

# Hysol®

# Hysol® 9461™

May 2006

## PRODUCT DESCRIPTION

Hysol® 9461™ provides the following product characteristics:

|                                                |                                                                                                                                                                                                                                         |
|------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Technology</b>                              | Epoxy                                                                                                                                                                                                                                   |
| <b>Chemical Type (Resin)</b>                   | Epoxy                                                                                                                                                                                                                                   |
| <b>Chemical Type (Hardener)</b>                | Amine                                                                                                                                                                                                                                   |
| <b>Appearance (Resin)</b>                      | White opaque paste                                                                                                                                                                                                                      |
| <b>Appearance (Hardener)</b>                   | Black opaque paste                                                                                                                                                                                                                      |
| <b>Appearance (Mixed)</b>                      | Gray paste                                                                                                                                                                                                                              |
| <b>Components</b>                              | Two part - Resin & Hardener                                                                                                                                                                                                             |
| <b>Viscosity</b>                               | Thixotropic                                                                                                                                                                                                                             |
| <b>Mix Ratio, by volume - Resin : Hardener</b> | 1 : 1                                                                                                                                                                                                                                   |
| <b>Mix Ratio, by weight - Resin : Hardener</b> | 100 : 100                                                                                                                                                                                                                               |
| <b>Cure</b>                                    | Room temperature cure after mixing                                                                                                                                                                                                      |
| <b>Application</b>                             | Bonding                                                                                                                                                                                                                                 |
| <b>Maximum Gap</b>                             | 3.0 mm                                                                                                                                                                                                                                  |
| <b>Specific Benefit</b>                        | <ul style="list-style-type: none"> <li>• Excellent peel strength</li> <li>• Excellent tensile shear strength</li> <li>• Impact and fatigue resistant</li> <li>• Non-sag slump resistance</li> <li>• Easy to mix and dispense</li> </ul> |

Hysol® 9461™ is a thixotropic, two component epoxy adhesive formulated for ease of use as well for a good balance of properties. This adhesive couples high peel strength and excellent shear strength in a smooth, non-sag paste that is easily dispensed. The product has a medium working life with a quick heat cure response if required. The tough nature of this structural adhesive makes it useful for bonding dissimilar substrates including metals, engineering thermoplastics and thermoset laminates such as sheet moulding compound (SMC).

## TYPICAL PROPERTIES OF UNCURED MATERIAL

### Resin Properties

|                                   |        |
|-----------------------------------|--------|
| Specific Gravity @ 25 °C          | 1.35   |
| Viscosity, DIN 54453, mPa·s (cP): |        |
| Shear rate 10 s <sup>-1</sup>     | 85,980 |
| Shear rate 50 s <sup>-1</sup>     | 38,570 |
| Thixotropic Index                 | 2.8    |
| Flash Point - See MSDS            |        |

### Hardener Properties

|                                   |        |
|-----------------------------------|--------|
| Specific Gravity @ 25 °C          | 1.31   |
| Viscosity, DIN 54453, mPa·s (cP): |        |
| Shear rate 10 s <sup>-1</sup>     | 59,530 |
| Shear rate 50 s <sup>-1</sup>     | 42,860 |
| Thixotropic Index                 | 2      |
| Flash Point - See MSDS            |        |

### Mixed Properties

|                            |    |
|----------------------------|----|
| Pot Life @ 22 °C, minutes: |    |
| 100 g mass                 | 40 |

## TYPICAL CURING PERFORMANCE

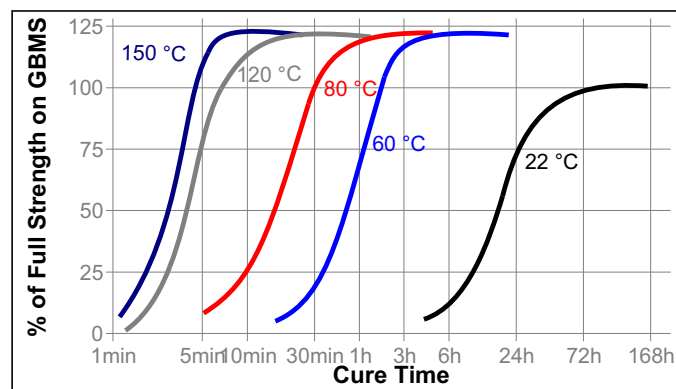
### Fixture Time

Fixture time is defined as the time to develop a shear strength of 0.1 N/mm<sup>2</sup>.

Fixture Time, mixed, @ 22 °C, minutes 240

### Cure Speed vs. Time/Temperature

Hysol® 9461™ will achieve handling strength in 4 to 5 hours at room temperature (note: this can vary with different bond configurations and ambient temperatures). Elevated temperatures may be used to accelerate the cure. The graph below shows the shear strength developed with time on grit blasted steel lap shears at different temperatures and tested according to ISO 4587.



## TYPICAL PROPERTIES OF CURED MATERIAL

Cured for 7 days @ 22 °C, 1.2 mm thick samples

### Physical Properties:

|                                      |                         |
|--------------------------------------|-------------------------|
| Shore Hardness, ISO 868, Durometer D | 80                      |
| Elongation, ISO 527-2, %             | 3.5                     |
| Tensile Strength, ISO 527-2          | N/mm <sup>2</sup> 30    |
|                                      | (psi) (4,400)           |
| Tensile Modulus, ISO 527-2           | N/mm <sup>2</sup> 2,757 |
|                                      | (psi) (400,000)         |

## TYPICAL PERFORMANCE OF CURED MATERIAL

### Adhesive Properties

Cured for 7 days @ 22 °C

Lap Shear Strength, ISO 4587:

|                                                 |                      |
|-------------------------------------------------|----------------------|
| Mild steel (grit blasted)                       | N/mm <sup>2</sup> 25 |
|                                                 | (psi) (3,600)        |
| Aluminum (abraded)                              | N/mm <sup>2</sup> 21 |
| (Silicon Carbide Paper, A166 grit, P400A grade) | (psi) (3,100)        |
| Aluminum (etched in acidic ferric sulphate)     | N/mm <sup>2</sup> 21 |
|                                                 | (psi) (3,100)        |
| Stainless steel                                 | N/mm <sup>2</sup> 19 |
|                                                 | (psi) (2,800)        |

|                               |                   |         |
|-------------------------------|-------------------|---------|
| Galvanized Steel (Hot Dipped) | N/mm <sup>2</sup> | 16      |
|                               | (psi)             | (2,300) |
| Brass                         | N/mm <sup>2</sup> | 11      |
|                               | (psi)             | (1,600) |
| Zinc dichromate               | N/mm <sup>2</sup> | 16      |
|                               | (psi)             | (2,300) |
| Polycarbonate                 | N/mm <sup>2</sup> | 6.5     |
|                               | (psi)             | (940)   |
| ABS                           | N/mm <sup>2</sup> | 6.2     |
|                               | (psi)             | (900)   |
| GRP (Polyester resin matrix)  | N/mm <sup>2</sup> | 5       |
|                               | (psi)             | (720)   |
| Glass Fiber Reinforced Epoxy  | N/mm <sup>2</sup> | 13      |
|                               | (psi)             | (1,900) |

180° Peel Strength, ISO 8510-2:

|                           |         |        |
|---------------------------|---------|--------|
| Mild Steel (grit blasted) | N/mm    | 10     |
|                           | (lb/in) | (57.1) |

IZOD Impact Resistance, ISO 9653 J/m<sup>2</sup>:

|                           |     |
|---------------------------|-----|
| Mild Steel (grit blasted) | 8.3 |
|---------------------------|-----|

**TYPICAL ENVIRONMENTAL RESISTANCE**

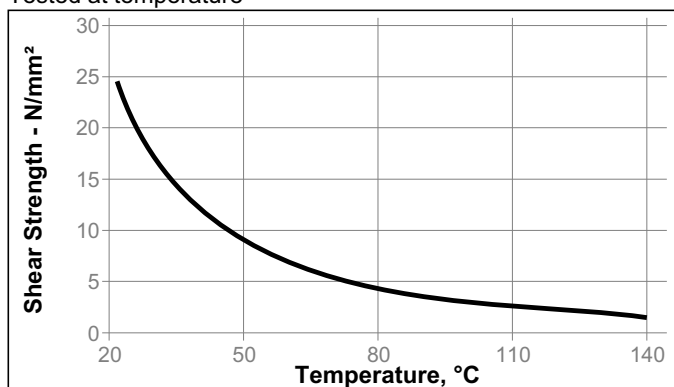
Cured for 7 days @ 22 °C

Lap Shear Strength, ISO 4587:

Mild Steel (grit blasted)

**Hot Strength**

Tested at temperature

**Heat Aging**

Stored at temperatures indicated and tested at 22°C.

| Temperature | % Initial strength retained after |         |         |
|-------------|-----------------------------------|---------|---------|
|             | 500 h                             | 1,000 h | 3,000 h |
| 50 °C       | 110                               | 105     | 105     |
| 80 °C       | 115                               | 125     | 120     |
| 100 °C      | 110                               | 100     | 100     |
| 120 °C      | 125                               | 125     | 125     |
| 150 °C      | 135                               | 125     | 120     |

**Chemical/Solvent Resistance**

Immersed in conditions indicated and tested at 22 °C.

| Environment                 | °C | % of initial strength |        |        |
|-----------------------------|----|-----------------------|--------|--------|
|                             |    | 500 h                 | 1000 h | 3000 h |
| Motor oil                   | 22 | 100                   | 95     | 100    |
| Unleaded gasoline           | 22 | 75                    | 70     | 60     |
| 50 % Water Glycol           | 87 | 75                    | 75     | 95     |
| 4% Sodium Hydroxide / Water | 22 | 85                    | 80     | 80     |
| 98% RH                      | 40 | 85                    | 70     | 70     |
| Water                       | 60 | 85                    | 75     | 75     |
| Water                       | 90 | 85                    | 80     | 55     |
| Acetone                     | 22 | 65                    | 35     | 35     |
| Acetic Acid, 10%            | 22 | 75                    | 65     | 50     |
| 7.5% Salt water solution    | 22 | 80                    | 80     | 80     |

**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).**

Where aqueous washing systems are used to clean the surfaces before bonding, it is important to check for compatibility of the washing solution with the adhesive. In some cases these aqueous washes can affect the cure and performance of the adhesive.

**Directions for use**

1. For best performance surfaces for bonding should be clean, dry and free of grease. For high strength structural bonds, special surface treatments can increase the bond strength and durability.
2. To use, resin and hardener must be blended. Product can be applied directly from dual cartridges by dispensing through the mixer head supplied. Discard the first 3 to 5 cm of bead dispensed. Using bulk containers, mix thoroughly by weight or volume in the proportions specified in the Product Description Matrix. For hand mixing, weigh or measure out the desired amount of resin and hardener and mix thoroughly. Mix approximately 15 seconds after uniform color is obtained.
3. It is recommended that this product is not mixed and cured in bulk quantities of greater than 4 kg as excessive heat build-up can occur. Mixing smaller quantities will minimize the heat build-up.
4. Apply the adhesive as quickly as possible after mixing to one surface to be joined. For maximum bond strength apply adhesive evenly to both surfaces. Parts should be assembled immediately after mixed adhesive has been applied.
5. For working life please see section 'Typical Properties of Uncured Material'. Higher temperatures and larger quantities will shorten this working time.
6. Keep the assembled parts from moving during cure. The joint should be allowed to develop full strength before subjecting to any service loads.
7. Excess uncured adhesive can be wiped away with organic solvent (e.g. Acetone).

Americas  
+860.571.5100

Europe  
+44.1442.278.402

Asia  
+81.45.758.1810

**For the most direct access to local sales and technical support visit: [www.loctite.com](http://www.loctite.com)**

8. After use and before adhesive hardens, mixing and application equipment should be cleaned with hot soapy water.

**Not for product specifications**

The technical data contained herein are intended as reference only. Please contact your local quality department for assistance and recommendations on specifications for this product.

**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**

$(^{\circ}\text{C} \times 1.8) + 32 = ^{\circ}\text{F}$

$\text{kV/mm} \times 25.4 = \text{V/mil}$

$\text{mm} / 25.4 = \text{inches}$

$\text{N} \times 0.225 = \text{lb}$

$\text{N/mm} \times 5.71 = \text{lb/in}$

$\text{N/mm}^2 \times 145 = \text{psi}$

$\text{MPa} \times 145 = \text{psi}$

$\text{N}\cdot\text{m} \times 8.851 = \text{lb}\cdot\text{in}$

$\text{N}\cdot\text{m} \times 0.738 = \text{lb}\cdot\text{ft}$

$\text{N}\cdot\text{mm} \times 0.142 = \text{oz}\cdot\text{in}$

$\text{mPa}\cdot\text{s} = \text{cP}$

**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**

Except as otherwise noted, all trademarks in this document are trademarks of Henkel Corporation in the U.S. and elsewhere. ® denotes a trademark registered in the U.S. Patent and Trademark Office.

Reference 1.0