

Dual-Cure 9481 Light/Moisture-Cure Conformal Coating

APPLICATIONS

- Conformal Coating

FEATURES

- UV/Visible Light Cure
- Secondary Moisture Cure
- Solvent Free
- No VOC
- Low Odor
- One Part, No Mixing Required

QUALIFICATIONS

- MIL-I-46058C Listed
- IPC-CC-830B
- UL 94 V0
- Bright Blue Fluorescing
- Chemically Resistant

DYMAX 9481 is a solvent-free, light- and moisture-cure conformal coating specifically formulated to ensure complete cure in applications where shadowed areas on high-density circuit boards are a concern. Shadowed areas cure over time with moisture. DYMAX 9481 fluoresces vivid blue when exposed to UV light (365 nm) and is low viscosity, allowing it to be dispensed easily with all of the current methods of dispensing. DYMAX lamps offer the optimum balance of UV and visible light for the fastest and deepest cures. DYMAX 9481's ability to cure in seconds with light enables faster processing, greater output, and lower assembly costs. 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	Nonalcoholic Solvents	N/A
Density, g/ml	1.07	ASTM D-1875
Viscosity, cP (20 rpm)	125 (nominal)	ASTM D-2556

ELECTRICAL PROPERTIES *

Property	Value †	Test Method
Dielectric Constant (1 MHz)	3.25	ASTM D-1304-99
Dissipation Factor (1 MHz)	0.01	ASTM D-1304-99
Dielectric Strength, kV/mm [V/mil]	75 [1,900]	ASTM D-1304-99
Volume Resistivity, ohm-cm	1.64 x 10 ¹⁶	ASTM D-1304-99
Surface Resistivity, ohm	2.46 x 10 ¹⁶	ASTM D-1304-99

CURED MECHANICAL PROPERTIES *

Property	Value †	Test Method
Durometer Hardness	D75	ASTM D-2240
Tensile at Break, MPa [psi]	22 [3,200]	ASTM D-638
Elongation at Break, %	4.0	ASTM D-638
Modulus of Elasticity, MPa [psi]	500 [73,000]	ASTM D-638

ADHESION

Substrate	Recommendation
Leadframe	✓
Ceramic	✓
PCB	✓
Flex	N/A
Silicon	o

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

OTHER CURED PROPERTIES *

Property	Value †	Test Method
Boiling Water Absorption, % (2 hr)	1.0	ASTM D-570
Water Absorption, % (25°C, 24 hr)	0.3	ASTM D-570
Linear Shrinkage, %	1.3	ASTM D-2566

* Not Specifications

† Measured 100 hours after light cure

N/A Not Applicable



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 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	3 sec
5000-EC (200 mW/cm ²) ^A	2 sec
BlueWave [®] 50 AS (3.0 W/cm ²) ^A	<1.2 sec
BlueWave [®] 200 (10 W/cm ²) ^A	<0.8 sec
UVCS Conveyor with one 5000-EC (200 mW/cm ²) ^A	>7.0 m/min [23 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 a 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 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 cures (up to 5x) generally will not degrade DYMAX light-curable materials.

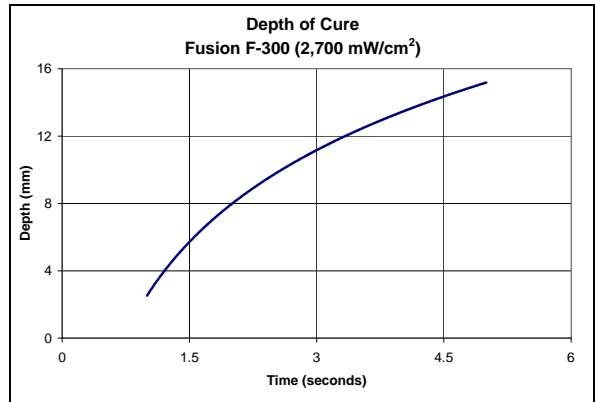
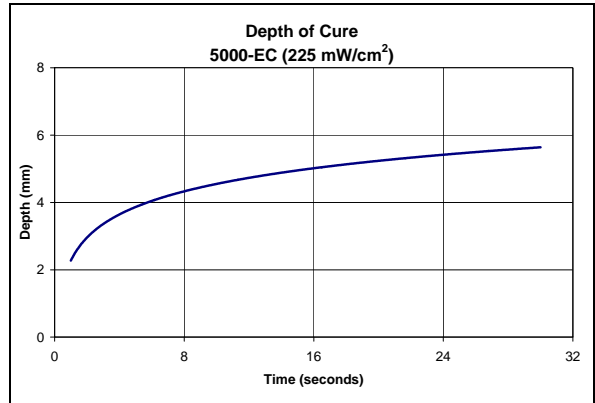
DYMAX recommends that customers employ a safety factor by curing longer and/or at higher intensities than required for full cure. Although DYMAX Applications Engineering can provide technical support and assist with process development, each customer ultimately must determine and qualify the appropriate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

Moisture Cure Following Light Exposure

Moisture may be used as a secondary cure mechanism for shadowed areas that cannot be cured with light. Light cure is recommended prior to moisture cure. While moisture cure time is typically 2-3 days at 23°C [73°F], 50% RH, actual moisture cure time is application specific and may vary. Cure time depends on humidity level, amount of coating in shadowed areas, and proximity of shadowed 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.

DEPTH OF CURE

The graphs below show the increase in depth of cure as a function of exposure time at two different lamp intensities. A 9.5 mm [0.37 in] diameter slug 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 primarily with exposure to UV and/or visible light. Any shadowed areas cure over time with moisture. Exposure to air, UV, ambient, or 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 coated surfaces should be clean and free from grease, mold release, or other contaminants prior to dispensing the coating.
3. Cure speed is dependent upon many variables in every application, including lamp intensity, distance from the light source, required depth of cure, bond gap, and transmission of the substrate through which the energy must pass.
4. Oxygen may inhibit surface cure. Surfaces exposed to air may require high-intensity UV (>100 mW/cm²) to produce a tack-free cure. Flooding the coated area with inert gas, such as nitrogen, can also reduce the effects of oxygen inhibition.
5. Parts should be allowed to cool before testing or subjecting to loads.
6. For rare applications, stress cracking may occur in assembled parts. There are three ways to solve the problem. One option is to heat anneal the parts to remove molded-in stresses. A second option is to eliminate or reduce interference fits between mating parts. The third option is to minimize the amount of time the liquid coating remains in contact with the substrate(s) prior to curing.
7. There is generally some heat associated with UV curing. If necessary, cooling fans can be placed in the curing area to reduce heat.
8. It is always a best practice to utilize an air exhaust system at the point of curing. This will minimize the heat and vapors formed during the curing process.
9. Resealing opened containers under nitrogen extends shelf life.

DISPENSING THE COATING

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

STORAGE AND SHELF LIFE

Store the material in cool, dark place when not in use. Do not expose to UV light or sunlight. This product may polymerize upon prolonged exposure to ambient light or atmospheric moisture. Reseal original package or container immediately after use. Resealing the container under nitrogen extends shelf life. This material has a minimum two-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.

CLEAN UP

Uncured material may be removed from dispensing components and parts with non-alcoholic solvents. Cured material will be impervious to many solvents and difficult to remove. Clean up of cured material may require mechanical methods of removal.

GENERAL INFORMATION

This product is intended for industrial use only. Keep out of 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 LITERATURE

LIT010A	Guide to Selecting and Using UV Light-Curing Systems
LIT019	UV Adhesives for Electronic Assembly
LIT077	Chemical Safety
LIT133	UV Light-Curing System Safety Considerations
LIT159	ACCU-CAL™ 50 Radiometer
LIT204	Conformal Coating Selector Guide
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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