987
Multi-Cure® Conformal Coating

APPLICATIONS

- **Conformal Coating**

FEATURES

- **UV/Visible Light Curing**
- **Secondary Heat Cure for Shadowed Areas**
- **Nonreactive, Solvent Free**
- **Blue Fluorescing**
- **Chemically Resistant**

BONDS

- **MIL-I-46058C**
- **IPC-CC-830B**

DYMAX 987 is a light-curable conformal coating specifically formulated for rapid, room-temperature cure when exposed to UV/Visible light. Shadowed areas on densely populated circuit boards may be cured with heat. DYMAX 987 fluoresces blue when exposed to UV light (365 nm) and is low viscosity, allowing it to be dispensed easily with current methods of dispensing. DYMAX 987 is nonreactive and solvent free. This material's ability to cure in seconds enables faster processing, greater output, and lower assembly costs. DYMAX lamps offer the optimum balance of UV and visible light for the fastest, deepest cures. This product is in full compliance with the RoHS Directives 2002/95/EC and 2003/11EC.

TYPICAL UNCURED PROPERTIES *

Property	Value	Test Method
Solvent Content	No Nonreactive Solvents	N/A
Chemical Class	Acrylated Urethane	N/A
Appearance	Clear/Light Amber Liquid	N/A
Solubility	Alcohols/Chlorinated Solvents	N/A
Density, g/ml	1.05	ASTM D-1875
Viscosity, cP (20 rpm)	150 (nominal)	ASTM D-2556

CURED ELECTRICAL PROPERTIES *

Property	Value	Test Method
Dielectric Constant (1 MHz)	3.24	ASTM D-1304-99
Dissipation Factor (1 MHz)	0.02	ASTM D-1304-99
Dielectric Withstanding Voltage, kV/mm [V/mil]	>59 [>1,500]	MIL-I-46058C
Volume Resistivity, ohm-cm	7.6 X 10^{15}	ASTM D-1304-99
Surface Resistivity, ohm	3.8 X 10^{15}	ASTM D-1304-99

CURED PROPERTIES *

Property	Value	Test Method
Boiling Water Absorption, % (2 h)	0.9	ASTM D-570
Water Absorption, % (25˚C, 24 h)	0.2	ASTM D-2566
Linear Shrinkage, %	1.3	ASTM D-638
Flame Resistance	Self Extinguishing	MIL-I-46058C

ADHESION

Substrate	Recommendation
Lead Frame	✓
Ceramic	o
PCB	✓
Flex	N/A
Silicon	✓

✓ Recommended Adhesive o Limited Applications
st Requires Surface Treatment (e.g., plasma, corona treatment, etc.)

CURED MECHANICAL PROPERTIES *

Property	Value	Test Method
Durometer Hardness	D85	ASTM D-2240
Tensile at Break, MPa [psi]	37 [5,300]	ASTM D-638
Elongation at Break, %	4.0	ASTM D-638
Modulus of Elasticity, MPa [psi]	900 [130,000]	ASTM D-638
Flexibility	Pass	MIL-I-46058C

* Not Specifications
N/A Not Applicable

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CURING GUIDELINES

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

DYMAX Curing System Intensity	Fixture Time or Belt Speed [B]
2000-EC (50 mW/cm^2) [A]	Not Recommeded
5000-EC (200 mW/cm^2) [A]	1 sec
BlueWave® 200 (10 W/cm^2) [A]	0.2 sec
BlueWave® 50 AS (3.0 W/cm^2) [A]	<0.2 sec
UVCS Conveyor with one 5000-EC (200 mW/cm^2) [A]	7.3 m/min [24 ft/min]
UVCS Conveyor with Fusion F300S (2.5 W/cm^2)[C]	>8.2 m/min [>27 ft/min]

A Intensity was measured over the UVA range (320-395 nm) using the DYMAX ACCU-CAL™ 50 Radiometer.

B Curing through light-blocking substrates may require longer cure times if they obstruct wavelengths used for light curing (320-400 nm for UV light curing, 320-450 nm for UV/Visible light curing). These fixture times/belt speeds are typical for curing thin films through 100% light-transmitting substrates.

C 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™ 100 Radiometer.

Full cure is best determined empirically by curing at different times and/or 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 UV exposure no longer improves cured properties. Higher intensities or longer cures (up to 5x) generally wull not degrade DYMAX light-curable adhesives.

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

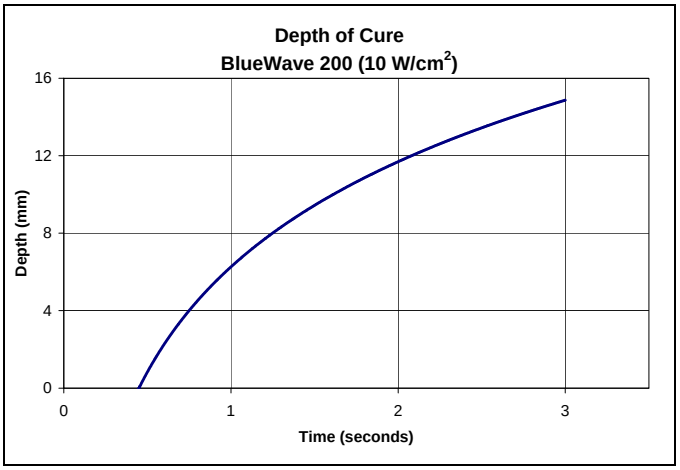
Heat Cure Following UV Exposure

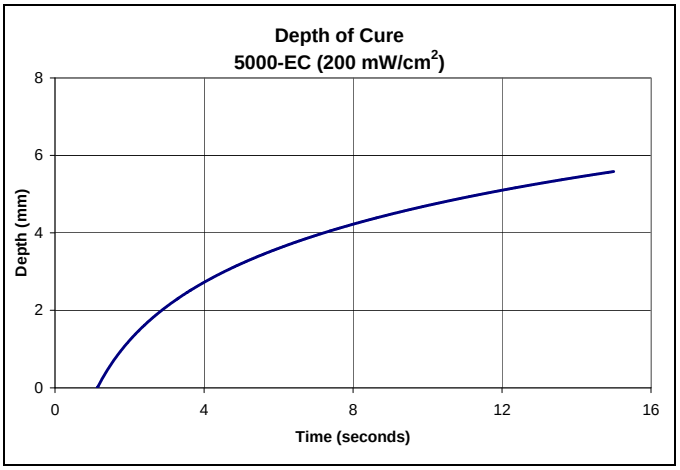
Heat cure can be used as a secondary mechanism for shadowed areas that cannot be cured with UV light. UV cure must be done prior to heat cure. The following schedule may be used as a starting point for establishing the optimal parameters for your process:

Coating Temperature	Time
225˚F [110˚C]	1 hour
250˚F [120˚C]	30 minutes
300˚F [150˚C]	15 minutes

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.





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987 Product Data Sheet

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 surfaces in contact with the material should be clean and free from flux residue, grease, mold release, or other contaminants prior to dispensing the material.
3. Cure speed is dependent upon many variables, including lamp intensity, distance from the light source, required depth of cure, thickness, and percent light transmission of components between the material and light source.
4. Oxygen in the atmosphere may inhibit surface cure. Surfaces exposed to air may require high-intensity (>100 mW/cm^2) UV light to produce a dry surface cure. Flooding the curing 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 or electrical testing.
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 any gap between mating parts to reduce stress caused by an interference fit. The third option is to minimize the amount of time the liquid material 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 MATERIAL

This material may be dispensed with a variety of manual and automatic applicators or other equipment as required. Questions relating to dispensing and curing systems for specific applications should be referred to DYMAX Applications Engineering.

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. Clean up of cured material may require mechanical methods of removal.

PERFORMANCE AFTER TEMPERATURE EXPOSURE

DYMAX light-curable materials typically have a lower thermal limit of -54˚C [-65˚F] and an upper limit of 150˚C [300˚F]. Many DYMAX products can withstand temperatures outside of this range for short periods of time. Please contact DYMAX Applications Engineering for assistance.

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 has a minimum six-month shelf life from date of shipment, unless otherwise specified, when stored between 10˚C [50˚F] and 32˚C [90˚F] in the original, unopened container.

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 Material Safety Data Sheet before use.

RECOMMENDED DYMAX LITERATURE

LIT010A	Guide to Selecting and Using UV Light-Curing Systems
LIT077	Chemical Safety
LIT133	UV Light-Curing System Safety Considerations
LIT159	ACCU-CAL™ 50 Radiometer
LIT206	Flood and Focused-Beam UV Light-Curing Systems
LIT218	BlueWave® 200 UV Light-Curing Spot Lamp

Literature is available through our website, www.dymax.com, or by calling any DYMAX location.

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