

**FLAME RETARDANT<sup>1</sup>, CORROSION RESISTANT, EPOXY VINYL ESTER RESIN**

**DESCRIPTION:** HETRON FR 992 SB resin is a low viscosity, unpromoted, flame retardant patented epoxy vinyl ester with F-Cat technology. Laminates made with HETRON FR 992 SB resin have achieved a flame spread of  $\leq 25$  (ASTM E-84). Use of this resin eliminates the need to handle and mix antimony trioxide powder.

**PERFORMANCE:**

- Excellent flame retardancy
- High strength characteristics
- Excellent impact strength and toughness
- Improved wet-out and low drainage
- Excellent corrosion resistance to acidic and alkaline environments

**Patented chemistry results:**

- No foaming
- Exotherm control
- Industry-leading storage stability

**SUGGESTED USES:** HETRON FR 992 SB resin can be used for corrosion resistant, reinforced thermosetting plastic equipment including filament wound, hand lay-up and spray-up tanks, pipes, ducts, stacks, scrubbers, linings or other equipment handling corrosive gases, vapors or liquids where a high degree of flame retardancy is required.

**ALTERNATIVE PRODUCTS:** HETRON FR 992 resin can be used to fabricate laminates with  $\leq 75$  FS (Class II). HETRON FR 998/35 resin can be used to fabricate laminates with improved corrosion resistance. If flame retardancy is not required, but equivalent corrosion properties are, HETRON 922 resin is the vinyl ester of choice. For recommendations on specific services, please contact us at [www.hetron.com](http://www.hetron.com). Conditions for these resins are outlined in Ashland's Resin Selection Guide. Recommendations for specific services and environments can be provided. Contact us at [hetron@ashland.com](mailto:hetron@ashland.com).

**STANDARD PACKAGE:** 55-Gallon Drum, Non-Returnable, Net Wt. 507 Lbs. (230 Kg's)  
**DOT LABEL REQUIRED:** Flammable Liquid  
**PRODUCT CODE:** 566-087

<sup>1</sup>HETRON polyester resin will burn if provided with a sufficient amount of heat and oxygen. The degree of flame retardancy of the cured polyester resin is characterized by the ASTM E-84 tunnel test. This test is performed under strictly controlled conditions where a flame spread rating is assigned according to comparisons with test set-point materials. The behavior of the cured composite under these controlled conditions can vary from an actual fire situation.

<sup>TM</sup>Trademark of Ashland  
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**TYPICAL\* LIQUID PROPERTIES AT 77°F (25°C)**

Percent Solids	57.5
Viscosity - Brookfield, cps #2 Spindle @ 30 rpm	425
Pounds Per Gallon	9.7
Flash Point Range, °F	73-100

**TYPICAL\* PERFORMANCE DATA**

(For Guidance Only)

**TYPICAL CURING CHARACTERISTICS AT 77°F (25°C):**

**SPI Gel Time - 180°F Bath, 2% LUPERCO<sup>2</sup> ATC Paste**

Gel Time, Minutes	17
Total Time, Minutes	23
Peak Exotherm, °F	380

**MEKP Cure System**

Resin Temperature		DMA	6% Cobalt Naphthenate	Catalyst	DELTA <sup>2</sup> X-9 Catalyst	LUPERSOL <sup>2</sup> DDM-9* Catalyst	HI POINT <sup>4</sup> 90 Catalyst	HI POINT 90/CHP 50/50 Catalyst
°F	°C	phr <sup>3</sup>	phr	phr	Gel Time, Minutes			
65	18	0.1	0.2	1.25	15	27	25	60
		0.075			20	30	30	70
		0.05			25	40	33	75
77	25	0.04	0.3	1.25	10	12	13	27
			0.2		15	20	20	40
			0.1		30	40	36	74
85	29	0.05	0.3	1.25	8	8	8	18
			0.2		10	12	12	24
			0.1		20	25	24	50

*\*Typical Values: Based on material tested in our laboratories, but varies from sample to sample. Typical values should not be construed as a guaranteed analysis of any specific lot or as specification items.*

<sup>2</sup>Registered trademark of Atofina Chemicals, Inc.

<sup>3</sup>All levels are based on parts per hundred resin (phr).

<sup>4</sup>Registered trademark of Witco Chemical Corporation.

**BPO / DMA Cure System**

Temperature		50% BPO Paste (phr)	DMA (phr)	Gel Time (Minutes)
°F	°C			
65	18	2.0	0.3	26
			0.2	36
			0.1	70
75	25	2.0	0.3	16
			0.2	24
			0.1	50
85	29	2.0	0.3	11
			0.2	16
			0.1	27

**Exotherm Control Formulations** – When laminates require a lower exotherm, copper<sup>5</sup> may be incorporated to achieve the desired reduction. High hydrogen peroxide catalysts, such as CADOX<sup>6</sup> M-50 or DELTA X-9, should be used to reduce shifts in gel times.

**Effects of 8% Copper Naphthenate<sup>7</sup>**

Resin Temperature (°F)	6% Cobalt Naphthenate (phr)	DMA (phr)	DELTA X-9 Catalyst (phr)	8% Copper Naphthenate (phr)	Gel Time (Minutes)	Gel to Peak (Minutes)	Peak Exotherm (°F)
65	0.3	0.05	1.25	0	11	10	330
				0.04	11	15	240
77	0.1	0.04	1.25	0	26	12	335
				0.04	22	17	265
85	0.1	0.03	1.25	0	19	12	335
				0.04	20	20	260
95	0.1	0.02	1.25	0	19	12	330
				0.04	20	26	250

**Effects of Copper Levels at 77°F**

6% Cobalt Naphthenate (phr)	DMA (phr)	DELTA X-9 Catalyst (phr)	8% Copper Naphthenate (phr)	Gel Time (Minutes)	Gel to Peak (Minutes)	Peak Exotherm (°F)
0.1	0.04	1.25	0	23	10	340
			0.01	20	10	320
			0.02	20	14	310
			0.03	21	16	290
			0.04	21	16	270

**CAUTION:** Thoroughly mix promoters with resin before adding catalyst.

<sup>5</sup>More than 500 ppm of 8% copper may be detrimental to cure.

<sup>6</sup>Registered trademark of Akzo Chemie England B.V.

<sup>7</sup>Can be acquired from Akcros Chemical, Inc., Huls America Inc., or O.M. Group Inc.

For all surfaces that will be exposed to air during fabrication (top-coating, lining, patching, exterior surfaces, etc.) the addition of 0.4% paraffin wax to the final resin layer is recommended. A waxed surface may interfere with secondary bonding adhesion.

Flame retardant vinyl resins do not demonstrate ultraviolet stability equivalent to non-halogenated vinyl ester resins. Ultraviolet stability may be improved by adding 0.5% CYASORB<sup>8</sup> UV-9 ultraviolet screener to the exterior exposed surfaces where aesthetic appearance is desired.

**TYPICAL\* MECHANICAL PROPERTIES**

**TYPICAL PHYSICAL PROPERTIES OF CURED CASTINGS<sup>9</sup> AT 77°F (25°C):**

TEST	VALUE	TEST METHOD
Barcol Hardness	35	ASTM D-2583
Tensile Strength, psi	13,000	ASTM D-638
Tensile Modulus, psi x 10 <sup>5</sup>	5.0	ASTM D-638
Tensile Elongation at Yield, %	4.6	ASTM D-638
Tensile Elongation at Break, %	5.0	ASTM D-638
Flexural Strength, psi	21,000	ASTM D-790
Flexural Modulus, psi x 10 <sup>5</sup>	5.2	ASTM D-790
Heat Deflection Temperature, °C/°F	108/227	ASTM D-648

**TYPICAL MECHANICAL PROPERTIES AT VARIOUS TEMPERATURES:**

Temperature		Approximately		Flexural		Tensile	
F	°C	Thickness Inch <sup>10</sup>	Glass Structure	Strength, psi	Modulus, psi x 10 <sup>6</sup>	Strength, psi	Modulus, psi x 10 <sup>6</sup>
77	25	1/8	V, 2M	19,800	0.81	12,800	1.12
		1/4	V, 2M, 2(RM)	35,000	1.21	19,900	1.85
		1/2	V, 4M, 4(RM)	26,200	1.08	23,200	1.92
200	93	1/8	V, 2M	20,200	0.72	13,200	1.01
		1/4	V, 2M, 2(RM)	32,400	1.04	23,900	1.42
		1/2	V, 4M, 4(RM)	31,600	1.21	21,400	2.26
250	121	1/8	V, 2M	15,400	0.40	7,500	0.50
		1/4	V, 2M, 2(RM)	12,500	0.60	18,900	1.31
		1/2	V, 4M, 4(RM)	23,100	0.98	19,000	0.98

V = 10 mil Glass Surfacing Veil  
 M = 1.5 oz Chopped Strand Mat  
 R = 24 oz Woven Roving

Formula: HETRON FR 992 Resin 100. parts  
 6% Cobalt Naphthenate 0.30 parts  
 DMA 0.05 parts  
 HI POINT 90 Catalyst 1.50 parts  
 Cure: Post Cured 2 Hours at 250°F

<sup>8</sup>Registered trademark of Cytec Industries

<sup>9</sup>HETRON FR 992 resin prior to adding antimony trioxide. Catalyzed with 1% BPO, cured two hours at 160°F, then one hour at 200°F, postcured two hours at 280°F.

<sup>10</sup>Glass content: 1/8"=25%, 1/4"=40%, 1/2"=40%

TYPICAL FLAME RETARDANCY OF LAMINATES<sup>11</sup>:

Resin	Class	ASTM E-84 Flame Spread
HETRON FR 992 SB Resin	I	≤ 25
HETRON FR 992 Resin With 3% antimony trioxide	I	≤ 25
Without antimony trioxide	II	≤ 75
CONTROL Cement Asbestos Board	I	0
Red Oak	III	100

MASTER BATCH GUIDE

6% Cobalt Naphthenate Quantity For:

PHR	55-Gallon (450 Lbs.)	5-Gallon (41 Lbs.)
0.2	13.5 fl.oz/400 cc	1.2 fl.oz/36 cc
0.3	20.3 fl.oz/600 cc	1.8 fl.oz/54 cc
0.4	27.9 fl.oz/800 cc	2.4 fl.oz/72 cc

DMA Quantity For:

PHR	55-Gallon (450 Lbs.)	5-Gallon (41 Lbs.)
0.05	3.6 fl.oz/106 cc	0.32 fl.oz/9.5 cc
0.10	7.2 fl.oz/212 cc	0.65 fl.oz/19.0 cc
0.15	10.8 fl.oz/318 cc	0.97 fl.oz/28.6 cc

8% Copper Naphthenate Quantity For:

PHR	55-Gallon (450 Lbs.)	5-Gallon (41 Lbs.)
0.02	1.0 fl.oz/40 cc	3 cc
0.03	2.0 fl.oz/60 cc	5 cc
0.04	3.0 fl.oz/80 cc	7 cc

9% MEKP Quantity For:

PHR	1 Quart	5 Lbs.
1.25	0.39 fl.oz/11.4 cc	0.90 fl.oz/26.2 cc

**HANDLING:** HETRON FR 992 SB resin contains ingredients, which could be harmful if mishandled. Contact with skin and eyes should be avoided and necessary protective equipment and clothing should be worn.

Ashland maintains Material Safety Data Sheets on all of its products. Material Safety Data Sheets contain health and safety information for your development of appropriate product handling procedures to protect your employees and customers.

Our Material Safety Data Sheets should be read and understood by all of your supervisory personnel and employees before using Ashland's products in your facilities.

<sup>11</sup>1/8" thick laminate with approximately 32% glass content

**RECOMMENDED STORAGE:**

**Drums - Store at temperatures below 80°F (27°C). Storage life decreases with increasing storage temperature. Avoid exposure to heat sources such as direct sunlight or steam pipes. To avoid contamination of product with water, do not store outdoors. Keep sealed to prevent moisture pick-up and monomer loss. Rotate stock.**

**Bulk - See Ashland's Bulk Storage and Handling Manual for Polyesters and Vinyl Esters. A copy of this may be obtained from Composite Polymers at (614) 790-3333.**

**COMMERCIAL WARRANTY: When stored in accordance with the above conditions, Ashland warrants this product to remain within specifications for six months from date of shipment. All things being equal, higher storage temperatures will reduce product stability and lower storage temperatures will extend product stability.**

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