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EMAX Dual-Cure 99003
High-Performance Conformal Coating with Secondary Moisture Cure

APPLICATIONS

- Conformal Coating
- Automotive Sensors
- Control Modules
- Automotive Miscellaneous

FEATURES

- UV/Visible Light Cure
- Secondary Moisture Cure
- Excellent Thermal Shock Resistance
- Corrosion Resistant
- Temperature/Humidity Performance
- Bright Blue Fluorescing
- UL 94 V0 Flammability
- UL 746E

RECOMMENDED SURFACES

- Rigid Printed Circuit Boads (PWBs)
- Flexible Printed Circuits (FPCs)

EMAX dual-cure 99003 is a high-performance light- and moisture-cure reworkable conformal coating specially formulated to ensure complete cure for coating that flows underneath components on printed circuit boards. Coating in shadow areas cures over time with ambient moisture. EMAX 99003 is engineered for coating thicknesses up to 0.203 mm (0.008 in). This conformal coating fluoresces a vivid blue when exposed to low-intensity black light for easy inspection of coating coverage. Dymax dual-cure materials contain no nonreactive solvents. Their ability to cure in seconds enables faster processing, greater output, and lower processing costs. When cured with Dymax light-curing, focused- beam lamps, or flood lamps, they deliver optimum speed and performance for electronic assembly. Dymax lamps offer the ideal balance of UV and visible light for the fastest, deepest cures. This product is in full compliance with 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, Light Yellow Liquid	N/A
Soluble in	Organic Solvents	N/A
Density, g/ml	1.09	ASTM D1875
Viscosity, cP (20 rpm)	750 (nominal)	DSTM 502

CURED MECHANICAL PROPERTIES *

Property	Value	Test Method
Durometer Hardness Ω	A55	ASTM D2240
Durometer Hardness ¥	D60	ASTM D2240
Tensile at Break, MPa [psi] ¥	16.2 [2,350]	ASTM D638
Elongation at Break, % ¥	22	ASTM D638
Modulus of Elasticity, MPa [psi] ¥	276 [40,000]	ASTM D638

OTHER CURED PROPERTIES * ¥

Property	Value	Test Method
Refractive Index (20˚C)	1.51	ASTM D542
Boiling Water Absorption, % (2 h)	1.4	ASTM D570
Water Absorption, % (25˚C, 24 h)	0.3	ASTM D570
Linear Shrinkage, %	2.0	ASTM D2566
Glass Transition T_g, ˚C	57	ASTM D5418
CTEα_1, µm/m/˚C	87	ASTM E831
CTEα_2, µm/m/˚C	188	ASTM E831

ELECTRICAL PROPERTIES * ¥

Property	Value	Test Method
Dielectric Constant (1 MHz)	3.26	ASTM D150
Dissipation Factor (1 MHz)	0.2	ASTM D150
Dielectric Withstand Voltage, kV/mm [V/mil]	59 [1500]	ASTM D149
Volume Resistivity, ohm-cm	4.39E+14	ASTM D257
Surface Resistivity, ohm	2.22E+12	ASTM D257

ADHESION Ω

Substrate	Recommendation
Lead Frame	✓
Ceramic	✓
PCB	✓
Flex	✓

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

* Not Specifications
¥ Measured after UV cure followed by 15 days at 25°C / 50% RH
Ω Measured after UV cure only
N/A Not Applicable
‡ DSTM Refers to Dymax Standard Test Method

RoHS Compliant

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ELECTRONIC CIRCUIT BOARD MATERIALS

EMAX 99003 Product Data Sheet

CURING GUIDELINES

UV- and moisture-curing guideline for E-MAX 99003 up to 0.2 mm [0.008 in].

Dymax Curing System (Intensity)	Exposure Time or Belt Speed	Moisture Curing (After Light Cure)	Only Moisture Cure for (Shadow Areas)
UVCS Conveyor with Fusion F300S (2.5 W/cm^2)[B]	1.5 m/min 5 ft/min	7 days at 25°C / 50% RH or 2 days at 40°C / 50% RH	2-3 days at 25°C / 50% RH
5000-EC (200 mW/cm^2)[A]	50 s		
UVCS Conveyor with 5000-EC (200 mW/cm^2)[B]	0.3 m/min 1 ft/min		

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

B. 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 MOISTURE CURE

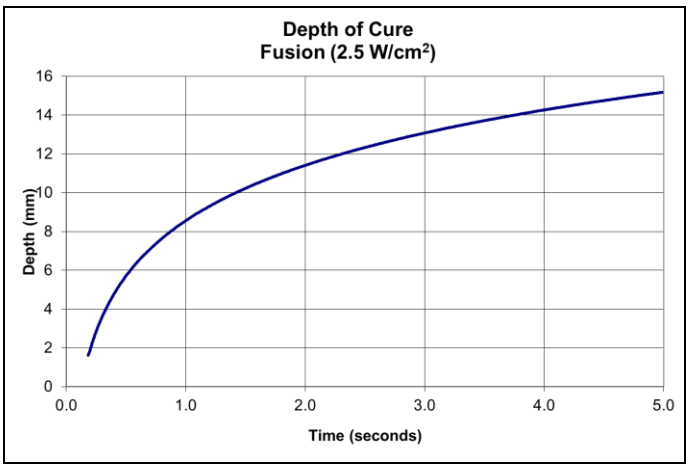
A combination of light and moisture cure is required to achieve full cured mechanical properties. Moisture is also used as a secondary cure mechanism for shadow areas that cannot be cured with light. While moisture cure time in shadow areas is typically 2-3 days at 25˚C [77˚F], 50% RH, actual moisture cure time is application specific and may vary. For adhesive that has been light cured, typical full property development is after 7 days at 25°C [77°F], 50% RH. Cure time for both light cured and shadow areas depends on humidity level, amount of coating in shadow areas, and proximity of shadow coating to humidity. Coating entrapped under large components may have a prolonged cure time. Exposure to heat (typically 65˚C-80˚C) and higher relative humidity will accelerate cure. Accelerated moisture cure time is also dependent on the variables listed above.

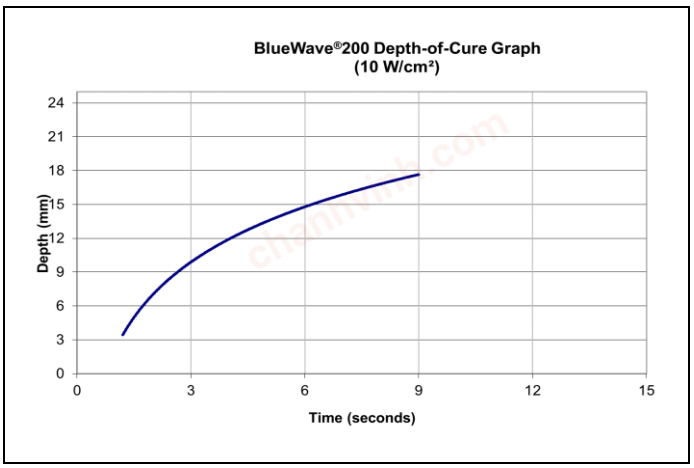
Full cure is best determined empirically by curing at different times and intensities, and measuring the corresponding change in cured properties such as tackiness, adhesion, hardness, etc. Full cure is defined as the point at which more light and/or ambient exposure no longer improves cured properties.

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 graph below shows the increase in depth of cure as a function of exposure time. 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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OPTIMIZING PERFORMANCE AND HANDLING

1. This product cures with exposure to UV and visible light as well as moisture. Exposure to ambient and artificial light and moisture 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 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.
9. Resealing opened container under a dry, inert gas, such as nitrogen, can help to prolong the shelf life.
10. Light cure is recommended prior to moisture cure. Full cure develops after both light and moisture cure, not one or the other.

DISPENSING THE RESIN

This material may be dispensed with a variety of manual, semi-automated, and fully automated fluid delivery systems. Dymax has several dispensing systems that may be suitable for use with this material such as our Model 110 mountable atomizing needle valve or SG-100-RS handheld spray gun. Small-area applications, including beads and small dots, can be achieved using hand-held dispensers such as our SD-100 syringe dispenser and our Model 400 needle valve systems. These valve systems can be used in a manual, semi-automated, or fully automated application. Actual dispensing options vary by material properties. 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 as well as atmospheric moisture. Keep covered when not in use. This material has a 7-month shelf life from date of manufacture, unless otherwise specified, 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. Clean up of cured material may require mechanical methods such as ultrasonic bath, water jet, vacuum tweezers, air knife and/ or warming to aid in the 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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