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R-Cord™ Resin 970

R-Cord™ Hardener H141

General Purpose Adhesive TDS

DESCRIPTION: R-Cord 970 resin/Hardener epoxy adhesive is a multi-purpose, viscous material that is suitable for bonding a variety of materials including metal, ceramic, and wood. The electrically insulating adhesive is easy to apply either manually by spatula and stiff brush or mechanically with meter/mix and coating equipment. R-Cord 970 resin/Hardener epoxy adhesive cures at temperatures from 68°F (20°C) to 356°F (180°C) with no release of volatile constituents. Pot Life 3 hours.

APPLICATIONS:

- Metal
- Ceramics
- Wood
- Vulcanized Rubber
- Foams
- Plastics

ADVANTAGES:

- Long open time
- High shear and peel strength
- Easy to apply
- Good resistance to static and dynamic loads
- Electrically insulating

TYPICAL		Test Values ⁽¹⁾		
PROPERTIES:	<u>Property</u>	<u>Test Method</u>	<u>Resin</u>	<u>Hardener</u>
	Color/appearance	Visual	Clear,	Amber Liquid
			viscous/liquid	
	Specific Gravity	ASTM D-792	1.17	0.92
	Viscosity (cP) @ 77°F (25°C)	ASTM D-2393	50,000	35,000

TYPICAL MIXED PROPERTIES:	<u>Property</u>	<u>Test Method</u>	<u>Test Values</u>
		Reaction Ratio (by weight)	
	Reaction Ratio (by volume)		100R/100H
	Pot Life, hours @ 77°F (25°C) (4.fl. oz. mass)	ASTM D-2471	2
	Mixed viscosity (cP) @ 77°F (25°C)	ASTM D-2393	45,000
	¹ Tested @ 77°F (25°C)		

RECOMMENDED	<u>Temperature</u>	<u>Handling Strength</u>	<u>Minimum Cure Time</u>
CURE SCHEDULES:	68°F (20°C)	12 hours	15 hours
	77°F(25°C)	7 hours	12 hours
	104°F (40°C)	2 hours	3 hours
	158°F (70°C)	30 minutes	50 minutes
	212°F (100°C)	6 minutes	10 minutes
	302°F (150°C)	4 minutes	5 minutes

TYPICAL CURED

Application of Adhesive

PROPERTIES:

The resin/hardener mix is applied with a spatula to the pretreated and dry joint surfaces.

A layer of adhesive 0.002 to 0.004-inches (0.05 to 0.10-mm) thick will normally impart the greatest lap shear strength to a joint.

The joint components should be assembled and clamped as soon as the adhesive has been applied. Even contact throughout suffices to ensure proper cure.

Standard Test Specimens

Unless otherwise stated, the figures given below were all determined by testing standard specimens made up by lap-jointing 4-inch x 1-inch x 0.06-inch (10-cm x 2.5-cm x 1.5-mm) strips of aluminum. The joint area was 0.5 x 1 inch (12.5 mm x 2.5 cm) in each case.

<u>Property</u>	<u>Test Method</u>	<u>Test Values⁽¹⁾</u>	
Lap Shear Strength, psi (MPa)	ASTM D-1002		
<i>Effects of cure time and temperature</i>			
<u>Cure Temperature</u>	<u>Time</u>		
77°F (25°C)	8 hours	710 (4.9)	
	15 hours	199 0	(13.7)
	24 hours	213 0	(14.7)
	72 hours	228 0	(15.7)
	5 days	256 0	(17.6)
158°F (70°C)	1 hour	313 0	(21.5)
	2 hours	341 0	(23.5)
	3 hours	320 0	(22)
212°F (100°C)	10 minutes	370 0	(25.5)
	20 minutes	398 0	(27.4)
	30 minutes	412 0	(28.4)
302°F (150°C)	5 minutes	427 0	(29.4)
	10 minutes	441 0	(30.4)

	20 minutes	441 0	(30.4)
<u>Property</u>	<u>Test Method</u>		
Lap Shear Strength, psi (MPa)	ASTM D-1002		
<i>Effect of Test Temperature</i>			
(Load applied 10 minutes after specimens reach test temperature.)			
<u>Cure Cycle</u>	<u>Test Temp.</u>		
5 days @ 77°F (25°C)	-76°F (-60°C)	2840	(19.5)
	-4°F (-20°C)	2840	(19.5)
	68°F (20°C)	2560	(17.6)
	104°F (40°C)	1420	(9.8)
	140°F (60°C)	570	(3.9)
20 min @ 212°F (100°C)	-76°F (-60°C)	3560	(24.5)
	-4°F (-20°C)	3410	(23.5)
	68°F (20°C)	3980	(27.4)
	104°F (40°C)	1990	(13.7)
	140°F (60°C)	1000	(6.9)

¹Tested @ 77°F (25°C)

Property

Lap Shear Strength, psi (MPa)

Effect of Immersion

(Cure cycle 16 hours @ 104°F (40°C). Immersion for 90 days in media listed.)

<u>Media</u>		<u>Test Values⁽¹⁾</u>	
		Standard - As prepared	2560
Acetone (30 days)	570	(3.9)	
Acetylene	430	(2.9)	
Gasoline	2410	(16.6)	
Ethyl Acetate (30 days)	570	(3.9)	
Acetic Acid 10%		Degraded	
Methanol		Degraded	
Lubricating Oil - HD30		2560 (17.6)	
Kerosene		Degraded	
Trichloroethylene		Degraded	
Water @ 68°F (20°C)		1420	(9.8)
Water @ 194°F (90°C)		430	(2.9)
Lap Shear Strength, psi (MPa)			
<i>Effect of Tropical Exposure</i>			
(104°F/40°C at 92% R.H.)			
<u>Cure Cycle</u>	<u>Exposure Time</u>	<u>Test Values⁽¹⁾</u>	
16 hrs @ 104°F (40°C)	0 days	2560	(17.6)
	10 days	2560	(17.6)
	30 days	1710	(11.8)

	60 days	1560	(10.7)
	90 days	570	(3.9)
20 min @ 212°F (100°C)	0 days	3980	(27.4)
	10 days	2560	(17.6)
	30 days	1710	(11.8)
	60 days	1560	(10.7)
	90 days	1280	(8.8)

¹Tested @ 77°F (25°C)

Lap Shear Strength, psi
(MPa)

Test Method

Effect of Heat Aging

ASTM D-1002

(Cured 16 hours @ 104°F (40°C)).

<u>Aging Temperature</u>	<u>Exposure Time</u>	<u>Test Values⁽¹⁾</u>
68°F (20°C)	0 days	2560 (17.6)
	1 years	2560 (17.6)
	2 years	2280 (15.7)
	3 years	1710 (11.8)
	4 years	1990 (13.7)
	5 year	1990 (13.7)
140°F (60°C)	3 days	2560 (17.6)
	10 days	2420 (16.6)
	30 days	2130 (14.7)
176°F (80°C)	3 days	2130 (14.7)
	10 days	2130 (14.7)
	30 days	2130 (14.7)
	60 days	2130 (14.7)
	1 year	1280 (8.8)
	2 years	710 (4.9)
	3 years	710 (4.9)
	4 years	430(2.9)
	5 years	280 (1.9)
	248°F (120°C)	3 days
10 days		2280(15.7)
30 days		2280(15.7)
60 days		2130(14.7)

Property

Lap Shear Strength, psi
(MPa)

***Tested on Metal
Substrates***

(Cured 20 min @ 212°F
(100°C))

<u>Metal</u>	<u>Substrate Thickness</u> <u>(in./mm)</u>	<u>Test Values</u> ⁽¹⁾
Carbon Steel	0.039/1.0	3840 (26.4)
Stainless Steel	0.039/1.0	3270 (22.5)
Galvanized Steel ²	0.06/1.5	1990 (13.7)
Copper	0.06/ 1.5	3270 (22.5)
Brass	0.06/ 1.5	2990 (20.6)

¹Tested @ 77°F (25°C)

²Surface degreased only, not roughened.

Property

Fatigue Strength

Tested using a load frequency of 90 Hz and a 1 inch (25 mm) joint overlap (Cured 20 min @ 212°F (100°C))

Fatigue Limit Load

<u>% Static Shear Strength</u>	<u>Cycles to Failure⁽¹⁾</u>
50	10 ³ -10 ⁴
40	10 ⁴ -10 ⁵
30	10 ⁵ -10 ⁶
25	10 ⁵ -10 ⁶
20	10 ⁶ -10 ⁷
15	10 ⁷

<u>Property</u>	<u>Test Method</u>	<u>Test Values⁽¹⁾</u>
Ultimate Tensile Strength, psi (MPa)	ASTM D-638	4800 (33)
Elongation, %	ASTM D-638	9
Tg per DMA, °F (°C)	ASTM D-4065	146 (63)
Hardness, Shore D	ASTM D-2240	80
Coefficient of Thermal Expansion (in/in/°C)	ASTM E-831	8.5 x 10 ⁻⁵
Roller Peel Test, pli (N/mm)	ISO 4578	28 (4.9)

¹Tested @ 77°F (25°C)

Electrical Properties

Thermal Conductivity, W/mK	0.22
Surface Resistivity, ohms	1.2 E+16
Dielectric Strength, volt/mil	400
Volume Resistivity, ohms-cm	7.1 E+14
Dielectric Constant, at 50Hz/1KHz/10KHz	3.4/3.2/3.2
Loss Tangent, % at	1.7/1.8/2.6

50Hz/1KHz/10KHz

STORAGE/ R-Cord epoxy adhesive components should be stored in their original,
sealed

SHELF LIFE: containers at room temperature. When stored at temperatures from
59-77°F

(15-25°C), the resin and hardener will remain in useable condition for 12 months

from date of shipping from Oram Products