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Technical Data Sheet Product 3211

Medical Products, April 2001

PRODUCT DESCRIPTION

LOCTITE® Product 3211 is a one component, thixotropic 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 3211 is primarily designed for bonding polycarbonate to itself, while not inducing stress cracking under typical molded in stress levels. 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 3211 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

	Typical		
	Value	Range	
Chemical Type	Acrylated Urethane		
Appearance	Pale, yellow liquid		
Specific Gravity @ 25°C	1.13		
Viscosity @ 25°C, mPa.s (cP)			
Brookfield RVT			
Spindle 5 @ 20 rpm	11,500	8,000 to 15,000	
Refractive index, N _D	1.48		
Flash Point (TCC), °C	80		
Stress Cracking			
Stress Cracking, ASTM D-3929			

Liquid adhesive was applied to a medical grade polycarbonate bar 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.

17 N/mm² (2500 psi) >15 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.

Fixture Time

The fixture time is the time required for a 1cm lap joint of polycarbonate 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.

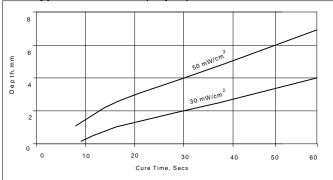
UV intensity, mW/cm ²		
30	50	
5-10		
	<5	
	<5	
	30	

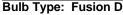
Depth of Cure vs. UV Irradiance

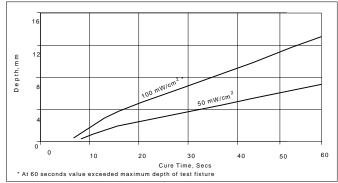
The graphs below show the increase in depth of cure with time at 30 mW/cm^2 - 100 mW/cm^2 as measured from the thickness of the cured pellet formed in a 15mm diameter PTFE die.

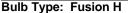
When exposed to a V Bulb at irradiances of 50 and 100 mW/cm^2 for 30 seconds, a depth of cure greater than 13 mm was achieved. The performance for Medium Pressure Hg will be similar to Fusion H Bulb.

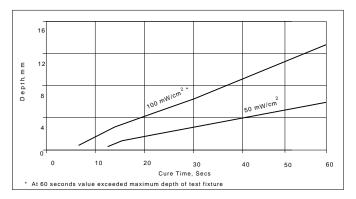
Bulb Type: Metal Halide (Doped)











NOT FOR PRODUCT SPECIFICATIONS

THE TECHNICAL DATA CONTAINED HEREIN ARE INTENDED AS REFERENCE ONLY. PLEASE CONTACT LOCTITE CORPORATION QUALITY DEPARTMENT FOR ASSISTANCE AND RECOMMENDATIONS ON SPECIFICATIONS FOR THIS PRODUCT.

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

TYPICAL PROPERTIES OF CURED MATERIAL

(Cured 80 seconds @ 30 mW/cm 2 using a glass filtered metal halide light source)

Physical Properties

Electrical Properties Constant	Loss
Refractive index, N _D	1.50
Water absorption, ASTM D570, 2hrs in boiling water, %	2.72
Hardness (Shore D):	51
(psi)	(30,000)
Modulus, N/mm ²	207
Elongation to break ASTMD882, %	260
(psi)	(2,500)
Tensile strength at break, ASTM D882, N/mm ²	17

Dielectric constant & loss, ASTM D150 @ 100 hz	5.697	0.0426
@ 1 khz	5.605	0.0188
@ 1 mhz	5.131	0.0419
Volume resistivity, ASTM D149, Ω - cm		8.9 x 10 ¹⁴
Surface resistivity, ASTM D149, Ω - cm		8.7 x 10 ¹⁴
Dielectric strength, ASTM D257, kV/mm		24

PERFORMANCE OF CURED MATERIAL

Shear strength in tensile mode tested in accordance with ASTM D3136 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		11
0	(psi)	(1600)

TYPICAL ENVIRONMENTAL RESISTANCE

Test Procedure:	ASTM D3136,
Substrate:	Polycarbonate with 0.5mm gap
Cure Procedure:	80 secs @ 30mW/cm ² Metal Halide
Solvent	% of initial strength retained at

	Temp	2hrs	24hrs	170hrs
Boiling Water		70		
Water Immersion	49°C			60
Isopropanol immersion	RT		95	
Humidity Resistance	38°C			75

Heat Aging on polycarbonate substrates

	Temp.	170hrs	340hrs
Bonded polycarbonate	71°Č	100 ¹	100 ¹
Bonded polycarbonate	93°C	100 ¹	100 ¹
Bonded polycarbonate	121°C	75 ¹	60 ¹
¹ Substrate failure			

Effects of Sterilization

In general, products similar in composition to Loctite Product 3211 subjected to standard sterilization methods, such as EtO and Gamma Radiation (25 to 50 kilorays cumulative) show excellent bond strength retention. Product 3211 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 safe handling information on this product, consult the Material Safety Data Sheet (MSDS).

Approvals

Product 3211 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. Agitate be for use. 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

Products shall be ideally stored in a cool, dry location in unopened containers at a temperature between $8^{\circ}-21^{\circ}$ C (46° - 70° F) unless otherwise labeled. The shelf-life period for containers up to 1 liter is 12 months based upon date of manufacture. To prevent contamination of unused product, do not return any material to its original container. For further specific shelf-life information on other package sizes, 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 or 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.