



Composite Polymers • Ashland Performance Materials • Division of Ashland
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FLAME RETARDANT¹, CORROSION RESISTANT, EPOXY VINYL ESTER RESIN

DESCRIPTION: HETRON FR 992 resin is a low viscosity, unpromoted, flame retardant patented epoxy vinyl ester with F-Cat technology. Laminates made with HETRON FR 992 resin have achieved a flame spread of ≤ 25 (ASTM E-84) when 3% antimony trioxide is added and a flame spread of ≤ 75 without antimony trioxide.

PERFORMANCE:

- Excellent flame retardancy
- High strength characteristics
- Excellent impact strength and toughness
- Fast 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 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 922 resin is a non-flame retardant epoxy vinyl ester. HETRON FR 992 SB resin can be used to achieve ≤ 25 flame spread without mixing additional antimony. HETRON FR 998/35 resin can be used to fabricate laminates with improved corrosion resistance. For recommendations on specific services, please contact us at hetron@ashland.com. Conditions for these resins are outlined in Ashland's Resin Selection Guide at www.hetron.com. Recommendations for specific services and environments can be provided.

TYPICAL* LIQUID PROPERTIES AT 77°F

Percent Solids	57.5
Viscosity - Brookfield, cps #2 Spindle @ 30 rpm	425
Color - Gardner	< 5
Pounds Per Gallon	9.7
Flash Point Range, °F	73-100

* 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.

STANDARD PACKAGE: 55-Gallon Drum, Non-Returnable, Net Wt. 507 Lbs. (230 Kg's)
DOT LABEL REQUIRED: Flammable Liquid
PRODUCT CODE: 566-621

¹HETRON 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.

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TYPICAL * PERFORMANCE DATA

(For Guidance Only)

TYPICAL CURING CHARACTERISTICS AT 77°F:

SPI Gel Time - 180 °F Bath, 2% LUPERCO² ATC Paste

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

MEKP Cure System

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

BPO / DMA Cure System

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

Exotherm Control Formulations – When laminates require a lower exotherm, copper⁵ may be incorporated to achieve the desired reduction. High hydrogen peroxide catalysts, such as CADOX⁶ M-50 or DELTA X-9, should be used to avoid dramatic moves in gel times.

²Registered trademark of Atofina Chemicals, Inc.

³All levels are based on parts per hundred resin (phr)

⁴Registered trademark of Witco Chemical Corporation

⁵More than 500 ppm of 8% copper may be detrimental to cure

⁶Registered trademark of Akzo Chemie England B.V.

Effects of 8% Copper Naphthenate⁷

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.

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 1.0% CYASORB⁸ UV-9 ultraviolet screener to the exterior exposed surfaces where aesthetic appearance is desired.

TYPICAL* MECHANICAL PROPERTIES

TYPICAL PHYSICAL PROPERTIES OF CURED CASTINGS⁹ AT 77°F:

TEST	VALUE	TEST METHOD
Barcol Hardness	35	ASTM D-2583
Tensile Strength, psi	13,000	ASTM D-638
Tensile Modulus, psi x 10 ⁵	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 ⁵	5.2	ASTM D-790
Heat Deflection Temperature, °F	227	ASTM D-648

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

⁸Registered trademark of Cytec Industries

⁹Catalyzed with 1% BPO, cured two hours at 160°F, then one hour at 200°F, postcured two hours at 280°F.

TYPICAL* MECHANICAL PROPERTIES

Continued

TYPICAL MECHANICAL PROPERTIES AT VARIOUS TEMPERATURES:

Test Temperature	Approximately		Flexural		Tensile	
	Thickness Inch ¹⁰	Glass Structure	Strength, psi	Modulus, psi x 10 ⁶	Strength, psi	Modulus, psi x 10 ⁶
77°F	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°F	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°F	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

TYPICAL FLAME RETARDANCY OF LAMINATES¹¹:

Resin	Class	ASTM E-84 Flame Spread
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

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

¹¹1/8" thick laminate with approximately 27% glass content

MASTER BATCH GUIDE

(Continued)

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 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.

RECOMMENDED STORAGE:

Drums - Store at temperatures below 80°F. Storage life decreases with increasing storage temperature. Avoid exposure to heat sources such as direct sunlight or steam pipes. For thixed resins, mild agitation is recommended to address thixotrope settling after prolonged storage. To avoid contamination of product with water, do not store outdoors. For monomer-containing resins, 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.