Advanced Bonding Systems

The Leader in Adhesive Innovation and Excellence

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- **APC™ Adhesive Coated Appliance System**
- **Transbond™ Plus Self Etching Primer**
- **Ortholux™ Luminous Curing Light**
Features

- **APC™ II Adhesive System**
  - Soft, workable adhesive for easier positioning
    - Bracket drift is virtually eliminated
  - Cuts overall bonding steps and time
  - Less mess compared to traditional bonding process

- **APC™ PLUS Color Change Adhesive System**
  - Good bond strength, comparable to APC™ II Adhesive
  - Pink color for easy flash removal
    - White light stability
  - Improved moisture tolerance
  - Good adhesive handling properties
The bond strength of APC™ PLUS Adhesive and APC™ II Adhesive is statistically equivalent to Transbond™ XT Light Cure Adhesive.
APC™ Adhesive Systems – Fewer Bonding Steps

- Using APC™ II Appliance System or APC™ PLUS Adhesive Pre-Coated Appliance will reduce the number of bonding steps compared to Traditional Light Cure Bonding
- Saves time and creates efficiency in the office
The initial pink color assists the user in seeing the adhesive clearly on the tooth.

Once light cured, APC™ PLUS Adhesive turns clear.
White Light Stability (for Color)

- A StellarNet spectrometer was used to characterize adhesive color over time (CIELAB color system) under fluorescent white light.
- The pink color, or $a^*$ parameter, decays to zero over a period of 20-25 minutes.
Improved Moisture Tolerance

Data shows APC™ PLUS Adhesive is more moisture tolerant than APC™ II Adhesive.
Adhesive Handling

On-bracket Texture Analysis for Precoated Metal Brackets

APC™ II and APC™ PLUS Adhesives have similar handling characteristics.

3M Unitek Internal Test Data
Total Bonding Efficiency

APC™ II

Unitek™ Bonding System
Fewer / Easier Bonding Steps

- Less chair time per patient
  - Orthodontist may possibly see more patients per day
  - Assistants may have more time for other functions
  - Patients may have shorter office visits
    - Parents are happier
  - Less variability
  - Lower possibility of error
Advantages for Doctor / Assistant

- Lower possibility of bracket base contamination
- Ease of use
- Convenient inventory & organization system
- Bond reliability
- Efficiency
- Better visual reference for accurate placement
- Consistent amount of adhesive on every bracket
- Better flash clean-up
- Complete moisture tolerant system when used with Transbond™ Plus Self Etching Primer
Transbond™ Plus Self Etching Primer

The Leader in Adhesive Innovation and Excellence
The bonding process is made up of a series of steps that the Orthodontist must follow. In a normal bonding process, the Orthodontist will etch the teeth to be bonded for 15 to 30 seconds, the etch will then be washed off and the teeth will be dried. The Orthodontist then applies a primer to the dry teeth. If moisture contaminates the teeth at any stage, it can compromise the bond strength, sometimes resulting in loose brackets. This can be time consuming for the Orthodontist and the patient.
Introduction

- Transbond™ Plus Self Etching Primer allows the Orthodontist to perform two stages of the bonding process at the same time. The product etches and primes the tooth all in one step on moist or dry teeth. This saves valuable time in the bonding process and eliminates worries about moisture control.
## Features & Benefits

<table>
<thead>
<tr>
<th>Feature</th>
<th>Advantage</th>
<th>Benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unique chemistry</td>
<td>Etch &amp; Prime at the same time</td>
<td>Saves time and reduces error</td>
</tr>
<tr>
<td></td>
<td></td>
<td>No need for separate bottles of etch &amp; primer</td>
</tr>
<tr>
<td>Single-patient use foil pack</td>
<td>Assures high quality delivery of material</td>
<td>No evaporation or contamination of material</td>
</tr>
<tr>
<td>Single-patient use foil pack</td>
<td>Single use only</td>
<td>Consistent convenient, hygienic product delivery</td>
</tr>
<tr>
<td>Excellent bond strength</td>
<td>Fewer bond failures</td>
<td>Reduces chairside time</td>
</tr>
<tr>
<td>Light cure</td>
<td>Immediate high bond strengths</td>
<td>Immediate archwire engagement</td>
</tr>
<tr>
<td>Primer applicators</td>
<td>Easy, simple application</td>
<td>No need for applicator brushes etc.</td>
</tr>
</tbody>
</table>
# Features & Benefits

<table>
<thead>
<tr>
<th>Feature</th>
<th>Advantage</th>
<th>Benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydrophilic Material (Moisture Tolerance)</td>
<td>Can be used in a moist or dry environment</td>
<td>Reduces moisture control issues and bond failure due to moisture</td>
</tr>
<tr>
<td></td>
<td>Increases appliance placement accuracy by increasing placement time available</td>
<td>Reduces worry about bond failure</td>
</tr>
<tr>
<td></td>
<td>Less need for lip expander</td>
<td>Improve patient comfort</td>
</tr>
<tr>
<td>New foil and packaging process</td>
<td>Easier to activate</td>
<td>Easier handling</td>
</tr>
</tbody>
</table>
Technical Data

Key Strengths:

- Self Etching component
- Moisture tolerance
- Unique dispensing
- Complements the APC™ Adhesive Coated Appliance System and the Transbond™ Adhesive Family
Application Technique

- One unit per arch
- RUB on tooth for 3-5 seconds
- REDIP applicator before RUBBING on every tooth
- GENTLE air burst for 2 seconds per tooth
- Place brackets within 2 minutes
Tooth Prep Comparison

**Transbond™ XT Light Cure Adhesive (Hydrophobic)**

- Dry → Etch (15s) → Rinse → Dry → Prime

**Transbond™ MIP Moisture Insensitive Primer (Hydrophilic)**

- Prophy → Rinse
- Dry → Etch (15s) → Rinse → Prime → Blow

**Transbond™ Plus Self Etching Primer**

- Prime (3s) → Blow
Bond Strength Comparison

This experiment is intended to demonstrate how well Transbond™ Plus Self Etching Primer performs in comparison with Transbond™ XT Primer and Transbond™ MIP Moisture Insensitive Primers. The bond strength on bovine teeth measured 24 hours after bonding shows that Transbond Self Etching Primer performs at least as well as our current primers. The fact that the bond strength is not affected by wet and saliva contamination demonstrates the moisture tolerance of Transbond Plus Self Etching Primer.
Bond Strength Comparison

This experiment is intended to show how quickly the bond strength of Transbond™ Plus Self Etching Primer builds after curing. The brackets are bonded to bovine teeth and the bond strength measured at given intervals following cure. Comparison is made to Transbond™ MIP Moisture Insensitive Primer, a product known to be effective. The bond strengths indicate that Transbond Plus Self Etching Primer is at least as strong as Transbond MIP Primer at archwire tie-in.
Importance of the Prophy Step

- It is important that a complete prophy be conducted prior to the use of the Transbond™ Plus Self Etching Primer. Published studies have shown that skipping the prophy step will lower bond strength, causing a higher bond failure rate.¹

Ideal Etch Pattern

SEM-Study (Dr. Perdigao, University of North Carolina)
A Well-Defined Etch Pattern

Transbond™ Plus Self Etching Primer is a low pH, self-etching adhesive that produces a well-defined etch pattern comparable to the etch pattern created with phosphoric acid.

Results of enamel etching with 37% phosphoric acid. Results of enamel etching with Transbond™ Plus Self Etching Primer.
Chemistry

Phosphoric Acid + HEMA → Self-etching primer
Chemical Mechanism

- Penetration
- Demineralization
- Acid-Base Reaction
- Light Curing
- Polymer
Chemical Mechanism

Acid Etches Enamel → Neutralization of Acid

Penetration of Monomer in the Demineralized Zone → Light Curing → Polymerization
Articles on Self-Etching Primer

- Pandisa, N. A Comparative In-Vivo Assessment of the Long-Term Failure Rate of Two Self-Etching Primers. AJODO Volume 128, Number 1, p. 96-98.
- Hosein, I, Enamel Loss During Bonding, Debonding, And Clean-up With Use Of A Self-Etching Primer. AJODO Volume 126, Number 6, p. 717-724.
Glossary

- **Self Etching Primer**: Etchant and primer contained within one system, one-step etching and priming
- **Methacrylated phosphoric acid esters**: Chemical containing both etching and adhesive priming elements
- **Reservoir**: Sealed blister containing chemicals
- **Disperse**: Spread, evenly distribute
- **Remineralization**: Replacement of the calcium that was previously removed from the hydroxyapatite during etching
Ortholux™ Luminous Curing Light
## Curing Light Technologies

<table>
<thead>
<tr>
<th></th>
<th>Halogen</th>
<th>Plasma arc</th>
<th>LED</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Power efficiency</strong></td>
<td>Low ~100 W</td>
<td>Low ~500 W</td>
<td>High ~10 W</td>
</tr>
<tr>
<td><strong>Brightness</strong></td>
<td>Medium</td>
<td>High</td>
<td>Medium-High</td>
</tr>
<tr>
<td><strong>Durability</strong></td>
<td>Okay replace bulb every 6 mo.</td>
<td>Excellent will vary in length</td>
<td>Excellent never need to replace LED</td>
</tr>
<tr>
<td><strong>Predictability</strong></td>
<td>Okay</td>
<td>Okay</td>
<td>Excellent</td>
</tr>
</tbody>
</table>

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LED Technology

- In an LED (Light Emitting Diode), two solid semiconductors are joined together.
- An electric charge is applied using a battery.
- When electrons and holes meet, energy is released in the form of light.

Advantages: No filament needed, efficient, low heat.
Why Are LEDs So Efficient?

- **Ortholux™ XT Curing Lights and ORTHO Lite™ Curing Lights** produce light with many wavelengths (380-740 nm), which needs to be filtered.

- **The Ortholux™ Luminous Curing Light** does not need filters; it produces only blue light (430-480 nm).
Absorption Spectrum

- **Source**: 3M ESPE, LED Technology, 2002
  - Camphorquinone, or CPQ, is the initiator in Transbond™ Self Etching Primer, Transbond™ XT Adhesive, and many other adhesives.
  - Light output matches the absorption spectrum of the initiator.
Ortholux™ Luminous Curing Light vs. Ortholux™ LED Curing Light

<table>
<thead>
<tr>
<th>Feature</th>
<th>Ortholux™ Luminous</th>
<th>Ortholux™ LED</th>
</tr>
</thead>
<tbody>
<tr>
<td>Charger size</td>
<td>Smaller</td>
<td>Small</td>
</tr>
<tr>
<td>Handpiece size</td>
<td>Shorter, thinner</td>
<td>Short, thin</td>
</tr>
<tr>
<td>Handpiece weight</td>
<td>Light</td>
<td>Lighter</td>
</tr>
<tr>
<td>Handpiece material</td>
<td>Stainless Steel</td>
<td>Polycarbonate</td>
</tr>
<tr>
<td>Handpiece heat build-up</td>
<td>Slightly warmer</td>
<td>Warm</td>
</tr>
<tr>
<td>Intensity</td>
<td>1600mW</td>
<td>1000mW</td>
</tr>
<tr>
<td>Cure time</td>
<td>3 sec.</td>
<td>5 sec.</td>
</tr>
<tr>
<td>Optical Range</td>
<td>430-480nm</td>
<td>430-480nm</td>
</tr>
<tr>
<td>Tack cure</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Extended cure</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Built-in handpiece rest</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Battery conditioning</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Battery charge time</td>
<td>2 hr.</td>
<td>2 hr.</td>
</tr>
<tr>
<td>Battery installation</td>
<td>Easy (screw in)</td>
<td>Latch-type</td>
</tr>
<tr>
<td>Battery charge indicator</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Battery type</td>
<td>Lithium-ion</td>
<td>Nickel metal hydride</td>
</tr>
<tr>
<td>Battery charged independently</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Raised, easy-to-locate buttons</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Light guide fitting</td>
<td>Magnetic</td>
<td>Friction fit</td>
</tr>
<tr>
<td>Light guide</td>
<td>8mm, black-coated</td>
<td>8mm, black-coated</td>
</tr>
<tr>
<td>Eye-shield</td>
<td>Luminous/LED</td>
<td>LED only</td>
</tr>
</tbody>
</table>
## Curing Times

### Ortholux™ Luminous Curing Light

<table>
<thead>
<tr>
<th>Appliance</th>
<th>Adhesive</th>
<th>Ortholux™ Luminous Curing Light</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metal Brackets</td>
<td>Transbond™ XT Adhesive,</td>
<td>3 seconds mesial x 3 seconds distal</td>
</tr>
<tr>
<td></td>
<td>Transbond™ PLUS Color Change Adhesive,</td>
<td></td>
</tr>
<tr>
<td></td>
<td>APC™ II Adhesive Coated Brackets,</td>
<td></td>
</tr>
<tr>
<td></td>
<td>APC™ PLUS Adhesive Coated Brackets</td>
<td></td>
</tr>
<tr>
<td>Ceramic Brackets</td>
<td>Transbond™ LR Adhesive</td>
<td>3 seconds mesial x 3 seconds distal</td>
</tr>
<tr>
<td>Buccal Tubes (direct bond)</td>
<td>Transbond™ Plus Band Adhesive</td>
<td>6 seconds mesial x 6 seconds occlusal</td>
</tr>
<tr>
<td>Lingual Retainers</td>
<td>Unitek™ Multi-Cure Glass Ionomer Band Cement</td>
<td>12 seconds (3 seconds per cusp)</td>
</tr>
<tr>
<td>Molar Bands</td>
<td>Transbond™ Supreme LV Low Viscosity Light Cure Adhesive</td>
<td>6 seconds mesial x 6 seconds distal through the trays</td>
</tr>
<tr>
<td>Indirect Trays (Metal Brackets)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Indirect Trays (Ceramic Brackets)</td>
<td></td>
<td>6 seconds through the bracket and trays</td>
</tr>
</tbody>
</table>
Battery Life

- Ortholux™ Luminous Curing Light
  - Up to sixteen full 7x7 hook ups can be completed on one full battery charge.
  - A steady green light means the battery is charged and ready for operation. A steady red light indicates low battery charge, while a flashing red light indicates the battery is fully discharged.
Inserting Battery

- **Ortholux™ Luminous Curing Light**
  - Remove battery cap and insert battery into handpiece. Tighten by turning clockwise.
Removing Battery

- Ortholux™ Luminous Curing Light
  - To remove battery from handpiece turn counter-clockwise
Battery Conditioning

- NOTE: The Lithium ion battery in the Ortholux™ Luminous Curing Light **DOES NOT** need to be conditioned.
Holding the Lights

- The Ortholux™ Luminous Curing Light should be held like a pencil.
Automatic Cool Down

- Ortholux™ Luminous Curing Light
  - It is normal for the handpiece to become warm after some use. According to laboratory data, it is expected that the Safety Shutdown would kick in if the unit had been used for bonding of more than 2 patients continuously, assuming full 7x7 upper and lower arches banded / bonded with metal appliances.
  - The unit will shut down automatically if the overheat protection mechanism is triggered (after approximately 7 minutes of continuous use).
  - After a 5 minute cooling period the light can be used again.
Light Meter Operation

- The built-in light meter should be used periodically to check the intensity of the light.
- If below 80%, inspect light guide for contamination or damage.

Ortholux™ Luminous Curing Light
Sterilization Technique

- The Ortholux™ Luminous Curing Light
  - Light guide
    - The light guide can be autoclaved. Do not exceed 134°C (273°F).
    - Adhering polymerized material should be removed with alcohol. A plastic spatula may help in removing the material.
  - Charger, Handpiece & Eye-Shield
    - Spray disinfectant on a towel and use it to disinfect the unit; wipe dry
    - Do not spray the disinfectant directly on the handpiece or the charger, and, make sure the charge contact pins remain dry
    - The protective glass of the handpiece can be cleaned with a soft and fluff-free cloth.
Charging pins can corrode!

Do **not** allow residual disinfectant to stay in contact with these pins.
Glossary

- **Camphorquinone (CPQ):** An initiator, or chemical used in many orthodontic adhesives to ‘kick off’ the curing process.
- **Diode:** An electronic device with two electrodes that allows current to flow only in one direction.
- **Efficiency:** The ability of a device to operate using as little power as possible.
- **Filter:** A device that selectively removes some wavelengths of light while allowing others to pass through.
- **Lithium ion:** A rechargeable battery technology that offers long battery life with no memory effect or conditioning necessary.
- **Nickel metal hydride:** A rechargeable battery technology that offers an excellent balance of capacity, power and value.
- **Semiconductor:** A class of materials that can act either as a conductor or insulator, depending on its environment.
- **Wavelength:** A fundamental characteristic of light that determines its energy and color.