



# PT2846

## HIGH TEMPERATURE EPOXY LAMINATING RESIN

### DESCRIPTION

PT2846 is an amber, unfilled high temperature epoxy laminating resin designed specifically for demanding high performance composite tooling. PT2846 has good heat resistance, making it capable of providing excellent long term service in today's higher temperature curing cycles. The resin has a medium-low viscosity, and, when combined with the hardeners recommended here, allows very easy handling in tool fabrication. The mixed systems wet out the tooling fabrics very readily. This allows faster tool production than when using more viscous materials. This feature is achieved without the use of hazardous or potentially restricted diluents. PT2846 does not contain vinylcyclohexane diepoxide (VCHD).

### HARDENER SELECTION

Three low toxicity hardeners are listed here for use with PT2846. These hardeners provide a broad range of working times for all sizes of tools and lay-up methods. All three hardeners give good high temperature performance with very high physical properties. These hardeners do not contain methylene dianiline (MDA), or other potentially harmful aniline derivatives. They are non-staining materials, and will not crystallize in normal shipping and storage conditions.

Other hardeners with special characteristics are available for use with PT2846. Check with our Technical Services department for details and recommendations.

| Hardener       | Mix Ratio | Pot Life    | Description   |
|----------------|-----------|-------------|---|
| PT2846 Part B  | 100 : 19  | 40-45 min.  | Intermediate high temperature service hardener with a shorter pot life for smaller tools. Provides a good hard gel at room temperature. Recommended for tools operating in the 275°F to 350°F range. Also, excellent for back-up structure attachment and quick repairs.  |
| PT2846 Part B1 | 100 : 22  | 2.5-3 hours | Intermediate high temperature service hardener with longer working time than PT2846 Part B, for somewhat larger tools and vacuum bagging operations. PT2846 Part B1 gives a good gel at room temperature (77°F), and can allow an unsupported post cure to a properly gelled tool. It provides durable tools with good dimensional stability, for applications in the 300°F to 350°F range. This combination has a lower mixed viscosity for good fabric wetting. |
| PT2846 Part B2 | 100 : 9.5 | 3-4 hours   | A unique high temperature service, low toxicity hardener for the most demanding tooling applications. The longer working time allows vacuum bag fabrication of medium sized tools with excellent cured properties. PT2846 Part B2 can be gelled hard at 120°F or higher on a plastic faced plaster pattern for subsequent unsupported post cure and service to over 425°F.  |

### PRODUCT SPECIFICATIONS

|                                | PT2846 A | PT2846 B   | PT2846 B1   | PT2846 B2 | ASTM Method |
|--------------------------------|----------|------------|-------------|-----------|-------------|
| Color                          | Amber    | Amber      | Amber       | Amber     | Visual      |
| Viscosity, @77°F, centipoise   | 7000 cps | 1700 cps   | 500 cps     | 690 cps   | D2392       |
| Specific Gravity, gms./cc      | 1.19     | 1.09       | 0.98        | 1.0       | D1475       |
| Mix Ratio                      |          | 100 : 19   | 100 : 22    | 100 : 9.5 | PTM&W       |
| Pot Life, 4 fl.oz. Mass @ 77°F |          | 40-45 min. | 2.5-3 hours | 3-4 hours | D2471       |

## CURING SCHEDULES

| PT2846 Part B and Part B1   | PT2846 Part B2   |
|---|--|
| <b>SPECIAL INFORMATION</b>  |  |
| <p>Hardeners PT2846 Part B and Part B1 have been designed to gel hard at room temperature, to allow removal of the laminate from the pattern after an overnight (18 to 24 hours) cure at room temperature, and then be given an unsupported post cure. PT2846 Part B1 has a longer pot life than PT2846 Part B, to allow vacuum bagging applications on smaller tools.</p>  | <p>A unique feature of PT2846 Part B2 is that the heat resistance of the material "leads" the curing temperature. For example, castings of PT2846 Part B2 and PT2846 cured for 16 hours at 120°F have a heat deflection temperature of over 175°F. With the addition of four hours at 200°F, the heat deflection temperature of the casting is increased to over 250°F. Values for a laminate would be much higher due to the reinforcement of the fabric. This feature allows the fabrication of a high temperature laminate on a plastic faced pattern, and removal after an initial low temperature cure. It can then be post cured unsupported with full confidence that the finished tool will have excellent stability.</p>  |
| <b>TYPICAL CURE SCHEDULE</b>  |  |
| <p>1. Allow to gel on the pattern at room temperature for a minimum of 18 hours.</p> <p>2. Remove tool from the pattern and place in a cold oven. Slowly raise to 150°F and hold 3 - 4 hours.</p> <p>3. Slowly raise the temp. to 250°F, hold 3 - 4 hours.</p> <p>4. Slowly raise the temperature to 350°F and hold for 4 hrs.</p> <p>5. After completion of the cure cycle, turn off the oven and allow the tool to cool to room temperature before removing for clean-up and service.</p> | <p><b>UNSUPPORTED POST CURE:</b> Cure on the pattern for 36 - 48 hours at Rm. Temp., then remove from the pattern and cure for 3 - 4 hours at 150°F, 200°F, 250°F, 350°F, and 4 hours at 25°F over the expected service temperature.</p> <p><b>PARTIALLY UNSUPPORTED POST CURE:</b> Cure on the pattern for 18 to 24 hours at room temperature followed by 16 hours at 120°F ; then remove from the pattern and post cure for 3 - 4 hours at each of the following temperatures: 150°F, 250°F, 350°F, and 425°F.</p> <p><b>SUPPORTED POST CURE - FOR MAXIMUM TOOL STABILITY:</b> Cure on the pattern 18 - 24 hours at room temperature plus 3 - 4 hours at each of the following temperatures: 150°F, 250°F, 350°F, and 425°F.</p> |

## TYPICAL MECHANICAL PROPERTIES

|   | PT2846 A/B                             | PT2846 A/B1                            | PT2846 A/B2                            | ASTM Method |
|---|--|--|--|-------------|
| Mix Ratio, By Weight                                  | 100 : 19                               | 100 : 22                               | 100 : 9.5                              | PTM&W       |
| Mixed Viscosity, @77°F, centipoise                    | 4000-4500 cps                          | 3000-3500 cps                          | 5100-5600 cps                          | D2393       |
| Pot Life, 4 fl. Oz. Mass, @77°F                       | 40 - 45 min.                           | 2.5 - 3 hours                          | 3 - 4 hours                            | D2471       |
| Cured Hardness, Shore D, @ 77°F<br>@ 300°F            | 90 D<br>86 D                           | 92 D<br>87 D                           | 89 D<br>80 D (@ 350°F)                 | D2240       |
| Specific Gravity, grams, cc                           | 1.17                                   | 1.15                                   | 1.17                                   | D1475       |
| Density, lb./cu. Inch                                 | .0424                                  | .0417                                  | .0424                                  | D792        |
| Specific Volume, cu. in./lb.                          | 23.6                                   | 23.9                                   | 23.6                                   |             |
| Tensile Strength, psi, Laminate*                      | 29,440 psi                             | 30,880 psi                             | 30,370 psi                             | D638        |
| Elongation at Break, %, Laminate*                     | 1.49 %                                 | 1.57 %                                 | 1.50 %                                 |             |
| Tensile modulus, psi, Laminate*                       | 50,303 psi                             | 54,250 psi                             | 69,730 psi                             |             |
| Flexural Strength, psi, Laminate*                     | 44,463 psi                             | 47,649 psi                             | 38,099 psi                             | D790        |
| Flexural Modulus, psi, Laminate*                      | 557,871 psi                            | 801,525 psi                            | 540,009 psi                            |             |
| Compressive Strength, psi, Cast Bar                   | 15,950 psi                             | 17,100 psi                             | 16,880 psi                             | D695        |
| Compressive Modulus, psi, Cast Bar                    | 138,040 psi                            | 139,540 psi                            | 138,820 psi                            |             |
| Glass Transition Temperature, Tg                      | 308°F                                  | 338°F                                  | 370°F                                  | (TMA) D3386 |
| Coefficient of Thermal Expansion, Range 50°C to 100°C | 3.62 x 10 <sup>-5</sup><br>in./in./ °F | 3.47 x 10 <sup>-5</sup><br>in./in./ °F | 3.72 x 10 <sup>-5</sup><br>in./in./ °F | D696        |

\*Tensile & Flexural Properties Determined with a 1/8" Laminate, Style 7500 Tooling Cloth, Resin Content of 50%-55%.

## SAFETY and HANDLING

PTM&W epoxy products are made from raw materials carefully chosen to minimize or even eliminate toxic chemicals, and therefore offer the user high performance products with minimum hazard potential when properly used. Generally, the PTM&W epoxy resins and hardeners will present no handling problems if users exercise care to protect the skin and eyes, and if good ventilation is provided in the work areas. However, breathing of mist or vapors may cause allergenic respiratory reaction, especially in highly sensitive individuals. As such, avoid contact with eyes and skin, and avoid breathing vapors. Wear protective rubber apron, clothing, nitrile rubber gloves, face shield or other items as required to prevent contact with the skin. In case of skin contact, immediately wash with soap and water, followed by a rinse of the area with vinegar, and then a further wash with soap and water. The vinegar will neutralize the hardener and lessen the chances of long term effects. Use goggles, a face shield, safety glasses or other items as required to prevent contact with the eyes. If material gets into the eyes, immediately flush with water for at least 15 minutes and call a physician. Generally, keep the work area as uncluttered and clean as possible, and clean up any minor spills immediately to prevent accidental skin contact at a later time. Keep tools clean and properly stored. Dispose of trash and empty containers properly. Do not use any of these types of products until Material Safety Data Sheets have been read and understood.

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