MD® 1406-M
LED-Optimized Adhesive for Plastics and Metals

APPLICATIONS

- **Thin Needle Bonding**
- **Syringe/Needle Assemblies**
- **Single Use Assemblies**

FEATURES

- **LED-Optimized 385/405 nm**
- **Blue Fluorescing**
- **Resists Yellowing**
- **Low Viscosity for Improved Wetting**
- **Superior Water Resistance**
- **Fast Cure**

RECOMMENDED SUBSTRATES

- **Stainless Steel**
- **Polypropylene**
- **Polyethylene**

BIOCOMPATIBILITY

- **ISO 10993-5 Cytotoxicity**

Dymax MD® Medical Device Adhesive 1406-M is designed to be cured with either 385 nm or 405 nm UV wavelength light sources for rapid bonding of various substrates typically used in the manufacturing of needle assembles, syringes, and other medical devices. The product fluoresces blue for in-line inspection under low-intensity black light (365 nm). Dymax MD® Medical Device Adhesives 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 medical device assembly. Dymax lamps offer the ideal balance of UV and visible light for the fastest, deepest cures. This product is in full compliance with the RoHS2 directives 2015/863/EU and 2011/65/EU.

UNCURED PROPERTIES *

Property	Value	Test Method
Solvent Content	No Nonreactive Solvents	N/A
Chemical Class	Acrylated Urethane	N/A
Appearance	Colorless Transparent Liquid	N/A
Soluble in	Organic Solvents	N/A
Density, g/ml	1.03	ASTM D1875
Viscosity, cP (20 rpm)	150	ASTM 502

CURED MECHANICAL PROPERTIES *

Property	Value	Test Method
Durometer Hardness	D70	ASTM D2240
Tensile at Break, MPa [psi]	15 [2,200]	ASTM D638
Elongation at Break, %	120	ASTM D638
Modulus of Elasticity, MPa [psi]	419 [60,800]	ASTM D638

OTHER CURED PROPERTIES *

Property	Value	Test Method
Refractive Index (20˚C)	1.49	ASTM D542
Boiling Water Absorption, % (2 h)	3.0	ASTM D570
Water Absorption, % (25˚C, 24 h)	1.5	ASTM D570
Linear Shrinkage, %	0.4	DSTM 614‡
Glass Transition T_g, ˚C	70	DSTM 256‡

* Not Specifications

N/A Not Applicable

‡ DSTM Refers to Dymax Standard Test Method

ADHESION

Substrate	Recommendation
ABS acrylonitrile-butadiene-styrene	✓
PC polycarbonate	✓
PEI polyetherimide	✓
PETG poly(ethylene terephthalate)glycol	✓
PMMA poly(methyl methacrylate)	✓
PS polystyrene	✓
SS stainless steel	✓
PVC	✓
PP	st
PE	st

✓ Recommended Adhesive o Limited Applications

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

Technical Data Collection in 2017

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CURING GUIDELINES

Fixture time is defined as the time to develop a shear strength of 0.1 N/mm^2 [10 psi] between glass slides. Actual cure time typically is 3 to 5 times fixture time.

Dymax Curing System (Intensity)	Fixture Time or Belt Speed [A]
BlueWave® MX-150 PrimeCure® 385nm (15 W/cm^2) [B]	0.2 s
BlueWave® MX-150 VisiCure® 405nm (15 W/cm^2) [B]	0.2 s
BlueWave® QX4® PrimeCure® 385nm (5 W/cm^2) [B]	0.4 s
BlueWave® QX4® VisiCure® 405nm (5 W/cm^2) [B]	0.4 s
BlueWave® LED Flood PrimeCure® 385nm (500 mW/cm^2) [B]	0.2 s
BlueWave® LED Flood VisiCure® 405nm (500 mW/cm^2) [B]	0.2 s
BlueWave® 200 (15 W/cm^2) [C]	0.2 s
UVCS Conveyor with Fusion F300S (2.5 W/cm^2) [D]	8.2 m/min [27 ft/min]

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/Visible range (350-450 nm) using a Dymax ACCU-CAL™ 50-LED Radiometer.*

C *Intensity was measured over the UVA range (320-395 nm) using a Dymax ACCU-CAL™ 50 Radiometer.*

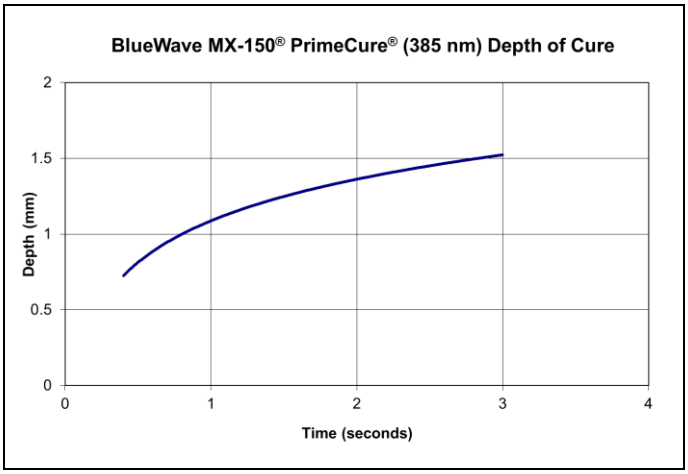
D *At 53 mm [2.1 in] focal distance. Maximum speed of conveyor is 8.2 m/min [27 ft/min]. Intensity was measured over the UVA range (320-395 nm) using the Dymax ACCU-CAL™ 160 Radiometer.*

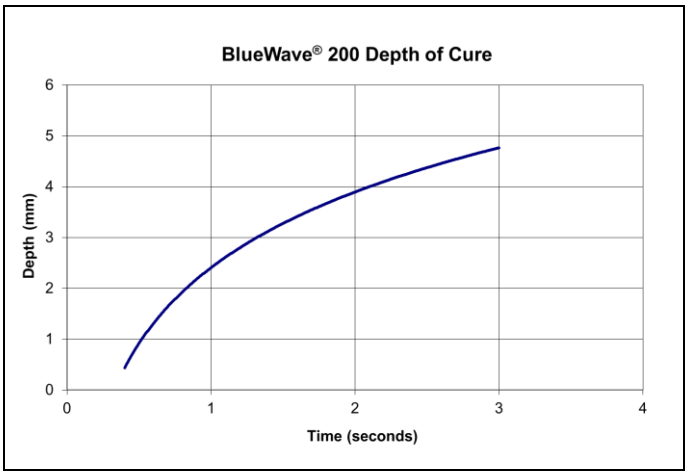
Full cure is best determined empirically by curing at different times and intensities, and measuring the corresponding change in cured properties such as tackiness, adhesion, hardness, etc. Full cure is defined as the point at which more light exposure no longer improves cured properties.

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 ultimately must 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 at two different lamp 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.





1406-M Product Data Sheet

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 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 (>100 mW/cm^2) 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. Cured parts should be allowed to cool 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.

DISPENSING THE ADHESIVE

This material may be dispensed with a variety of manual, semi-automated and fully automated fluid delivery systems. Small area applications including beads and small dots can be achieved using hand-held Dymax dispensing systems like our SD-100 syringe dispenser and Micro-Dot syringe dispenser. Questions relating to and defining the best fluid delivery system and curing equipment for specific applications should be referred to the Dymax Application Engineering Team.

CLEANUP

Uncured material may be removed from dispensing components and parts with organic solvents. Cured material will be impervious to many solvents and difficult to remove. Cleanup of cured material may require mechanical methods of removal.

BIOCOMPATIBILITY

Polymerized Dymax MD® Medical Device Adhesives are bio-compatibility 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.

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.

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. Keep covered when not in use. This material has a 6-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.

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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