

> BR[®] 95 PASTE ADHESIVE

TECHNICAL DATA SHEET



DESCRIPTION

BR[®] 95 paste adhesive is a two-part, modified epoxy adhesive maintaining superior strength in metallic and composite structure. BR 95 structural adhesive is curable at room temperature. Accelerated techniques may be employed if faster cure or improved elevated temperature strength are desired.

To achieve consistent mechanical performance as well as maximum environmental resistance when bonding aluminum details, the use of BR[®] 127 corrosion inhibiting primer is recommended.

FEATURES & BENEFITS

- Superior strength in bonding metallic and composite structures
- Service temperature range from -67°F to 300°F (-55°C to 150°C)
- Curable at room temperature or through accelerated curing techniques
- Unique characteristic of a versatile mix ratio

CHARACTERISTICS

Table 1 | Product Description: BR 95 Paste Adhesive

Product Description	Part A	Part B
Base	Modified epoxy resin	Amine curing agent
Color	Gray	Amber
Consistency at 75°F (24°C)	Thixotropic paste	Viscous liquid
Solids	100%	100%
Density	12.6 ± 0.3 lb/gal (1.51 gms/cc)	8.0 ± 0.2 lb/gal (0.96 gms/cc)
Viscosity at 75°F (24°C)	Thixotropic	35000 cps
Shelf Life	Twelve months from date of shipment when stored at recommended storage conditions	
Recommended Storage	40°F (5°C)	40°F (5°C)
Recommended Mix Ratio (by weight)		
Room Temperature Cure:	Three	One
Elevated Temperature Cure:	Six	One
Pot Life at 75°F (24°C)	One hour minimum	
100 gram mass	Five hours	
Set Time at 75°F (24°C)	Five days	
Full Cure at 75°F (24°C)	One hour	
Full Cure at 200°F (93°C)		

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Table 2 | Product Description: BR 127 Corrosion Inhibiting Primer

Color	Yellow
Solids	10% ± 1% sprayable
Density	7.3 lb/gal (875 g/liter)
Shop Life	Five days at 90°F (32°C)
Shelf Life	12 months from date of shipment at recommended storage conditions
Recommended Storage	Store at or below 0°F (-18°C)

PROPERTIES

Table 3 | Effects of Cure Conditioning and Varied Mix Ratios on Average Lap Shear Strength Tested in Conformance with Federal Specification MMM-A-132

Cure Condition	A:B Mix Ratio (by weight) 3:1	A:B Mix Ratio (by weight) 6:1	A:B Mix Ratio (by weight) 10:1
60 minutes with BR 127 Primer at 200°F (95°C), 10 psi (0.07 MPa)			
-67°F (-55°C)	4120 (28.4)	3600 (24.8)	3480 (24.0)
75°F (24°C)	3940 (27.2)	3680 (25.4)	3200 (22.1)
180°F (82°C)	3540 (24.4)	3300 (22.7)	2770 (19.1)
300°F (150°C)	1770 (12.2)	1880 (12.9)	1860 (12.8)
350°F (175°C)	820 (5.66)	1360 (9.38)	1270 (8.73)
60 minutes without Primer at 200°F (95°C), 10 psi (0.07 MPa)			
-67°F (-55°C)	3830 (26.4)	3080 (21.2)	3100 (21.4)
75°F (24°C)	3290 (22.7)	2960 (20.4)	2920 (20.1)
180°F (82°C)	2520 (17.4)	2910 (20.1)	2860 (19.7)
300°F (150°C)	1430 (9.83)	1470 (10.1)	1870 (12.9)
350°F (175°C)	850 (5.86)	1340 (9.21)	1540 (10.6)
5 days with BR 127 Primer at 75°F (24°C), 10 psi (0.07 MPa)			
-67°F (-55°C)	2990 (20.6)	1590 (10.9)	1820 (12.6)
75°F (24°C)	3090 (21.3)	2380 (16.4)	2610 (18.0)
180°F (82°C)	2510 (17.3)	2270 (15.6)	1760 (12.1)
300°F (150°C)	1500 (10.3)	1780 (12.3)	1630 (11.2)
350°F (175°C)	890 (6.14)	1340 (9.21)	1340 (9.25)
5 days without Primer at 75°F (24°C), 10 psi (0.07 MPa)			
-67°F (-55°C)	3190 (22.0)	1600 (11.0)	1620 (11.2)
75°F (24°C)	2870 (19.8)	2500 (17.3)	2140 (14.7)
180°F (82°C)	2730 (18.8)	2750 (19.0)	2370 (16.3)
300°F (150°C)	1190 (8.21)	1900 (13.1)	2250 (15.5)
350°F (175°C)	835 (5.76)	1300 (8.97)	1040 (7.14)

Metal: 0.063 inch (1.58 mm) 2024-T3 clad

Cleaning method: FPL Etch

Primer: 0.0001 to 0.0003 inch (0.0025 to 0.0075 mm) dried thickness, oven cured 30 minutes at 250°F (120°C)

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Table 4 | Effect of Hot Wet Environment on Double Overlap Performance of BR 95 Paste Adhesive on Non-Metallic Substrates

Cure Condition	5 Days 75°F (24°C) 3:1	5 Days 75°F (24°C) 3:1	5 Days 75°F (24°C) 3:1	5 Days 75°F (24°C) 3:1
75°F (24°C) Control				
No Exposure	1900 (13.1)	1870 (12.9)	3360 (23.2)	3630 (25.1)
Exposed 14 days at 100% RH and 160°F (70°C)	3410 (23.5)	3870 (26.7)	3500 (24.1)	3740 (25.8)
180°F (82°C) Control				
No Exposure	2080 (14.3)	2720 (18.8)	3250 (22.4)	3450 (23.8)
Exposed 14 days at 100% RH and 160°F (70°C)	1600 (11.0)	3210 (22.2)	1900 (13.1)	2560 (17.7)
300°F (150°C) Control				
No Exposure	941 (6.49)	1340 (9.24)	1010 (6.95)	1570 (10.8)
Exposed 14 days at 100% RH and 160°F (70°C)	537 (3.70)	895 (6.17)	637 (4.39)	826 (5.70)
350°F (177°C) Control				
No Exposure	656 (4.52)	663 (4.57)	713 (4.92)	870 (6.03)
Exposed 14 days at 100% RH and 160°F (70°C)	340 (2.34)	466 (3.22)	300 (2.07)	430 (2.97)

Adhesive: BR 95 two-component adhesive

Substrate: CYCOM® 985 GFE-3K70 precured graphite laminates

Thickness:

Outside substrate: 7 plies, 0.062 in (1.58 mm)

Center substrate: 14 plies, 0.118 in (3.0 mm)

Surface Preparation: Peel ply

Cure Cycle:

75°F (24°C) for 5 days, 10 psi (0.07 MPa)

200°F (95°C) for 1 hour, 10 psi (0.07 MPa)

Exposure: 14 days at 160°F (70°C) and 100% RH

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Table 5 | Environmental Testing of BR 95 Two-Part Modified Epoxy Structural Paste Adhesive without Primer¹

Property and Test Condition	Typical Average Results psi (MPa)
Tensile Shear at 75°F (24°C)²	
After 7 days in tap water	3490 (24.1)
After 30 days in tap water	3390 (23.4)
After 30 days in salt spray	3490 (24.1)
After 7 days in JP-4 fuel	3440 (23.7)
After 7 days in anti-icing fluid	3480 (24.0)
After 7 days in hydraulic fluid	3420 (23.6)
After 7 days in Skydrol® 500 hydraulic fluid at 120°F (49°C)	3390 (23.4)

¹ Cure Cycle: 7 days at 75±5°F (24±3°C) with 10 psi (0.07 MPa)

Tested at 75±5°F (24±3°C)

Metal: 0.063 inch (1.58 mm) 2024-T3 clad

Surface Preparation: FPL etch

² Temperature tested at is ±5°F (±3°C)

Note: To increase the severity of the exposure test, individual coupons, one inch (25.4 mm) wide with two cut edges were exposed.

APPLICATION NOTES

Preparation of Aluminum

A clean, dry, grease-free surface is required for optimum performance. Aluminum surfaces should be cleaned by either an FPL etch process or phosphoric acid anodizing process.

The procedure for cleaning aluminium surfaces by FPL etch is described in the following steps. For information on phosphoric acid anodizing refer to Boeing patent 4,085,012 issued April 18, 1978.

FPL Etch Procedure

The FPL etch process involves immersion of the aluminum surface in a sodium dichromate/sulfuric acid solution. Instructions for preparing this solution follow.

NOTE: Chromic acid is highly corrosive. All contact with skin and tissues must be prevented. Wear impervious apron, boots and gloves as well as splash-proof goggles and a face shield when preparing and/or using chromic acid solutions. If air-borne concentrations of chromic acid exceed the 8 hour total weight average (TWA) permissible exposure limit (PEL) established by OSHA, respirators approved by NIOSH must be worn.

NOTE: Chromic acid solutions should be prepared and handled only in fume hoods or other adequately ventilated areas, even when the TWA is not exceeded. Traces of chromyl chloride may occur in the vapors above heated chromic acid solutions prepared from chlorinated water.

Preparation of the Sodium Dichromate/Sulfuric Acid Solution

Prepare the sodium dichromate/sulfuric acid solution according to the following steps. This solution will dissolve 1.5 grams of 2024 clad aluminium per liter.

1. Dissolve 34 grams of sodium dichromate (FED-O-S-595A) in 700 ml of deionized water
2. Add 304 grams of sulphuric acid (FED-O-A-115, Class A, Grade 2)
3. Mix well adding additional deionized water to make one liter of solution.

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FPL Etch Cleaning Method

Once the sodium dichromate/sulfuric acid solution is prepared, the aluminium surface should be cleaned according to the following steps.

1. Vapor degrease, alkaline clean, and rinse the aluminium surface checking for water break
2. Immerse the aluminium in the sodium dichromate/sulfuric acid solution at 155°F ± 5°F (68°C ± 3°C) for the length of time listed in Table 6.

Table 6 | Etch Time for Clad and Bare Aluminum

Type of Aluminum	Etch Time
Clad	10 minutes
Bare	5 minutes

3. Spray rinse the aluminum with deionized water at or below 75°F (24°C)
4. Immerse the aluminum in cold water
5. Repeat the spray rinse with deionized water
6. Check for water break
7. Dry in at a maximum temperature of 150°F (65°C) in an oven with mechanical exhaust ventilation

Primer Application

Although not mandatory BR 127 corrosion inhibiting primer is recommended for use with BR 95 paste adhesive in the bonding of aluminum details. BR 127 primer offers superior durability and resistance to hostile environments within the bond line and also may be used as a protective coating outside the bonded areas.

1. Allow the BR 127 primer to warm to room temperature prior to opening the container
2. Thoroughly mix the BR 127 prior to application and continue to agitate it during application
3. Spray or brush coat to a dry primer thickness of 0.0001 inch (0.0025 mm) nominal with a 0.0003 inch (0.0075 mm) maximum thickness.
For protective coating applications, increase primer thickness to 0.0004 up to 0.0010 inch (0.0100 to 0.0250 mm).
4. Air dry for 30 minutes minimum prior to oven cure
5. Oven cure for 30 minutes at 250°F ± 10°F (120°C ± 6 °C)

NOTE: Primed assemblies which have been cured and wrapped with a protective covering such as Kraft paper may be stored at 75°F (24°C) for six months or longer without fear of degradation of the final bond.

Bonding Procedure

1. Before bonding assemble all detail parts and adhesive
2. Combine the recommended ratios of Part A and Part B (see Table 1) and thoroughly mix until the curing agent is uniformly dispersed
3. Apply the mixed BR 95 adhesive with a spatula or trowel on the cleaned surface of the part to be bonded. The recommended glue line thickness may range from 0.003 to 0.005 inches (0.076 to 0.127 mm)
4. Assemble the parts applying sufficient pressure to ensure mating of faying surfaces
5. Cure at room temperature or 200°F (93°C) according to strength requirements

NOTE: An exothermic reaction may occur when working with large quantities of this adhesive and may shorten the pot life. Limit mixes to small quantities or quantities which may be applied soon after mixing.

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Cleanup

Prior to curing, excess adhesive and equipment may be cleaned using methylene chloride or ketone solvents.

NOTE: When using solvents for cleanup, it is essential that proper safety precautions be observed.

PRODUCT HANDLING AND SAFETY

Cytec Engineered Materials recommends wearing clean, impervious gloves when working with epoxy adhesive systems to reduce skin contact and to avoid contamination of the product.

Materials Safety Data Sheets (MSDS) and product labels are available upon request and can be obtained from any Cytec Engineered Materials Office.

DISPOSAL OF SCRAP MATERIAL

Disposal of scrap material should be in accordance with local, state, and federal regulations.

CONTACT INFORMATION

GLOBAL HEADQUARTERS

Tempe, Arizona
tel 480.730.2000
fax 480.730.2088

NORTH AMERICA

Olean, New York
tel 716.372.9650
fax 716.372.1594

Winona, Minnesota
tel 507.454.3611
fax 507.452.8195

Greenville, Texas
tel 903.457.8500
fax 903.457.8598

Springfield, Massachusetts
tel 1.800.253.4078
fax 716.372.1594

Anaheim, California
tel 714.630.9400
fax 714.666.4345

Cytec Carbon Fibers LLC
Piedmont, South Carolina
tel 864.277.5720
fax 864.299.9373

Havre de Grace, Maryland
tel 410.939.1910
fax 410.939.8100

Orange, California
tel 714.639.2050
fax 714.532.4096

D Aircraft Products, Inc.
Anaheim, California
tel 714.632.8444
fax 714.632.7164

EUROPE AND ASIA

Wrexham, United Kingdom
tel +44.1978.665200
fax +44.1978.665222

Östringen, Germany
tel +49.7253.934111
fax +49.7253.934102

Shanghai, China
tel +86.21.5746.8018
fax +86.21.5746.8038

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