



## Multi-Cure<sup>®</sup> 6-621

### Adhesive for Phenolic and Filled Plastics, Glass, and Metal

#### APPLICATIONS

- Metal-to-Glass Bonding
- Coil Winding
- Potting

#### FEATURES

- UV/Visible Light Cure
- Secondary Heat Cure
- Activator Cure
- Bonds Multiple Substrates
- Hard and Clear Bonds

#### RECOMMENDED SUBSTRATES

- Metals
- Glass
- Ceramic
- Polyamide (Filled/Unfilled)
- Phenolic Plastics

Dymax Multi-Cure<sup>®</sup> 6-621 cures upon exposure to light and is designed for rapid assembly of parts made of metal, glass, ceramic, phenolic, filled polyamide, and other materials. Dymax 6-621 is specially formulated to cure with heat in applications where shadowed areas exist. Dymax Multi-Cure materials contain no nonreactive solvents and their ability to cure in seconds enables faster processing, greater output, and lower processing costs. When cured with Dymax light-curing spot lamps, focused-beam lamps, or flood lamps, they deliver optimum speed and performance for industrial product assembly. Dymax lamps offer the ideal balance of UV and visible light for the fastest, deepest cures. These products are in full compliance with the RoHS Directives 2015/863/EU.

| UNCURED PROPERTIES *                                    |                          |             |
|---|--------------------------|-------------|
| Property  | Value                    | Test Method |
| Solvent Content   | No Nonreactive Solvents  | N/A         |
| Chemical Class  | Acrylated Urethane       | N/A         |
| Appearance  | Clear Translucent Liquid | N/A         |
| Soluble in  | Organic Solvents         | N/A         |
| Density, g/ml   | 1.08                     | N/A         |
| Viscosity, cP (20 rpm)                                  | 800 (nominal)            | ASTM D1084  |
| Shelf Life @ RT (22°C to 25°C) from Date of Manufacture | 18 months                | N/A         |

| CURED MECHANICAL PROPERTIES *    |              |             |
|----------------------------------|--------------|-------------|
| Property                         | Value        | Test Method |
| Durometer Hardness               | D80          | ASTM D2240  |
| Tensile at Break, MPa [psi]      | 22 [3,200]   | ASTM D638   |
| Elongation at Break, %           | 37           | ASTM D638   |
| Modulus of Elasticity, MPa [psi] | 550 [80,500] | ASTM D638   |

| OTHER CURED PROPERTIES *                               |       |             |
|--|-------|-------------|
| Property   | Value | Test Method |
| Refractive Index (20°C)                                | 1.51  | ASTM D542   |
| Boiling Water Absorption, % (2 h)                      | 4.1   | ASTM D570   |
| Water Absorption, % (25°C, 24 h)                       | 1.7   | ASTM D570   |
| Linear Shrinkage, %                                    | 0.4   | ASTM D2566  |
| CTE $\alpha_2$ , $\mu\text{m}/\text{m}/^\circ\text{C}$ | 221   | ASTM E831   |
| CTE $\alpha_1$ , $\mu\text{m}/\text{m}/^\circ\text{C}$ | 66    | ASTM E831   |
| Glass Transition T $_g$ , °C                           | 74    | ASTM D5418  |

\* Not Specifications

N/A Not Applicable

‡ DSTM Refers to Dymax Standard Test Method

| TYPICAL PERFORMANCE OF CURED MATERIAL *         |           |             |
|---|-----------|-------------|
| Property  | Value     | Test Method |
| Glass-to-Stainless Steel Compression, MPa [psi] | 15 [2215] | DSTM 251‡   |

| DISPENSE EQUIPMENT RECOMMENDATIONS * |        |                 |                 |
|--------------------------------------|--------|-----------------|-----------------|
| Application                          | Manual | Semi-Automated  | Fully Automated |
| Beads                                | SD-100 | Model 400 Valve | eco-PEN450      |
| Dots                                 | SD-100 | Model 400 Valve | eco-PEN450      |

| ADHESION                            |                |
|-------------------------------------|----------------|
| Substrate                           | Recommendation |
| ABS acrylonitrile-butadiene-styrene | ✓              |
| EP epoxy, FR-4 Circuit Board        | ✓              |
| PA polyamide                        | ✓              |
| PC polycarbonate                    | o              |
| PEI polyetherimide                  | o              |
| PET poly(ethylene terephthalate)    | o              |
| Phenolic Plastic                    | ✓              |
| PI polyimide                        | o              |
| PU polyurethane                     | o              |
| PVC poly(vinyl chloride)            | o              |
| CER ceramic                         | ✓              |
| AL aluminum                         | ✓              |
| CU copper                           | ✓              |
| Glass: borosilicate, quartz, mica   | ✓              |
| CRS cold rolled steel               | ✓              |
| SS stainless steel                  | ✓              |

✓ Recommended      o Limited Applications

st Requires Surface Treatment (e.g. plasma, corona treatment, etc.)





## CURING GUIDELINES

Fixture time is defined as the time to develop a shear strength of 0.1 N/mm<sup>2</sup> [10 psi] between glass slides. Actual cure time typically is 3-to-5 times fixture time.

| Dymax Curing System (Intensity)                                       | Fixture Time or Belt Speed <sup>A</sup> |
|---|---|
| 2000-EC (50 mW/cm <sup>2</sup> ) <sup>B</sup>                         | 2 s                                     |
| 5000-EC (200 mW/cm <sup>2</sup> ) <sup>B</sup>                        | 1 s                                     |
| BlueWave® 200 (10 W/cm <sup>2</sup> ) <sup>B</sup>                    | <1 s                                    |
| UVCS Conveyor with one 5000-EC (200 mW/cm <sup>2</sup> ) <sup>C</sup> | 7.3 m/min [24 ft/min]                   |
| UVCS Conveyor with Fusion F300S (2.5 W/cm <sup>2</sup> ) <sup>C</sup> | >8.2 m/min [>27 ft/min]                 |

<sup>A</sup> Fixture times/belt speeds are typical for curing thin films through 100% UV and light-transmitting substrates. Light-obstructing substrates may require longer cure times.

<sup>B</sup> Intensity was measured over the UVA range (320-395 nm) using a Dymax ACCU-CAL™ 50 Radiometer.

<sup>C</sup> At 53 mm [2.1 in] focal distance. Maximum speed of conveyor is 8.2 m/min [27 ft/min]. Intensity was measured over the UVA range (320-395 nm) using the Dymax ACCU-CAL™ 160 Radiometer.

## SECONDARY HEAT CURE

Heat can be used as a secondary cure mechanism where the resin cannot be cured with light. The following heat-cure schedule may be used:

| Temperature   | Time*      |
|---------------|------------|
| 110°C [230°F] | 60 minutes |
| 120°C [250°F] | 30 minutes |
| 150°C [300°F] | 15 minutes |

\*Note: Actual heat cure time may vary due to part configuration, volume of mask applied, and oven efficiency.

## ACTIVATOR CURE

Shadow areas can be cured with activator.

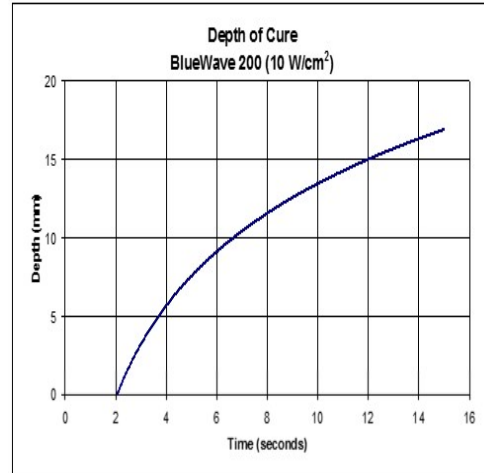
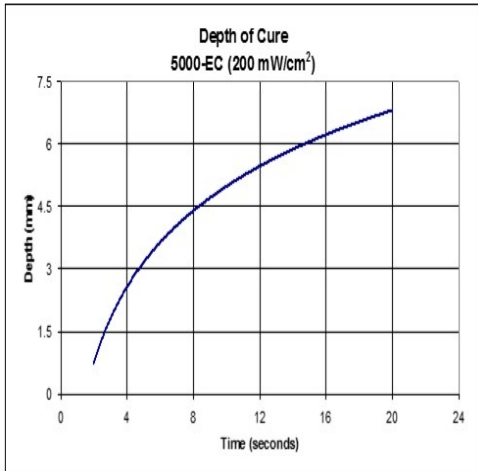
Activator is placed on one surface and the adhesive on the mating surface. Curing takes place at room temperature when the parts are mated. Activator requires closely mated parts (up to 0.5 mm [0.02 in] gap). Closely mated parts fixture (achieve handling strength) in less than a minute. See Dymax Technical Bulletin "Guidelines for Activator Curing" for complete instructions for all activators.

Full cure is best determined empirically by curing at different times and intensities, and measuring the corresponding change in cured properties such as tackiness, adhesion, hardness, etc. Full cure is defined as the point at which more light exposure no longer improves cured properties. Higher intensities or longer cure times may degrade Dymax light-curable masks.

Dymax recommends that customers employ a safety factor by curing longer and/or at higher intensities than required for full cure. Although Dymax Application Engineering can provide technical support and assist with process development, each customer must ultimately determine and qualify the appropriate curing parameters required for their unique application.

### DEPTH OF CURE

The graphs below show the increase in depth of cure as a function of exposure time with two different lamps at different intensities. A 9.5 mm [0.37 in] diameter specimen was cured in a polypropylene mold and cooled to room temperature. It was then released from the mold and the cure depth was measured. These depths are only due to light cure.



### OPTIMIZING PERFORMANCE AND HANDLING

1. This product cures with exposure to UV and visible light. Exposure to ambient and artificial light should be kept to a minimum before curing. Dispensing components including needles and fluid lines should be 100% light blocking, not just UV blocking.
2. All bond surfaces should be clean and free from grease, mold release, or other contaminants prior to dispensing the adhesive.
3. Cure speed is dependent upon many variables, including lamp intensity, distance from the light source, required depth of cure, bond gap, and percent light transmission of the substrate.
4. Oxygen in the atmosphere may inhibit surface cure. Surfaces exposed to air may require high-intensity (>100 mW/cm<sup>2</sup>) UV light to produce a dry surface cure. Flooding the bond area with an inert gas, such as nitrogen, can also reduce the effects of oxygen inhibition.
5. Parts should be allowed to cool after cure before testing and subjecting to any loads.
6. In rare cases, stress cracking may occur in assembled parts. Three options may be explored to eliminate this problem. One option is to heat anneal the parts to remove molded-in stresses. A second option is to open the gap between mating parts to reduce stress caused by an interference fit. The third option is to minimize the amount of time the liquid adhesive remains in contact with the substrate(s) prior to curing.
7. Light curing generally produces some heat. If necessary, cooling fans can be placed in the curing area to reduce the heating effect on components.
8. At the point of curing, an air exhaust system is recommended to dissipate any heat and vapors formed during the curing process.

### DISPENSING THE ADHESIVE

This material may be dispensed with a variety of manual, semi-automated, and fully automated fluid-delivery systems. Small-area applications, including beads and small dots, can be achieved using hand-held Dymax dispensing systems like our SD-100 syringe dispenser and Model 400 needle valve systems. These valve systems can be used in manual, semi-automated, or fully automated applications. Dymax has several other dispensing systems that may be suitable for use with our adhesive materials. Questions relating to and defining the best fluid-delivery system and curing equipment for specific applications should be discussed with the Dymax Application Engineering Team.

### STORAGE AND SHELF LIFE

Store the material in a cool, dark place when not in use. Do not expose to light. This product may polymerize upon prolonged exposure to ambient and artificial light. Keep covered when not in use. This material shelf life is noted on page 1 of this document, when stored between 10°C (50°F) and 32°C (90°F) in the original, unopened container.

### CLEAN UP

Uncured material may be removed from dispensing components and parts with organic solvents. Cured material will be impervious to many solvents and difficult to remove. Cleanup of cured material may require mechanical methods of removal.



## GENERAL INFORMATION

This product is intended for industrial use only. Keep out of the reach of children. Avoid breathing vapors. Avoid contact with skin, eyes, and clothing. Wear impervious gloves. Repeated or continuous skin contact with uncured material may cause irritation. Remove material from skin with soap and water. Never use organic solvents to remove material from skin and eyes. For more information on the safe handling of this material, please refer to the Safety Data Sheet before use.

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