



Dual-Cure 9771

Low Ionic Content and Low Outgassing Light + Moisture Cure Conformal Coating

APPLICATIONS

- Conformal Coating for Critical PCBs in Missiles, Satellites, and Spacecraft

FEATURES

- UV/Visible Light Cure
- Secondary Moisture Cure
- Bright Blue Fluorescing
- Low Ionic Content Compliance with Mil Std 883 Method 5011
- Temperature/Humidity Resistance
- Corrosion Resistance

OTHER FEATURES

- Mil Std 883 Method 5011 Compliant
- UL 94V-0 Flammability
- UL 746-E Recognized
- Meets ASTM E595 Low Outgassing
- MIL-I-46058C -- Pending
- Meets IPC-CC-830-B -- Pending

Dymax dual-cure 9771 is a low-ionic, low-outgassing, high-performance light and moisture-cure reworkable conformal coating especially formulated to ensure complete cure for coating that flows underneath components on critical printed circuit boards in missiles, satellites, and spacecraft. Coating in the shadow areas cures with moisture. Dymax 9771 is engineered for coating thicknesses up to 0.203 mm (0.008 in). This conformal coating fluoresces a vivid blue when exposed to UV light (365 nm) for easy inspection of coating coverage. Dymax conformal coating materials contain no nonreactive solvents and cure upon exposure to light. 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 PCB 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. Properties below unless specified were measured after full light + moisture cure.

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	1.08	ASTM D1875
Viscosity, cP	820 (nominal)	DSTM 502‡
Shelf Life @ RT (22°C to 25°C) from Date of Manufacture	7 months	N/A

CURED MECHANICAL PROPERTIES *

Property	Value	Test Method
Durometer Hardness (UV Only)	A62	ASTM D2240
Durometer Hardness	D72	ASTM D2240
Tensile at Break, MPa [psi]	20.4 [2952]	ASTM D638
Elongation at Break, %	13	ASTM D638
Modulus of Elasticity, MPa [psi]	910.3 [132,026]	ASTM D638
Glass Transition Tg, °C	86	ASTM D5418
CTE α_1 , $\mu\text{m}/\text{m}/^\circ\text{C}$	108	ASTM E831
CTE α_2 , $\mu\text{m}/\text{m}/^\circ\text{C}$	191	ASTM E831

OTHER CURED PROPERTIES *

Property	Value	Test Method
Refractive Index (20°C)	1.51	ASTM D542
Boiling Water Absorption, % (2 h)	1.16	ASTM D570
Water Absorption, % (25°C, 24 h)	0.21	ASTM D570
Linear Shrinkage, %	1.4	ASTM 2566
Volumetric Shrinkage, %	4.5	DSTM 6114‡
Outgassing – Total Mass Loss (TML), %	0.90	ASTM E595
Outgassing – Collected Volatile Condensable Material (CVCM), %	0.02	ASTM E595
Thermal Shock, -65°C to 125°C	Pending	MIL-I-46058C
Moisture Resistance	Pending	MIL-I-46058C
Fungus Resistance (ASTM G21-13)	Pending	MIL-I-46058C
Ionic Content	Passes	MIL-STD-883 Method 5011
Specific Electrical Conductance	2.6 mS/m	MIL-STD-883 Method 5011
pH	4.5	MIL-STD-883 Method 5011
Sequential Environmental Testing: Thermal Shock (15 cycles) + Cycle (100 cycles)	Passes	MIL-STD-883 Method 5011

* Not Specifications

N/A Not Applicable

‡ DSTM Refers to Dymax Standard Test Method

© 2021 Dymax Corporation. All rights reserved.

All trademarks in this guide, except where noted, are the property of, or used under license by Dymax Corporation, U.S.A.

Technical Data Collected 04/13/21 Rev. 09/16/2021





ELECTRONIC CIRCUIT BOARD MATERIALS

9771 Conformal Coating Product Data Sheet

ELECTRICAL PROPERTIES *		
Property	Value	Test Method
Dielectric Constant (1 MHz)	4.29	ASTM D150
Dissipation Factor (1 MHz)	0.0287	ASTM D150
Dielectric Breakdown Voltage, V	26,320	ASTM D149
Dielectric Strength (V/mil)	665	ASTM D149
Surface Resistivity, ohm	2.23e+13	ASTM D257
Volume Resistivity, ohm-cm	3.48e+14	ASTM D257

ADHESION	
Substrate	Recommendation
Ceramic	✓
Common Solder Masks	✓
FR4	✓
Flex Circuit (Polyimide)	✓
Lead Frame	✓
PCB	✓
Silicon	✓

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

CURING GUIDELINES

UV-curing guidelines for 9771 at 0.08mm (0.003 in) thickness:

Dymax Curing System (Intensity)	Cure Time or Belt Speed
UVCS Conveyor with Fusion F300S (2.5 W/cm ²) ^B	1.2 m/min [4 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 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 or 2 days at 40°C [104°F], 50% RH.

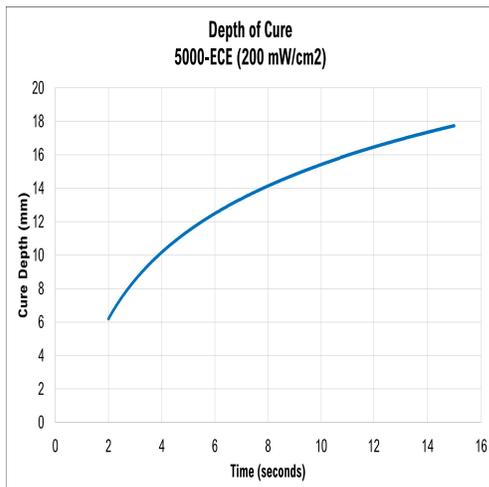
Cure time for both light-cured and shadow areas depends on humidity level, amount of material in shadow areas, and its proximity to humidity. Material entrapped under large components may have a prolonged cure time. Exposure to heat (typically 40°C-60°C) and higher relative humidity will accelerate cure.

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 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.





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 COATING

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 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 25°C (77°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.

CLEANUP

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. For more information on rework or removal of cured conformal coatings, please consult TB095 Rework and Removal of UV Light-Curable Conformal Coatings.



ELECTRONIC CIRCUIT BOARD MATERIALS 9771 Conformal Coating Product Data Sheet

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 [General Terms & Conditions of Sale](#). 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 DYMAYX

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