



Dual-Cure 9481-E Light + Moisture-Cure Conformal Coating

APPLICATIONS

- Conformal Coating

FEATURES

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

OTHER FEATURES

- Bright Blue Fluorescing
- Chemically Resistant
- MIL-I-46058C
- IPC-CC-830B
- UL 94 V0 Flammability
- UL 746-E

Dymax dual-cure 9481-E is a light- and moisture-cure conformal coating specifically 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. This coating fluoresces a vivid blue when exposed to UV light (365 nm) for easy inspection of coating coverage. Dymax 9481-E is engineered for coating thicknesses up to 0.127 mm [0.005 in]. 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 spot lamps, focused-beam lamps, or flood lamps, they deliver optimum speed and performance for conformal coating. 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	Colorless/Light Amber Liquid	N/A
Soluble in	Organic Solvents	N/A
Density, g/ml	1.07	ASTM D1875
Viscosity, cP (20 rpm)	125 (nominal)	ASTM D2556
Shelf Life @RT (22°C to 25°C) from Date of Manufacture	12 months	N/A

CURED MECHANICAL PROPERTIES †

Property	Value	Test Method
Durometer Hardness (UV Only)	D65	ASTM D2240
Durometer Hardness	D75	ASTM D2240
Tensile at Break, MPa [psi]	11 [1,600]	ASTM D638
Elongation at Break, %	60	ASTM D638
Modulus of Elasticity, MPa [psi]	150 [21,800]	ASTM D638
Glass Transition T _g , °C	56	ASTM D5418
CTE _{α1} , μm/m/°C	74	ASTM E831
CTE _{α2} , μm/m/°C	210	ASTM E831

* Not Specifications

N/A Not Applicable

† Measured after UV cure followed by 15 days at 25°C/50% RH

OTHER CURED PROPERTIES ‡

Property	Value	Test Method
Boiling Water Absorption, % (2 h)	1.4	ASTM D570
Water Absorption, % (25°C, 24 h)	0.2	ASTM D570
Linear Shrinkage, %	1.6	ASTM D2566
Flammability	V0	UL 94
Thermal Shock, -65°C to 125°C	50 cycles	MIL-I-46058C
Moisture Resistance	Passes	MIL-I-46058C
Fungus Resistance (ASTM G21-13)	Passes	MIL-I-46058C

ADHESION

Substrate	Recommendation
Leadframe	✓
Ceramic	✓
PCB	✓
Flex	-
Silicon	o

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





ELECTRICAL PROPERTIES *		
Property	Value	Test Method
Dissipation Factor (1 MHz)	0.01	ASTM D-150
Dielectric Withstand Voltage, V	>1,500	MIL-I-46058C
Volume Resistivity, ohm-cm	1.01×10^{16}	ASTM D-257
Surface Resistivity, ohm	3.92×10^{15}	ASTM D-257
Dielectric Constant (1 MHz)	3.90	ASTM D-150

CURING GUIDELINES

UV-curing guidelines for 9481-E at 0.003 in (0.076 mm)

Dymax Curing System (Intensity)	Fixture Time or Belt Speed
5000-EC (225 mW/cm ²) ^A	40 s
BlueWave [®] 200 (10 W/cm ²) ^A	5 s
UVCS Conveyor with Fusion D lamp (2.5 W/cm ²) ^B	1.5 m/min [5 ft/min]
UVCS Conveyor with one 5000-EC (250 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 Intensity was measured over the UVA range (320-395 nm) using a 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 shadowed areas that cannot be cured with light. While moisture cure time in shadowed 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.

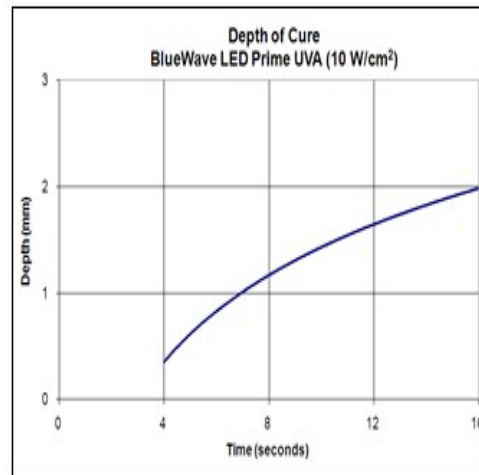
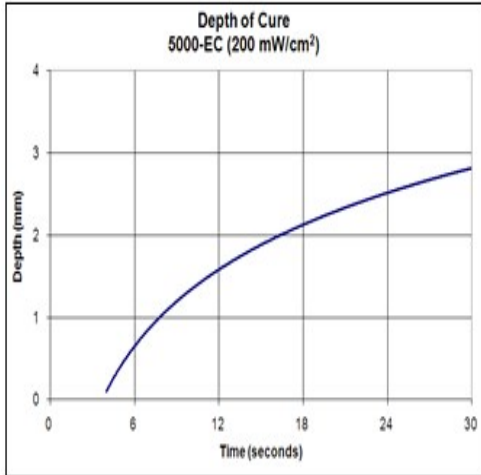
Cure time for both light cured and shadow areas depends on humidity level, amount of material in shadowed areas, and its proximity to humidity. Material entrapped under large components may have a prolonged cure time. Exposure to heat (typically 40°C-60°C) and higher relative humidity will accelerate 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 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 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, coating thickness and amount of material in shadowed areas.
4. Oxygen in the atmosphere may inhibit surface cure. Surfaces exposed to air may require high-intensity (>100 mW/cm²) 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 curing, an air exhaust system is recommended to dissipate any heat and vapors formed during the curing process.
8. Resealing opened containers under nitrogen extends shelf life.

DISPENSING THE MATERIAL

Dymax conformal coatings are typically applied via spraying. Dymax offers several dispensing systems that may be suitable for manual, semi-automated, and fully automated fluid delivery of the conformal coatings including our Model 110 mountable atomizing valve, the eco-PEN450 valve, or the SG-150-RS handheld spray gun. Non-atomized, small area, or manual touch-up applications can be achieved with options like our SD-100 syringe dispenser or the Model 400 needle valve.

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 low humidity, cool, and dark place when not in use. This product may polymerize upon prolonged exposure to ambient and artificial light as well as moisture. This material shelf life noted on page 1 of this document, when stored between 10°C (50°F) and 32°C (90°F) in the original, unopened container.

Resealing large containers under dry inert gas, such as nitrogen, can help maintain the shelf life. Smaller syringes and cartridges should be kept in moisture barrier bags with desiccant when not in use.

CLEAN UP

Uncured Dymax dual-cure materials may be removed from dispensing components and parts with non-alcoholic solvents. Alcoholic solvents (such as IPA or ethanol) that contain moisture activate the curing process. Therefore, it is recommended that non-alcohols such as Butyl Acetate Acetone, or MEK be used to clean up uncured material and purge wetted dispensing lines.

Cured material will be impervious to many solvents and difficult to remove. Cleanup 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.

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.

Numerous factors—including, without limitation, transport, storage, processing, the material with which the product is used, and the ultimate function or purpose for which the product was obtained—may affect the product's performance and/or may cause the product's actual behavior to deviate from its behavior in the laboratory. None of these factors are within Dymax's control. Conclusions about the behavior of the product under the user's particular conditions, and the product's suitability for a specific purpose, cannot be drawn from the information contained in this document.

It is the user's responsibility to determine (i) whether a product is suitable for the user's particular purpose or application and (ii) whether it is compatible with the user's intended manufacturing process, equipment, and methods. Under no circumstances will Dymax be liable for determining such suitability or compatibility. Before the user sells any item that incorporates Dymax's product, the user shall adequately and repetitively test the item in accordance with the user's procedures and protocols. Unless specifically agreed to in writing, Dymax will have no involvement in, and shall under no circumstances be liable for, such testing.

Dymax makes no warranties, whether express or implied, concerning the merchantability of this product or its fitness for a particular purpose. Nothing in this document should be interpreted as a warranty of any kind. Under no circumstances will Dymax be liable for any injury, loss, expense or incidental or consequential damage of any kind allegedly arising in connection with the user's handling, processing, or use of the product. It is the user's responsibility to adopt appropriate precautions and safeguards to protect persons and property from any risk arising from such handling, processing, or use.

The specific conditions of sale for this product are set forth in Dymax's Conditions of Sale which are available at <https://dymax.com/resources/sales-terms-conditions>. Nothing contained herein shall act as a representation that the product use or application is free from patents owned by Dymax or any others. Nothing contained herein shall act as a grant of license under any Dymax Corporation Patent.

Except as otherwise noted, all trademarks used herein are trademarks of Dymax. The "®" symbol denotes a trademark that is registered in the U.S. Patent and Trademark Office.

The contents of this document are subject to change. Unless specifically agreed to in writing, Dymax shall have no obligation to notify the user about any change to its content.

CONTACT Dymax

www.dymax.com

Americas

USA | +1.860.482.1010 | info@dymax.com

Europe

Germany | +49 611.962.7900 | info_de@dymax.com

Ireland | +353 21.237.3016 | info_ie@dymax.com

Asia

Singapore | +65.67522887 | info_ap@dymax.com

Shanghai | +86.21.37285759 | dymaxasia@dymax.com

Shenzhen | +86.755.83485759 | dymaxasia@dymax.com

Hong Kong | +852.2460.7038 | dymaxasia@dymax.com

Korea | +82.31.608.3434 | info_kr@dymax.com