 seconds**



CLEARFIL™ S3 BOND PLUS
Kuraray Noritake Dental

Apply and leave it in place for 10 seconds

Blowing mild air for more than 5 seconds

Light cure for 10 seconds



Adper Prompt L-Pop***
3M ESPE

Massage it in for 15 seconds, applying pressure. Apply a second coat after dry

Use a gentle stream of air to thoroughly dry the adhesive to a thin film. Again, use a gentle stream of air to thoroughly dry the adhesive to a thin film

Light cure for 10 seconds



OptiBond All-In-One***
Kerr

Apply twice with brushing motion for 20 seconds each time

Dry with gentle air first and then medium air for at least 5 seconds

Light cure for 10 seconds

Technical specifications

Film thickness	5-10 μm
Film thickness mixed with CLEARFIL™ DC Activator	<1 μm
Working time with light blocking plate	7 min.
Working time mixed with CLEARFIL™ DC Activator	90 sec.

Application time for direct restoration

	Self-etch	Total-etch/ Selective-etch
Phosphoric acid etching	-	10 sec.
Bond application	Apply with rubbing motion; No waiting time needed	Apply with rubbing motion; No waiting time needed
Air-dry	5 sec.	5 sec.
Light cure	10 sec.*	10 sec.*
Total application time	15 sec.	25 sec.

*5 sec. for high power LED (Light intensity: more than 1500 mW/cm²)

Principal ingredients

10-Methacryloyloxydecyl dihydrogen phosphate (MDP), Bisphenol A diglycidylmethacrylate (Bis-GMA), 2-Hydroxyethyl methacrylate (HEMA), Hydrophilic amide monomers, Colloidal silica, Silane coupling agent, Sodium fluoride, dl-Camphorquinone, Ethanol, Water



RESEARCH DATA

SHEAR BOND STRENGTH OF CLEARFIL™ Universal Bond Quick IN SELF-ETCH MODE TO BOVINE ENAMEL AND DENTIN

Institute:

Kuraray Noritake Dental Inc., Niigata, Japan

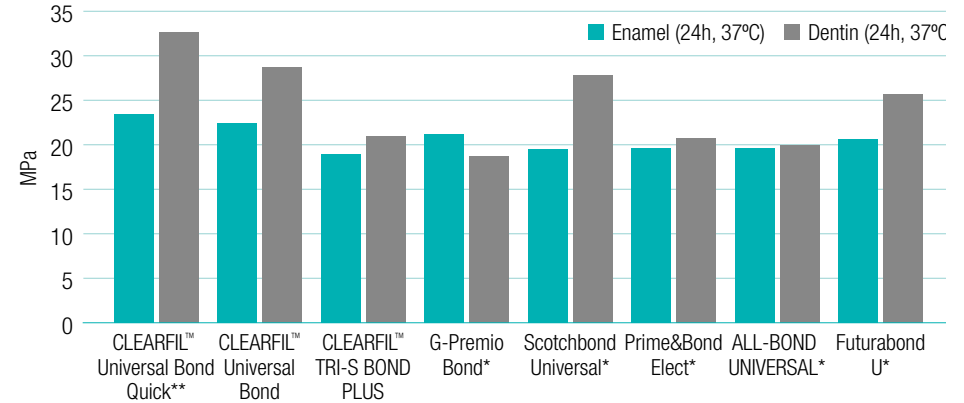
Objectives

The purpose of this study was to compare the shear bond strength of CLEARFIL™ Universal Bond Quick in self-etch mode to bovine enamel and dentin with 7 other commercial single-step adhesives: CLEARFIL™ Universal Bond & CLEARFIL™ TRI-S BOND PLUS (Kuraray Noritake Dental), G-Premio Bond (GC), Scotchbond Universal (3M ESPE), Prime&Bond Elect (Dentsply), ALL-BOND UNIVERSAL (BISCO), Futurabond U (VOCO).

Methods

Extracted bovine teeth embedded in gypsum were polished with 600-grit Si-C paper under running water to obtain flattened enamel and dentin surfaces. Each adhesive system was applied to enamel or dentin surfaces according to each manufacturer's instructions. The cylindrical mold (Ultradent, D=2.38mm) was placed on the bonding surface, and then the composite build-up was done with CLEARFIL™ AP-X. After the specimens were stored in 37°C for 24 hours, the shear bond strength was measured at a crosshead speed of 1 mm/min using a universal testing instrument (Shimadzu).

Shear bond strength to bovine teeth (self-etch)



* Trademarks are property of their respective owners

** In this research, CLEARFIL™ Universal Bond Quick is applied with rubbing motion for 3 seconds.

Conclusions

CLEARFIL™ Universal Bond Quick showed the highest bond strengths to bovine enamel and dentin in self-etch mode among the single-step adhesives tested in this study.

TENSILE BOND STRENGTH OF CLEARFIL™ Universal Bond Quick IN TOTAL-ETCH MODE TO BOVINE ENAMEL

Institute

Kuraray Noritake Dental Inc., Niigata, Japan

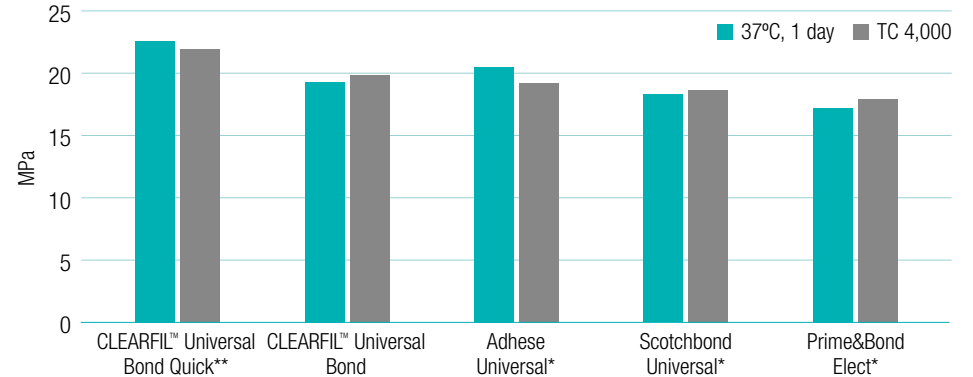
Objectives

The purpose of this study was to compare the tensile bond strength of CLEARFIL™ Universal Bond Quick in total-etch mode to bovine enamel with 4 other commercial single-step universal adhesives: CLEARFIL™ Universal Bond (Kuraray Noritake Dental), Adhese Universal (Ivoclar Vivadent), Scotchbond Universal (3M ESPE), Prime&Bond Elect (Dentsply).

Methods

Extracted bovine teeth were polished with 1000-grit Si-C paper under running water to obtain flattened enamel surfaces. Each universal adhesive was applied to the phosphoric-acid-etched enamel surfaces covered with masking tape with 3 mm diameter hole according to each manufacturer's instructions. Light-curing composite resin (CLEARFIL™ AP-X) was further applied to the treated dentin surface, covered with a polyester film, and then light cured. Stainless steel rod was cemented to the cured surface with resin cement (PANAVIA™ 21) as a test sample. After storage in 37°C water for 24 hours, the specimens were divided into two groups. Half of the samples were subjected to thermo-cycling (4°C-60°C, 1 min. each, 4,000 cycles: TC4,000). The tensile bond strength was measured at a crosshead speed of 1 mm/min using a universal testing instrument (Shimadzu).

Tensile bond strength to bovine enamel (total-etch)



* Trademarks are property of their respective owners

** In this research, CLEARFIL™ Universal Bond Quick is applied with rubbing motion for 3 seconds.

Conclusions

CLEARFIL™ Universal Bond Quick showed the highest bond strengths to bovine enamel in total-etch mode both after 24 hours and TC4,000, among the single-step universal adhesives tested in this study.

SHEAR BOND STRENGTH OF CLEARFIL™ Universal Bond Quick IN TOTAL-ETCH MODE TO BOVINE DENTIN

Institute:

Kuraray Noritake Dental Inc., Niigata, Japan

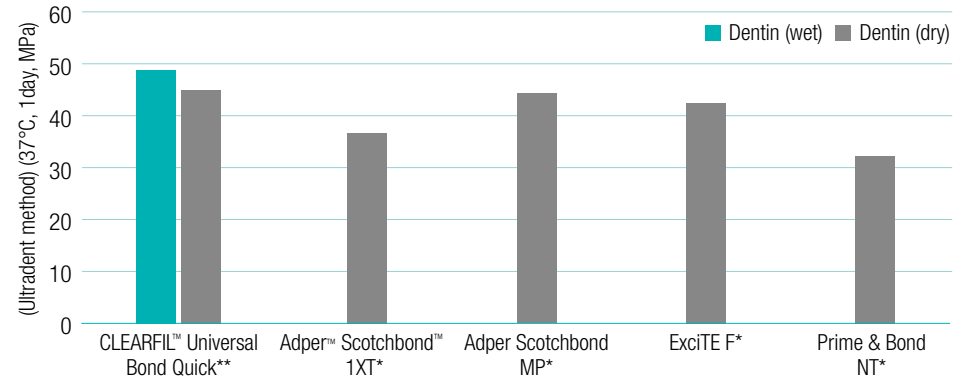
Objectives

The purpose of this study was to compare the shear bond strength of CLEARFIL™ Universal Bond Quick to bovine dentin in total-etch mode with 4 other commercial single-step total-etch adhesives: Adper Scotchbond 1XT & Adper Scotchbond MP (3M ESPE), Excite F (Ivoclar Vivadent), Prime&Bond NT (Dentsply).

Methods

Extracted bovine teeth embedded in gypsum were polished with 600-grit Si-C paper under running water to obtain flattened dentin surfaces. Each adhesive was applied to the phosphoric-acid-etched dentin surfaces according to each manufacturer's instructions. With regard to CLEARFIL™ Universal Bond Quick, blot-drying (wet dentin) condition was added to the test in addition to its standard method (dry dentin). The cylindrical mold (Ultradent, D=2.38mm) was placed on the bonding surface, and then the composite build-up was done with CLEARFIL™ AP-X. After the specimens were stored in 37°C for 24 hours, the shear bond strength was measured at a crosshead speed of 1 mm/min using a universal testing instrument (Shimadzu).

Shear bond strength to bovine dentin (Total-etch)



* Trademarks are property of their respective owners

** In this research, CLEARFIL™ Universal Bond Quick is applied with rubbing motion for 3 seconds.

Conclusions

CLEARFIL™ Universal Bond Quick showed the highest bond strengths to bovine dentin in total-etch mode, irrespective to the dentin moisture condition.

FLUORIDE RELEASING PROPERTY OF CLEARFIL™ Universal Bond Quick

Institute

Kuraray Noritake Dental Inc., Niigata, Japan

Objectives

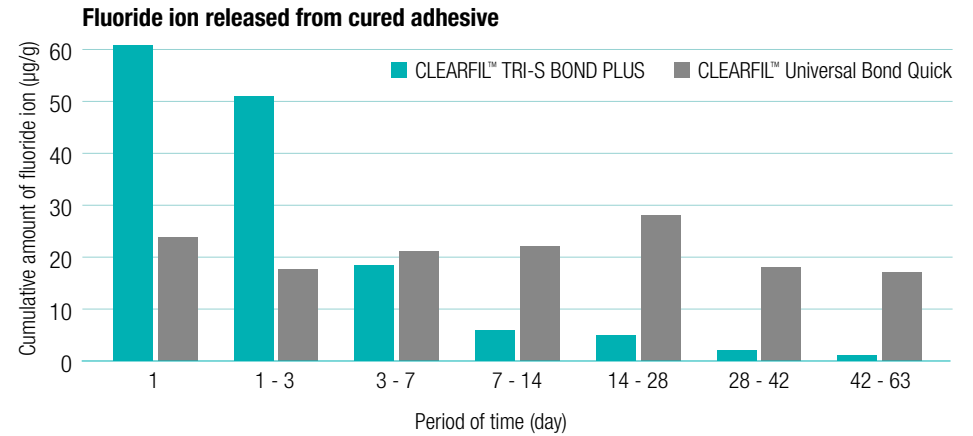
The purpose of this study was to compare the amount of fluoride release from CLEARFIL™ Universal Bond Quick with single-step self-etch adhesive CLEARFIL™ TRI-S BOND PLUS.

Methods

The solvents of each material were removed by blowing mild air prior to the test. Discs of each cured material were prepared and stored in phosphate buffer solutions. The amount of fluoride release was measured with fluoride ion-selective electrode at the integral time from day 1 up to day 63.

Conclusions

CLEARFIL™ Universal Bond Quick showed a more sustainable fluoride releasing behavior compared to CLEARFIL™ TRI-S BOND PLUS.



SHEAR BOND STRENGTH OF PANAVIA™ SA CEMENT PLUS TO HUMAN ENAMEL AND DENTIN WITH/WITHOUT THE PRE-TREATMENT WITH CLEARFIL™ Universal Bond Quick

Institute

Kuraray Noritake Dental Inc., Niigata, Japan

Objectives

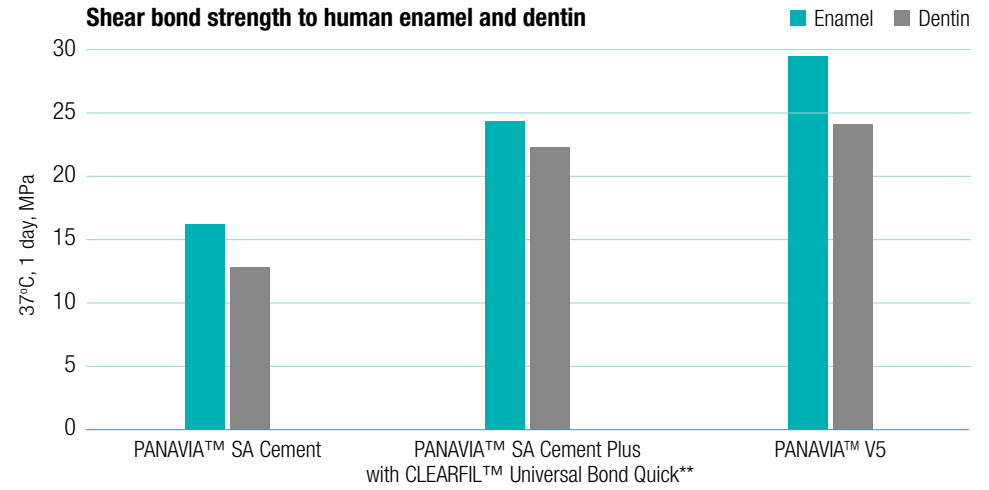
The purpose of this study was to compare the shear bond strength of PANAVIA™ SA Cement Plus to human enamel and dentin with/without the pretreatment of adherent surface by CLEARFIL™ Universal Bond Quick, with PANAVIA™ V5.

Methods

Extracted human teeth embedded in acrylic resin were polished with 1000-grit Si-C paper under running water to obtain flattened enamel or dentin surfaces. Stainless steel rod (diameter 3mm) was cemented with each resin cement system according to each manufacturer's instructions. After the specimens were stored in 37°C for 24 hours, the shear bond strength was measured at a crosshead speed of 1 mm/min using a universal testing instrument (Shimadzu).

Conclusions

Shear bond strengths of PANAVIA™ SA Cement Plus to human enamel and dentin were both significantly enhanced when used in combination with CLEARFIL™ Universal Bond Quick, and its values were close to that of PANAVIA™ V5.



** In this research, CLEARFIL™ Universal Bond Quick is applied with rubbing motion for 3 seconds.

SHEAR BOND STRENGTH OF CLEARFIL™ Universal Bond Quick IN TOTAL-ETCH MODE TO BOVINE ENAMEL AND DENTIN

Institute

Kuraray Noritake Dental Inc., Niigata, Japan

Objectives

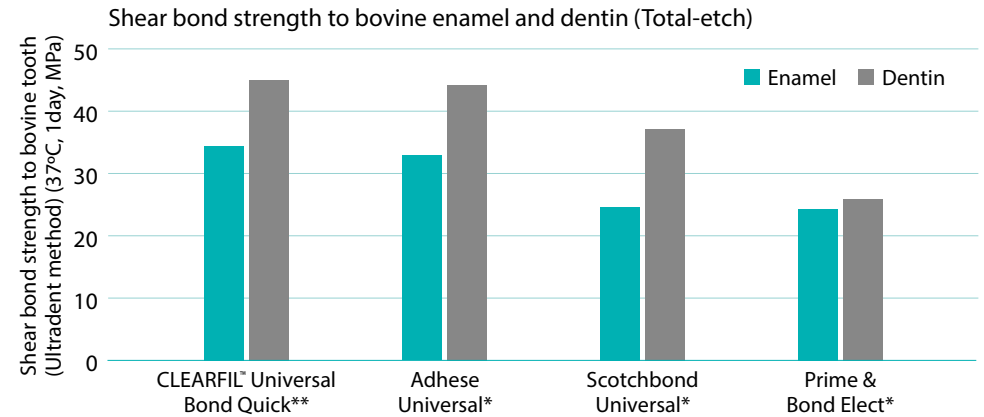
The purpose of this study was to compare the shear bond strength of CLEARFIL™ Universal Bond Quick to bovine enamel and dentin in total-etch mode with other 3 commercial single-step universal adhesives: Adhese Universal (Ivoclar Vivadent), Scotchbond Universal (3M ESPE), Prime & Bond Elect (Dentsply).

Methods

Extracted bovine teeth embedded in gypsum were polished with 600-grit Si-C paper under running water to obtain flattened enamel and dentin surfaces. Each adhesive system was applied to phosphoric-acid-etched enamel or dentin surfaces according to each manufacturer's instructions. The cylindrical mold (Ultradent, D=2.38mm) was placed on the bonding surface, and then the composite build-up was done with CLEARFIL™ AP-X. After the specimens were stored in 37°C for 24 hours, the shear bond strength was measured at a crosshead speed of 1 mm/min using a universal testing instrument (Shimadzu).

Conclusions

CLEARFIL™ Universal Bond Quick showed the highest bond strengths to both bovine enamel and dentin in total-etch mode among the universal adhesives tested in this study.



* Trademarks are property of their respective owners

** In this research, CLEARFIL™ Universal Bond Quick is applied with rubbing motion for 3 seconds.

Instructions for use

CLEARFIL™ Universal Bond Quick can be used for various indications. In the flowcharts you will find the instructions for use.

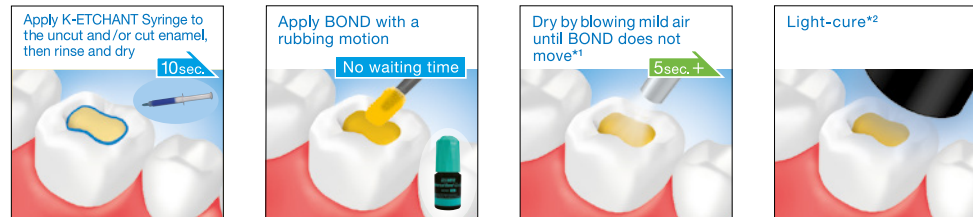
Wide indication range

- ✓ Direct restorations using light-cured composite resin
- ✓ Cavity sealing as a pretreatment for indirect restorations
- ✓ Treatment of exposed root surfaces
- ✓ Treatment of hypersensitive teeth
- ✓ Intraoral repairs of fractured restorations
- ✓ Post cementation and core build-ups
- ✓ Cementation of indirect restorations

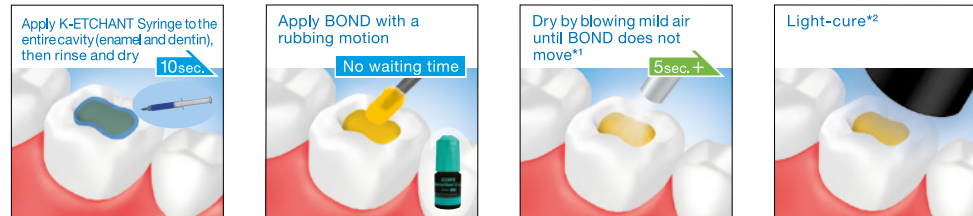
Self-etch procedure with CLEARFIL™ Universal Bond Quick



Selective-etch procedure with CLEARFIL™ Universal Bond Quick



Total-etch procedure with CLEARFIL™ Universal Bond Quick





PRODUCT ASSORTMENT

CLEARFIL™ Universal Bond Quick BOTTLE STANDARD KIT

#3571-EU Bottle (5 ml),
K-ETCHANT Syringe (3 ml),
Applicator Brush (fine <silver>) (x 50 pcs),
Needle Tip (x 20 pcs),
Dispensing Dish, Light Blocking Plate



CLEARFIL™ Universal Bond Quick UNIT DOSE STANDARD PACK

#3577-EU Unit Dose (50 pcs x 0.1 ml),
K-ETCHANT Syringe (3 ml),
Applicator Brush (fine <silver>) (x 50 pcs),
Needle Tip (x 20 pcs)



CLEARFIL™ Universal Bond Quick BOTTLE REFILL

#3572-EU Bottle (5 ml)



CLEARFIL™ DC ACTIVATOR

#3250- EU 1 bottle (4 ml)



CLEARFIL™ Universal Bond Quick BOTTLE VALUE PACK

#3574-EU Bottle (3 x 5 ml)



K-ETCHANT SYRINGE

#3252- EU K-ETCHANT Syringe (2 x 3 ml),
Needle Tip (x 40 pcs)

Needle Tips

#3253- EU Needle Tip (x 20 pcs)



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