



1001 Trout Brook Crossing
 Rocky Hill, CT 06067-3910
 Telephone: (860) 571-5100
 FAX: (860) 571-5465

Technical Data Sheet

Product 3311

Medical Products, May 2001

PRODUCT DESCRIPTION

LOCTITE® Product 3311 is a one component, low viscosity adhesive that cures rapidly to form flexible, transparent bonds when exposed to ultraviolet radiation and/or visible light of sufficient intensity.

TYPICAL APPLICATIONS

Loctite Product 3311 is primarily designed for bonding rigid and flexible PVC to polycarbonate, while not inducing stress cracking under typical molded in stress levels. It enables easy assembly of components with close fitting tolerances (i.e. joining polycarbonate to flexible PVC tubing), and is recommended for applications involving small gaps less than 0.25mm. Its flexibility enhances the load bearing and shock absorbing characteristics of the bond area. It has also shown excellent adhesion to a wide variety of substrates including glass, many plastics and most metals. Loctite Product 3311 complies with the Loctite ISO-10993 Biocompatibility test program. Certificates of Compliance are available through the Loctite Quality Department. Suitable for use in assembly of disposable medical devices.

PROPERTIES OF UNCURED MATERIAL

	Value	Typical Range
Chemical Type	Acrylated Urethane	
Appearance	Clear liquid	
Specific Gravity @ 25°C	1.10	
Viscosity @ 25°C, mPa.s (cP)		
Brookfield RVT		
Spindle 1 @ 20 rpm	300	200 to 400
Flash Point (TCC), °C	>77	

Stress Cracking

Liquid adhesive was applied to medical grade polycarbonate bars 6.4cm by 13mm by 3mm which had been flexed to induce different stress levels. The time it took for signs of crazing or stress cracking to appear was recorded.

Stress Cracking, ASTM D3929 7 N/mm ² (1000 psi)	>15 minutes
Stress Cracking, ASTM D3929 12 N/mm ² (1750 psi)	3-4 minutes

TYPICAL CURING PERFORMANCE

This product can be cured by irradiation with ultraviolet and/or visible light of sufficient intensity. To obtain full cure on surfaces exposed to air, the intensity of UV radiation at 220 to 260 nm will accelerate the tack free cure of surface. The cure rate and ultimate depth of cure will depend on light intensity, the spectral distribution of the light source, the exposure time and the light transmittance of the substrates.

NOTE: UV intensities where quoted are measured at 365nm using an OAI 306 UV Powermeter.

Fixture Time

The fixture time is the time required for a 1cm lap joint of PVC and polycarbonate with 13mm overlap and 0.5mm gap to be irradiated with light energy so it has sufficient strength to support a 3 kg weight for 10 seconds.

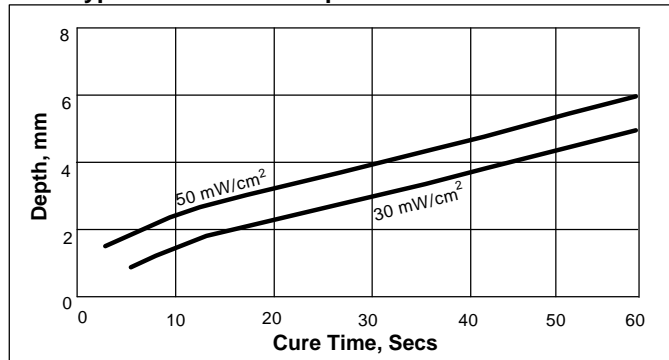
FIXTURE TIME, secs	UV Intensity, mW/cm ²	
LAMP TYPE	30	50
Metal Halide	<5	
Fusion H & V Bulbs		<5
Fusion D Bulb		<5

Depth of Cure vs. UV Irradiance

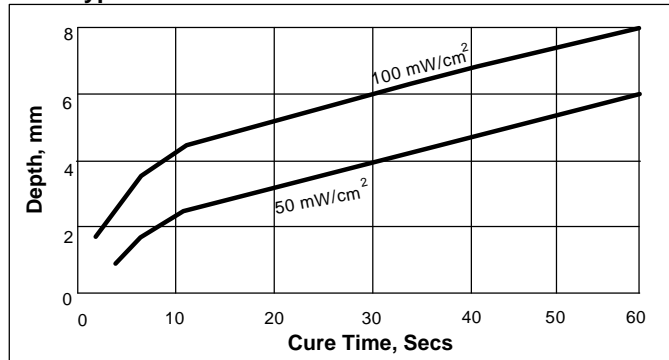
The graphs below show the increase in depth of cure with time at 30 mW/cm² - 100 mW/cm² as measured from the thickness of the cured pellet formed in a 15mm diameter PTFE die.

When exposed to a V Bulb at irradiances of 50 and 100 mW/cm² for 30 seconds, a depth of cure greater than 13 mm was achieved. The performance for Medium Pressure Hg will be similar to Fusion H Bulb.

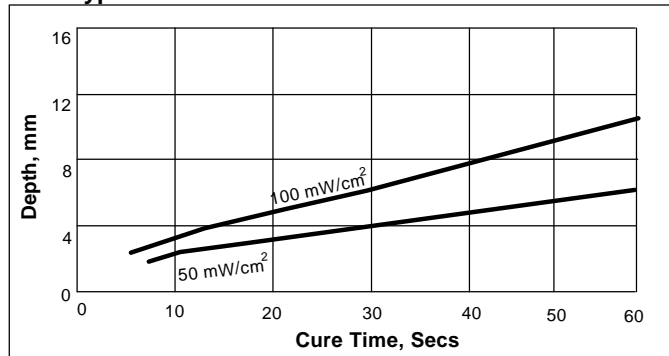
Bulb Type: Metal Halide Doped



Bulb Type: Fusion D



Bulb Type: Fusion H



TYPICAL PROPERTIES OF CURED MATERIAL

(Cured 80 seconds @ 30 mW/cm² using a glass filtered metal halide light source)

Physical Properties

Tensile strength at break, N/mm ²	23
(psi)	(3,300)
% Elongation to break ASTM D882	265
Modulus, ASTM D882, N/mm ²	669
(psi)	(97,000)
Hardness (Shore D):	64
Water absorption, ASTM D570, 2hrs in boiling water, %	5.36
Refractive index, N _D	1.50

Electrical Properties

	Constant	Loss
Dielectric constant & loss, ASTM D150 @ 100 Hz	4.556	0.0473
	@ 1 kHz	4.408
	@ 1 MHz	4.023
Volume resistivity, ASTM D149, Ω·cm		8.4 x 10 ¹⁴
Surface resistivity, ASTM D149, Ω		1.0 x 10 ¹⁵
Dielectric strength, ASTM D257, kV/m		31

PERFORMANCE OF CURED MATERIAL

Shear strength in tensile mode tested in accordance with ASTM D3163 on polycarbonate with a 0.5mm gap. Lap shear assemblies were cured for 80 seconds @ 30mW/cm² using a metal halide light source.

Initial Strength, N/mm ²	5
(psi)	(750) ¹

TYPICAL ENVIRONMENTAL RESISTANCE

Test Procedure:	ASTM D3163
Substrate:	Polycarbonate with 0.5mm gap
Cure Procedure:	80 secs @ 30mW/cm ² Metal Halide

	Temp at	% of initial strength retained		
		2hrs	24hrs	170hrs
Solvent				
Boiling Water		100 ¹		
Water Immersion	49°C			100 ¹
Isopropanol immersion	RT		100 ¹	
Humidity Resistance	38°C			100 ¹

Heat Aging on polycarbonate substrates

	Temp	170hrs	340hrs
Bonded polycarbonate	71°C	100 ¹	100 ¹
Bonded polycarbonate	93°C	100 ¹	100 ¹

¹ Substrate failure

Effects of Sterilization

In general, products similar in composition to Loctite Product 3311 subjected to standard sterilization methods, such as EtO and Gamma Radiation (25 to 50 kilorays cumulative) show excellent bond strength retention. Product 3311 maintains bond strength after 1 cycle of steam autoclave. It is recommended that customers test specific parts after subjecting them to the preferred sterilization method. Consult with Loctite for a product recommendation if your device will see more than 3 sterilization cycles.

GENERAL INFORMATION

This product is not recommended for use in pure oxygen and/or oxygen rich systems and should not be selected as a sealant for chlorine or other strong oxidizing materials.

For save handling information on this product, consult the Material Safety Data Sheet (MSDS).

Approvals

Product 3311 has been granted ISO-10993 certification which makes it particularly suited for use in disposable medical device assemblies.

Directions for use

This product is UV sensitive. Exposure to daylight, UV light and artificial lighting should be kept to a minimum during storage and handling. Product should be dispensed from applicators with black feed lines. For best performance bond surfaces should be clean and free from grease. UV cure rate is dependent on lamp intensity, distance from light source, depth of cure needed or bondline gap and light transmittance of the substrate through which the radiation must pass.

Recommended intensity for cure in bondline situation is 5 mW/cm² minimum (measured at the bondline) with an exposure time of 4-5 times the fixture time at this same intensity. For dry curing of exposed surfaces higher intensity UV is required (100 mW/cm² minimum). Cooling should be provided for temperature sensitive substrates such as thermoplastics. Crystalline and semi-crystalline thermoplastics should be checked for risk of stress cracking when exposed to liquid adhesive. Excess adhesive can be wiped away with organic solvent. Bonds should be allowed to cool before subjecting to any service loads.

Storage

Product shall be ideally stored in a cool, dry location in unopened containers at a temperature between 8°C to 28°C (46°F to 82°F) unless otherwise labeled. Optimal storage is at the lower half of this temperature range. To prevent contamination of unused product, do not return any material to its original container. For further specific shelf life information, contact your local Technical Service Center.

Data Ranges

The data contained herein may be reported as a typical value and/or range. Values are based on actual test data and are verified on a periodic basis.

Note

The data contained herein are furnished for information only and are believed to be reliable. We cannot assume responsibility for the results obtained by others over whose methods we have no control. It is the user's responsibility to determine suitability for the user's purpose of any production methods mentioned herein and to adopt such precautions as may be advisable for the protection of property and of persons against any hazards that may be involved in the handling and use thereof. In light of the foregoing, **Loctite Corporation specifically disclaims all warranties expressed or implied, including warranties of merchantability of fitness for a particular purpose, arising from sale or use of Loctite Corporation's products. Loctite Corporation specifically disclaims any liability for consequential or incidental damages of any kind, including lost profits.** The discussion herein of various processes or compositions is not to be interpreted as representation that they are free from domination of patents owned by others or as a license under any Loctite Corporation patents which may cover such processes or compositions. We recommend that each prospective user test his proposed applications before repetitive use, using this data as a guide. This product may be covered by one or more patents or patent applications.