LOCTITE® 3311™

November 2004

PRODUCT DESCRIPTION

LOCTITE® 3311™ provides the following product characteristics:

Technology	Acrylic
Chemical Type	Acrylated urethane
Appearance (uncured)	Transparent liquid[LMS]
Components	One component - requires no mixing
Viscosity	Low
Cure	Ultraviolet (UV)/ visible light
Cure Benefit	Production - high speed curing
Application	Bonding
Flexibility	Enhances load bearing & shock absorbing characteristics of the bond area.

LOCTITE® 3311™ is primarily designed for bonding rigid or flexible PVC to polycarbonate, while not inducing stress cracking under typical molded 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. It has also shown excellent adhesion to a wide variety of substrates including glass, many plastics and most metals. Suitable for use in the assembly of **disposable medical devices**.

ISO-10993

An ISO 10993 Test Protocol is an integral part of the Quality Program for LOCTITE® 3311™. LOCTITE® 3311™ has been qualified to Loctite's ISO 10993 Protocol as a means to assist in the selection of products for use in the medical device industry. Certificates of Compliance are available at www.loctite.com or through the Henkel Loctite Quality Department.

TYPICAL PROPERTIES OF UNCURED MATERIAL

Specific Gravity @ 25 °C 1.1

Flash Point - See MSDS

Viscosity, Brookfield - RVT, 25 °C, mPa·s (cP):

Spindle 1, speed 20 rpm 200 to 400[LMS]

TYPICAL CURING PERFORMANCE

LOCTITE® 3311™ can be cured by exposure to UV and/or visible light of sufficient intensity. To obtain full cure on surfaces exposed to air, radiation @ 220 to 260 nm is also required. The speed of cure will depend upon the UV intensity and spectral distribution of the light source, the exposure time and the light transmittance of the substrates.

Stress Cracking

Liquid adhesive is applied to a medical grade polycarbonate bar 6.4 cm by 13 mm by 3 mm which had been flexed to induce a known stress level.

Stress Cracking, ASTM D 3929, minutes:

7 N/mm² stress on bar >15

12 N/mm² stress on bar 3 to 4

Fixture Time

Fixture time is defined as the time to develop a shear strength of 0.1 N/mm² .

UV Fixture Time, ISO 4587, Glass microscope slides, seconds:

Black light, Zeta® 7500 light source:

6 mW/cm² @ 365 nm ≤15[LMS]

UV Fixture Time, ISO 4587, Polycarbonate, seconds:

Metal halide bulb:

30 mW/cm² @ 365 nm <5

Fusion® H & V light source:

50 mW/cm² <5

Fusion® D light source:

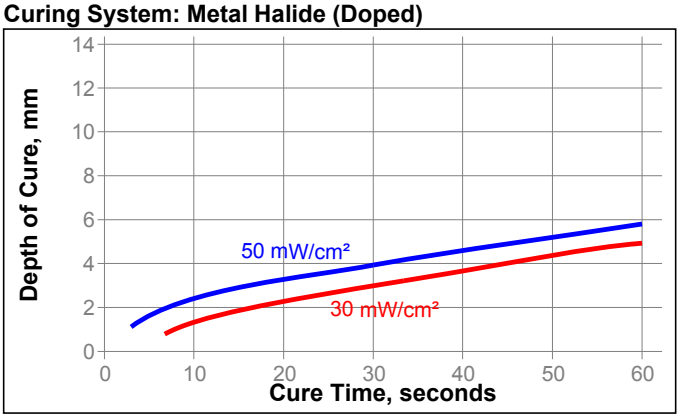
50 mW/cm² <5

Depth of Cure vs. Irradiance (365nm)

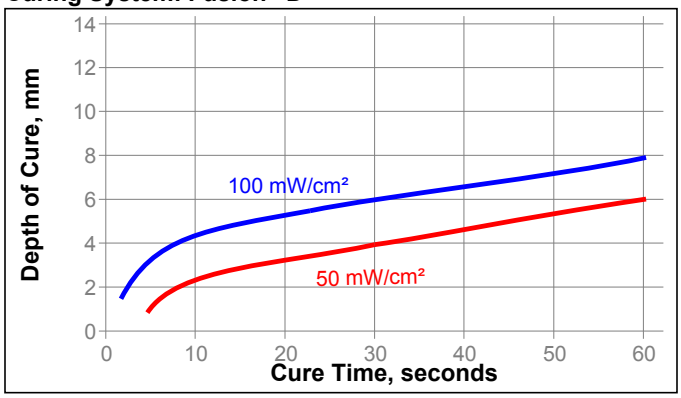
The graphs below show the increase in depth of cure with time at 30 mW/cm² - 100 mW/cm² as measured from the thickness of the cured product formed in a 9.5mm trough.

Note: 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

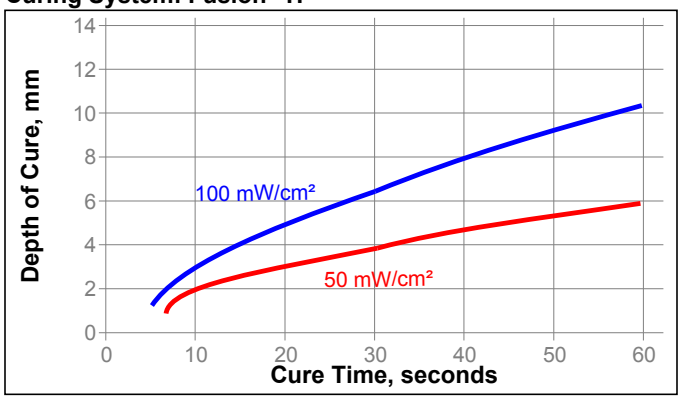
Curing System: Metal Halide (Doped)



Curing System: Fusion® D



Curing System: Fusion® H



TYPICAL PROPERTIES OF CURED MATERIAL

30 mW/cm² @ 365 nm for 80 seconds using a glass filtered metal halide light source

Physical Properties

Shore Hardness, ISO 868, Durometer D		64
Refractive Index		1.5
Water Absorption, ISO 62, %:		
2 hours in boiling water		5.36
Elongation, at break, ISO 527, %		265
Tensile Modulus, ISO 527	N/mm²	669
	(psi)	(97,000)
Tensile Strength, at break, ISO 527	N/mm²	23
	(psi)	(3,300)

Electrical Properties

Surface Resistivity, IEC 60093, Ω	1.0×10^{15}
Volume Resistivity, IEC 60093, Ω·cm	8.4×10^{14}
Dielectric Breakdown Strength, IEC 60250, kV/mm	31
Dielectric Constant / Dissipation Factor, IEC 60250:	
100 Hz	4.56 / 0.05
1 kHz	4.41 / 0.02
1 MHz	4.02 / 0.03

TYPICAL PERFORMANCE OF CURED MATERIAL

Adhesive Properties

Cured @ 30 mW/cm² @ 365 nm for 80 seconds using a metal halide light source

Lap Shear Strength, ISO 4587:

Polycarbonate:

0.5 mm gap	N/mm²	*5.2
	(psi)	(750)

* substrate failure

TYPICAL ENVIRONMENTAL RESISTANCE

Cured @ 30 mW/cm² @ 365 nm for 80 seconds using a metal halide light source

Lap Shear Strength, ISO 4587:

Polycarbonate:

0.5 mm gap

Chemical/Solvent Resistance

Aged under conditions indicated and tested @ 22 °C.

		% of initial strength		
Environment	**°C**	**2 h**	**24 h**	**170 h**
Boiling water	100	* 100	----------	----------
Water immersion	49	---------	----------	* 100
IPA immersion	21	---------	* 100	----------
Heat/humidity	38	---------	----------	* 100

Heat Aging

Lap Shear Strength, ISO 4587, % of initial strength:

Polycarbonate:

Aged @ 71°C for 170 hours	*100
Aged @ 71°C for 340 hours	*100
Aged @ 93°C for 170 hours	*100
Aged @ 93°C for 340 hours	*100

* substrate failure

Effects of Sterilization

In general, products similiar in composition to LOCTITE® 3311™ subjected to standard sterilization methods, such as EtO and Gamma Radiation (25 to 50 kiloGrays cumulative) show excellent bond strength retention. LOCTITE® 3311™ maintains bond strength after 1 cycle of steam autoclave. It is recommended that customers test specific parts after subjecting them to the perferred 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).

Directions for use

1. This product is light sensitive; exposure to daylight, UV light and artificial lighting should be kept to a minimum during storage and handling.
2. The product should be dispensed from applicators with black feedlines.
3. For best performance bond surfaces should be clean and free from grease.
4. 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.
5. Recommended intensity for cure in bondline situation is 5mW/cm² minimum (measured at the bondline) with an exposure time of 4-5 times the fixture time at the same intensity.
6. For dry curing of exposed surfaces, higher intensity UV is required (100mW/cm²).
7. Cooling should be provided for temperature sensitive substrates such as thermoplastics.
8. Plastic grades should be checked for risk of stress cracking when exposed to liquid adhesive.
9. Excess uncured adhesive can be wiped away with organic solvent (e.g. Acetone).
10. Bonds should be allowed to cool before subjecting to any service loads.

Loctite Material Specification[LMS]

LMS dated October 2, 2000. Test reports for each batch are available for the indicated properties. LMS test reports include selected QC test parameters considered appropriate to specifications for customer use. Additionally, comprehensive controls are in place to assure product quality and consistency. Special customer specification requirements may be coordinated through Henkel Quality.

Storage

Store product in the unopened container in a dry location. Storage information may be indicated on the product container labeling.

Optimal Storage: 8 °C to 21 °C. Storage below 8 °C or greater than 28 °C can adversely affect product properties. Material removed from containers may be contaminated during use. Do not return product to the original container. Henkel Corporation cannot assume responsibility for product which has been contaminated or stored under conditions other than those previously indicated. If additional information is required, please contact your local Technical Service Center or Customer Service Representative.

Conversions

(°C x 1.8) + 32 = °F
kV/mm x 25.4 = V/mil
mm / 25.4 = inches
N x 0.225 = lb
N/mm x 5.71 = lb/in
N/mm² x 145 = psi
MPa x 145 = psi
N·m x 8.851 = lb·in
N·m x 0.738 = lb·ft
N·mm x 0.142 = oz·in
mPa·s = cP

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, **Henkel Corporation specifically disclaims all warranties expressed or implied, including warranties of merchantability or fitness for a particular purpose, arising from sale or use of Henkel Corporation's products. Henkel 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 Henkel Corporation patents that may cover such processes or compositions. We recommend that each prospective user test his proposed application before repetitive use, using this data as a guide. This product may be covered by one or more United States or foreign patents or patent applications.

Trademark usage

Reference 1