HLC-M-1000
Wicking Grade Hybrid Light-Curable Adhesive

APPLICATIONS

- Catheter Devices
- Endoscopes
- Diagnostic Equipment
- Therapeutic Devices
- General Medical Devices

FEATURES

- UV/Visible Light Cure
- Contact/Moisture Cure
- Limited Blooming with Light Cure
- Wicking Grade Viscosity

RECOMMENDED SUBSTRATES

- ABS
- PC
- PEBA
- PMMA

BIOCOMPATIBILITY

- ISO 10993-4 Hemolysis
- ISO 10993-5 Cytotoxicity
- ISO 10993-6 Implantation
- ISO 10993-11 Systemic Toxicity
- ISO 10993-23 Intracutaneous Irritation

Dymax HLC-M-1000 is designed for the rapid assembly of medical devices. Hybrid light-curable (HLC) technology is a new patent-pending adhesive platform that combines the best qualities of anionic and free-radical adhesive chemistries. HLC adhesives feature on-contact cure capability for dark areas not reachable by light as well as rapid, low-intensity curing with UV or Visible Light. HLC-M-1000 is recommended for very tight bond gaps requiring a wicking grade adhesive or for dark area bonds that cannot be reached with light curing alone. Dymax MD medical device adhesives 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 device assembly. This material is 100% solids. 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	Hybrid Light-Curable	N/A
Appearance	Yellow Transparent Liquid	N/A
Soluble in	Aprotic Solvents	N/A
Density, g/ml	1.06	ASTM D1875
Viscosity, cP	3 (nominal)	ASTM D1084
Unopened Shelf Life @ 2-8°C from Date of Manufacture	6 months	N/A

CURED MECHANICAL PROPERTIES *‡

Property	Value	Test Method
Durometer Hardness	D80	ASTM D2240
Tensile at Break, MPa [psi]	49.0 [7,100]	ASTM D638
Elongation at Break, %	4	ASTM D638
Modulus of Elasticity, MPa [psi]	2,144.3 [311,000]	ASTM D638

OTHER CURED PROPERTIES *‡

Property	Value	Test Method
Refractive Index (20°C)	1.50	ASTM D542
Boiling Water Absorption, % (2 h)	1.7	ASTM D570
Water Absorption, % (25°C, 24 h)	0.9	ASTM D570
Linear Shrinkage, %	0.7	ASTM D2566

ADHESION

Substrate	Recommendation
ABS acrylonitrile-butadiene-styrene	✓
PA polyamide	o
PC polycarbonate	✓
PCTG poly(cyclohexylene dimethylene terephthalate)glycol	✓
PEBA polyether block amide	✓
PETG poly(ethylene terephthalate)glycol	✓
PI polyimide	o
PMMA poly(methyl methacrylate)	✓
PS polystyrene	✓
PSU polysulfone	o
PVC poly(vinyl chloride)	o
SAN styrene-acrylonitrile	✓
SS stainless steel	✓
TPU thermoplastic polyurethane	o

✓ Recommended o Limited Applications

* Not Specifications

N/A Not Applicable

‡ Samples cured with 405 nm LED at 100 mW/cm² followed by 24 hours at 25°C/50% R.H.

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CURING GUIDELINES – TACK-FREE TIME

Cure rate is dependent upon many variables including lamp intensity, distance from the light source, and required depth of cure. The cure times below are based on lab results and are intended for reference only. Testing was performed using a 0.127 mm (0.005") thickness and measured based on the time to achieve a tack-free surface.

Dymax Curing System (Intensity)	Tack-Free Time [A]
5000-EC (200 mW/cm²) [B]	1.0s
BlueWave® MX-250 RediCure®365 nm (255 mW/cm²) [C]	0.4s
BlueWave® MX-250 PrimeCure®385 nm (355 mW/cm²) [C]	0.4s
BlueWave® MX-250 VisiCure®405 nm (375 mW/cm²) [C]	0.4s
BlueWave®200 (10 W/cm²) [B]	0.2s
BlueWave® MX-150 RediCure®365 nm (10 W/cm²) [C]	0.2s
BlueWave® MX-150 PrimeCure®385 nm (15 W/cm²) [C]	0.2s
BlueWave® MX-150 VisiCure®405 nm (15 W/cm²) [C]	0.2s

A Tack-free times/belt speeds are based on a 0.127 mm thickness coating when cured with the noted Dymax cure systems.
B Intensity was measured over the UVA range (320-395 nm) using a Dymax ACCU-CAL™ 50 Radiometer.
C Intensity was measured over the UVA/Visible range (350-450 nm) using a Dymax ACCU-CAL™ 50-LED 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.

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.

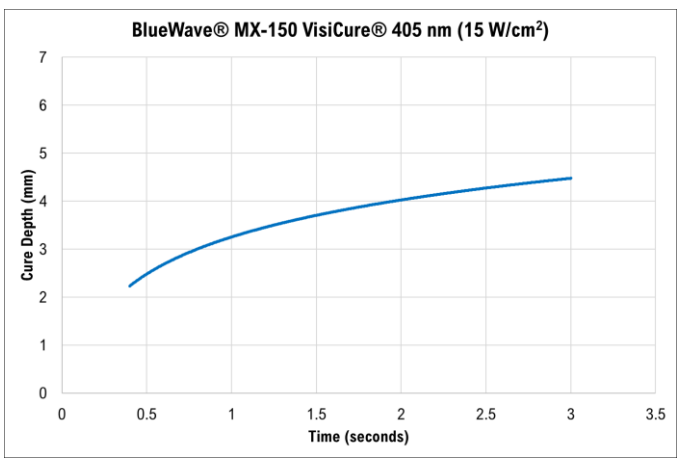
CURING GUIDELINES – NON-UV CURE SPEED VS. SUBSTRATE

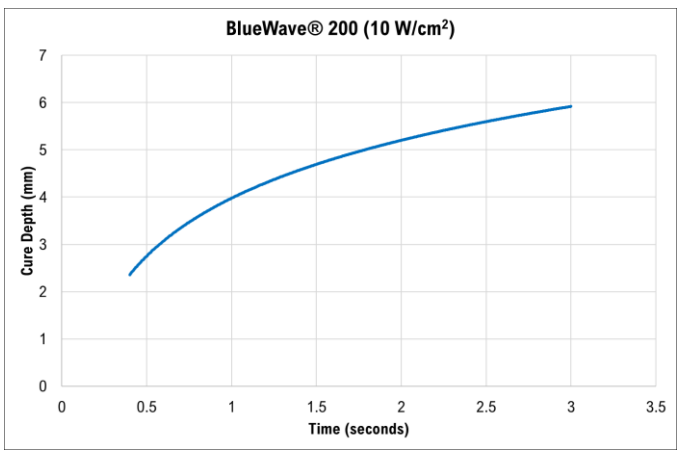
Cure rate is dependent upon many variables including substrate cleanliness, porosity, and required depth of cure. The cure times below are based on lab results and are intended for reference only. Testing was performed using a 250 mm² (0.39 in²) bond area and represents the time required for the bond to support a 3 kg (6.6 lb.) weight for 10 seconds at 22°C/50% R.H.

Substrates	Non-UV Fixture Time
ABS – ABS	5 – 15s
Aluminum – Aluminum	10 – 20s
PC – PC	60 – 70s
PMMA – PMMA	25 – 35s
PVC – PVC	25 – 35s
Stainless Steel – Stainless Steel	65 – 75s
Cold Rolled Steel – Cold Rolled Steel	55 – 65s

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 light (ambient and artificial) and moisture should be kept to a minimum before curing. Use of nitrogen or dry compressed air is recommended to eliminate moisture in dispensing lines.
2. Dispensing components including needles and fluid lines should be 100% light blocking, not just UV blocking. Fresh acetone or similar aprotic solvents should be used for cleaning and/or purging dispensing equipment.
3. Use polypropylene, polyethylene, PTFE, or PTFE-lining for all wetted parts in direct contact with the liquid adhesive. Passivated stainless steel can be used in place of any metal components that are in direct contact with the liquid adhesive.
4. All bond surfaces should be clean and free from grease, mold release, or other contaminants prior to dispensing the adhesive.
5. 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.
6. Parts should be allowed to cool after cure before testing and subjecting to any loads.
7. 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.
8. Light curing generally produces some heat. If necessary, cooling fans can be placed in the curing area to reduce the heating effect on components.
9. At the point of curing, an air exhaust system is recommended to dissipate any heat and vapors formed during the curing process.

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.

Refer to TB117 – Hybrid Light Curable Best Practices for additional details.

STORAGE AND SHELF LIFE

This material shelf life noted on page 1 of this document, when stored between 2°C (35°F) and 8°C (46°F) in the original, unopened container. Storage below 2°C (35°F) and above 8°C (46°F) can adversely affect product properties and shelf life. This product may polymerize upon prolonged exposure to ambient and artificial light as well as moisture.

Unopened material should be brought to ambient temperature before the package is opened for use. Once opened, maintaining storage between 10°C (50°F) and 21°C (70°F) in a low humidity, dark environment is recommended. Shelf life of opened material will be dependent on several factors including temperature and humidity.

Material removed from the original container may be contaminated during handling or use. Do not return product to the original container.

STERILIZATION

Compatible sterilization methods include gamma irradiation and ethylene oxide. Sterilization by autoclaving may be limited to certain applications. It remains the user's obligation to ascertain the effect of sterilization on the cured adhesive.

CLEANUP

Uncured material may be removed from dispensing components and parts with aprotic solvents, such as acetone or ethyl acetate. 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.

BIOCOMPATIBILITY

Polymerized Dymax MD® medical device adhesives are biocompatibility tested in accordance with ISO 10993 and/or USP Class VI. The completed tests are listed on each product data sheet. Copies of the test reports are available upon request. In all cases, it is the user's responsibility to determine and validate the suitability of these adhesives in the intended medical device. These adhesives have not been tested for prolonged or permanent implantation and are only intended for use in short-term (<29 days) or single-use disposable-device applications. Dymax does not authorize their use in long-term implant applications. Customers using these materials for such applications do so at their own risk and take full responsibility for ensuring product safety and biocompatibility.

HYBRID LIGHT-CURABLE MEDICAL ADHESIVES
HLC-M-1000 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.

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