Dual-Cure 9103
Light/Moisture-Cure Clear Encapsulant

APPLICATIONS

- Chip on Board
- Chip on Flex
- Chip on Glass
- Wire Bonding

FEATURES

- UV/Visible Light Cure
- Secondary Moisture Cure
- Flexible Encapsulant
- Shadow Area Performance
- Moisture and Thermal Resistance
- Blue Fluorescing for Inspection

RECOMMENDED SUBSTRATES

- FR4
- Kapton
- Glass

Dymax dual-cure 9103 is an improved, resilient, chip-encapsulant material designed with a UV/Visible light and secondary ambient moisture-cure system, making it ideal for encapsulation applications where shadow areas are present. Dymax 9103 is specially formulated to cure in shadow areas over time with ambient moisture. Dymax dual-cure materials contain no nonreactive solvents and cure upon exposure to light and moisture. Their ability to UV cure tack free 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, supplemented by a secondary moisture cure, they deliver high performance for encapsulation requirements. 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	Translucent Light Straw Liquid	N/A
Soluble in	Organic Solvents	N/A
Density, g/ml	1.09	ASTM D1875
Viscosity, cP	25,000 (nominal)	ASTM D2556
Shelf Life at Recommended Conditions from Date of Manufacture	10 months	N/A

CURED MECHANICAL PROPERTIES *

Property	Value	Test Method
Durometer Hardness	D30-D50	ASTM D2240
Tensile at Break, MPa [psi]	4.9 [718]	ASTM D638
Elongation at Break, %	36	ASTM D638
Modulus of Elasticity, MPa [psi]	17.6 [2,560]	ASTM D638
Glass Transition Tg, °C	58	ASTM D5418
CTEα1, µm/m/°C	81	ASTM E831
CTEα2, µm/m/°C	152	ASTM E831

OTHER CURED PROPERTIES *

Property	Value	Test Method
Refractive Index (20°C)	1.50	ASTM D542
Boiling Water Absorption, % (2 h)	0.4	ASTM D570
Linear Shrinkage, %	2.0	ASTM D2566

ELECTRICAL PROPERTIES *

Property	Value	Test Method
Dielectric Constant (1 MHz)	2.80	ASTM D150
Dissipation Factor (1 MHz)	0.06	ASTM D150
Volume Resistivity, ohm-cm	2.62E+13	ASTM D257
Surface Resistivity, ohm	3.53+12	ASTM D257
Dielectric Breakdown Voltage, kV/mm [V/mil]	24.17 [614]	ASTM D149

ADHESION

Substrate	Recommendation
FR4	✔
Kapton	✔
Glass	✔

✔ Recommended o Limited Applications

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

* Not Specifications

N/A Not Applicable

Technical Data Collected 2012 Rev.02/10/2023

CURING GUIDELINES

Fixture time is defined as the time to develop a shear strength of 0.1 N/mm² [10 psi] between glass slides. Actual cure time typically is 3-to-5 times fixture time. No moisture cure time was allowed for this evaluation.

Dymax Curing System (Intensity)	Fixture Time[A]
5000-EC (200 mW/cm²)[B]	2 s
BlueWave® 200 (200 mW/cm²)[B]	0.4 s

A 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.
B Intensity was measured over the UVA range (320-395 nm) using a Dymax ACCU-CAL™ 50 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 material that has been light cured, typical full property development is after 7 days at 25°C [77°F], 50% RH.

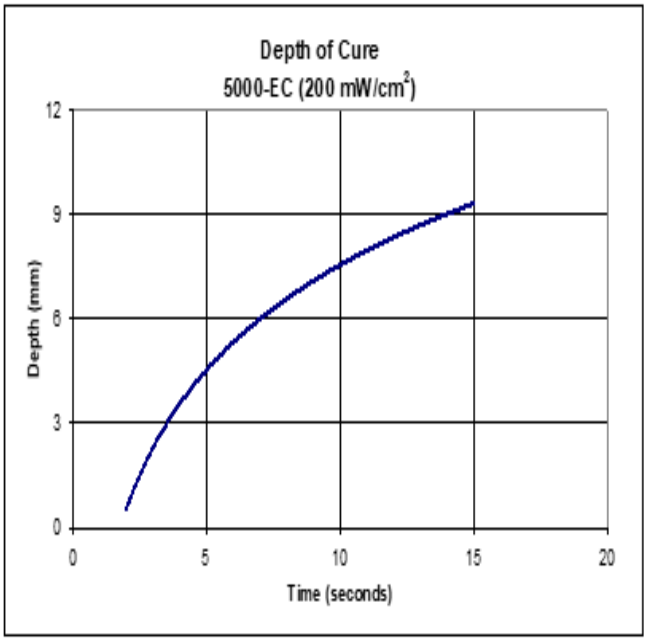
Cure time for both light cured and shadow areas depends on humidity level, amount of material in shadow areas, and its proximity to humidity. Material entrapped under large components may have a prolonged cure time. Exposure to heat (typically 40°C-60°C) and higher relative humidity will accelerate cure.

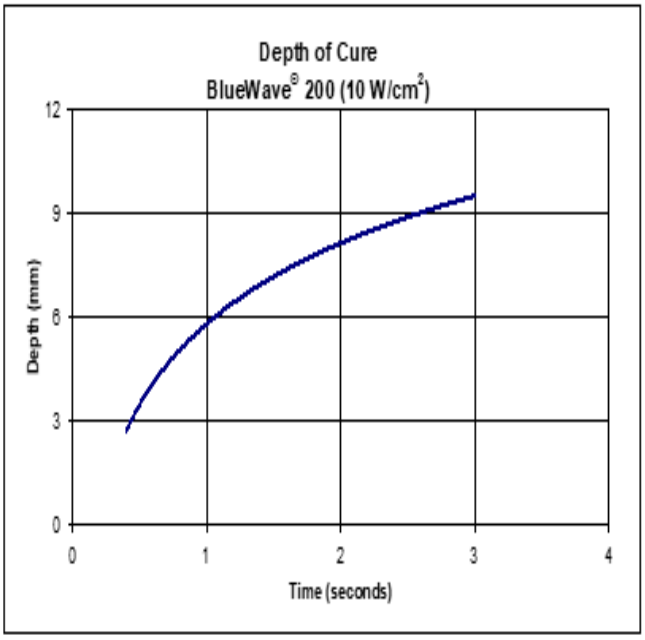
Full cure is best determined empirically by curing at different times and intensities, and measuring the corresponding change in cured properties such as tackiness, adhesion, hardness, etc. Full cure is defined as the point at which more light and/or ambient exposure no longer improves cured properties.

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 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.





OPTIMIZING PERFORMANCE AND HANDLING

1. This product cures with exposure to UV/Visible light and ambient moisture. Exposure to light and ambient 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 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. Light curing generally produces some heat. If necessary, cooling fans can be placed in the curing area to reduce the heating effect on components.
7. At the point of light curing, an air exhaust system is recommended to dissipate any heat and vapors formed during the curing process.
8. Do not open the syringe before contents reach 25°C [77°F]. Typical warm-up time for a syringe is two hours. Remove any moisture collected on the warmed-up syringe before opening.
9. Light cure is recommended prior to moisture cure. Full cure develops after light and moisture cure.

DISPENSING SUPPORT

The Dymax Application Engineering team is ready to discuss your application requirements to provide the most appropriate dispensing and/or spraying solution. Visit our current dispensing equipment portfolio here or consult our global contact phone numbers and online chat feature (available in North America only) during normal business hours for instant support.

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 shelf life noted on page 1 of this document, when stored between 1°C (34°F) and 5°C (41°F) in the original, unopened container.

CLEANUP

Cleaning Dymax dual-cure systems in the uncured state is relatively simple as the material will dissolve in non-alcoholic solvents. Alcoholic solvents that contain moisture activate the curing process. Therefore, it is recommended that non-alcohols be used to clean up uncured material and purge wetted dispensing lines. Please review TB104 for more information.

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.

The data provided in this document are based on historical testing that Dymax performed under laboratory conditions as they existed at that time and are for informational purposes only. The data are neither specifications nor guarantees of future performance in a particular application. Dymax does not guarantee that this product's properties are suitable for the user's intended purpose.

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