Technical Datasheet

INEOS Composites

HETRON™ 922 Corrrosion/Heat Resistant Epoxy Vinyl Ester Resin

HETRON 922 resin is a low viscosity, unpromoted patented epoxy vinyl ester resin with F-Cat technology. This patented technology results in a resin that exhibits no foaming, excellent exotherm control, and industry-leading storage stability.

The raw materials used in the manufacture of this resin are listed as acceptable in FDA regulation Title 21 CFR 177.2420 for repeated use in contact with food, subject to user's compliance with the prescribed limitations of that regulation. HETRON 922 epoxy vinyl ester resin gives final products with:

- Excellent corrosion resistance
- Excellent impact strength
- High tensile elongation

APPLICATIONS AND USE

HETRON 922 resin is designed for use in hand lay-up, spray-up, and filament winding. It can also be used for flake glass and filled lining and coating compounds.

HETRON 922L epoxy vinyl ester resin can be used when a lower viscosity is desired. HETRON FR992 vinyl ester resin provides flame retardancy. Recommendations for specific services and environments can be provided by contacting us at hetron@ineos.com.

TYPICAL LIQUID RESIN PROPERTIES

Property(1) at 25°C (77°F)	Value	Unit
Viscosity, Brookfield # 2 spindle @ 30 rpm	400	mPas (cps)
Percent Solids	55.5	%
Color	<4	Gardner
Specific Gravity	1.04	gm/cc

(1) Properties are typical values based on material tested in our laboratories. Typical values should not be construed as a guaranteed analysis of any specific lot or as specification items.

Technical Datasheet

INEOS Composites

HETRON™ 922 Corrrosion/Heat Resistant Epoxy Vinyl Ester Resin

TYPICAL CURING CHARACTERISTICS

SPI Gel Time at 82°C (180°F) Bath, 2% Luperco(2) ATC Paste	Value	Unit
Gel Time	12	minutes
Total Time	20	minutes
Peak Exotherm	188 (370)	°C(°F)

MEKP Cure System

Typical geltimes at different temperatures using different pre-acceleration systems and curing with Delta(2) X-9, Lupersol(2) DDM-9 and Hi-Point(3) 90 catalysts(4).

Temperature / Catalyst	DMA (phr)	Co-nap6% (phr)	Delta X-9	DDM-9	HiPoint 90
18°C (65°F) / 1.25 phr	0.15	0.3	14 minutes	21 minutes	22 minutes
	0.075	0.3	24 minutes	31 minutes	29 minutes
	0.05	0.3	40 minutes	40 minutes	40 minutes

Temperature / Catalyst	DMA (phr)	Co-nap6% (phr)	Delta X-9	DDM-9	HiPoint 90
25°C (77°F) / 1.25 phr	0.075	0.3	15 minutes	17 minutes	17 minutes
	0.05	0.3	21 minutes	23 minutes	22 minutes
	0.025	0.3	33 minutes	35 minutes	36 minutes

Temperature / Catalyst	DMA (phr)	Co-nap6% (phr)	Delta X-9	DDM-9	HiPoint 90
29°C (85°F) / 1.25 phr	0.075	0.2	15 minutes	18 minutes	18 minutes
	0.05	0.2	22 minutes	24 minutes	24 minutes
	0.025	0.2	37 minutes	40 minutes	40 minutes

(2) Registered trademark of Atofina Chemicals Inc.
(3) Registered trademark of Witco Chemical Corporation.

Technical Datasheet

INEOS Composites

HETRON™ 922 Corrrosion/Heat Resistant Epoxy Vinyl Ester Resin

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

BPO / DMA Cure System

Temperature / BPO Paste 50%	DMA (phr)	Gel Time
18°C (65°F) / 2.0 phr	0.7	17 minutes
	0.5	24 minutes
	0.3	40 minutes
24°C (75°F) / 2.0 phr	0.5	15 minutes
	0.3	25 minutes
	0.15	49 minutes
29°C (85°F) / 2.0 phr	0.3	18 minutes
	0.2	25 minutes
	0.1	36 minutes
29°C (85°F) / 2.0 phr + 0.2 phr TBPB	0.3	18 minutes

Effect of Copper Naphthenate

Copper Naphthenate (Cu-nap 8%)(5) will influence Gel Time, Gel-to-Peak and Peak Exotherm at different temperatures and pre-accelerations. Catalyst used is Delta X-9 at 1.25 phr.

CAUTION: Thoroughly mix promoters with resin before adding catalyst.

Temperature / Cu-nap 8%	Co-nap6% (phr)	DMA (phr)	Gel Time	Gel-Peak	Peak Exo
18°C (65°F) / 0 phr	0.3	0.15	12 minutes	5 minutes	168°C (335°F)
18°C (65°F) / 0.04 phr	0.3	0.15	10 minutes	6 minutes	107°C (225°F)

HETRON™ 922 Corrrosion/Heat Resistant Epoxy Vinyl Ester Resin

25°C (77°F) / 0 phr	0.3	0.075	16 minutes	8 minutes	160°C (320°F)
25°C (77°F) / 0.04 phr	0.3	0.075	17 minutes	10 minutes	102°C (215°F)
29°C (85°F) / 0 phr	0.3	0.04	19 minutes	11 minutes	157°C (315°F)
29°C (85°F) / 0.04 phr	0.3	0.04	20 minutes	23 minutes	82°C (180°F)
35°C (95°F) / 0 phr	0.3	0.02	22 minutes	15 minutes	156°C (313°F)
35°C (95°F) / 0.04 phr	0.3	0.02	29 minutes	28 minutes	49°C (120°F)

Remark: Exotherm control formulations - When laminates require a lower exotherm, copper(6) may be incorporated to achieve the desired reduction. High hydrogen peroxide catalysts, such as CADOX(7) M-50 or DELTA X-9, should be used to avoid dramatic moves in gel times.

(5) Can be acquired by Akcros Chemical, Inc., Huls America Inc., or O.M. Group Inc.
(6) More than 500 ppm of 8% copper may be detrimental to cure
(7) Registered trademark of Akzo Nobel

Copper Naphthenate (Cu-nap 8%) will influence Gel Time, Gel-to-Peak and Peak Exotherm at 25°C (77°F). Catalyst used is Delta X-9 at 1.25 phr.

CAUTION: Thoroughly mix promoters with resin before adding catalyst.

Cu-naphthenate 8% (phr)	DMA (phr)	Co-nap6% (phr)	Gel Time	Gel-Peak	Peak Exo
0	0.075	0.3	16 minutes	9 minutes	160°C (320°F)
0.01	0.075	0.3	16 minutes	8 minutes	141°C (285°F)

HETRON™ 922 Corrrosion/Heat Resistant Epoxy Vinyl Ester Resin

0.02	0.075	0.3	16 minutes	11 minutes	138°C (280°F)
0.03	0.075	0.3	17 minutes	11 minutes	110°C (230°F)
0.04	0.075	0.3	16 minutes	13 minutes	99°C (210°F)

TYPICAL MECHANICAL PROPERTIES

Property[1] of cured casting[8] at 25°C (77°F)	Value (SI)	Value (US)	Method
Barcol Hardness	30	30	ASTM D2583
Tensile Strength	86 MPa	12,500 psi	ASTM D638
Tensile Modulus	3170 MPa	4.6 psi x 10^5	ASTM D638
Tensile Elongation at yield	4.9%	4.9%	ASTM D638
Tensile Elongation at break	6.7%	6.7%	ASTM D638
Flexural Strength	141 MPa	20,500 psi	ASTM D790
Flexural Modulus	3450 MPa	5.0 psi x 10^5	ASTM D790
Heat Distortion Temperature	105°C	221°F	ASTM D648

(8) Catalyzed with 1.0% BPO, cured two hours at 71°C (160°F), then one hour at 93°C (200°F), post-cured two hours at 138°C (280°F).

Master Batch Guide

Cobalt Naphthenate 6% Quantity for:	55-Gal (205 kg, 452 lbs)	5-Gal (19 kg, 41 lbs)
0.2%	14.5 fl.oz/429 cc	1.3 fl.oz/38 cc
0.3%	21.7 fl.oz/642 cc	1.9 fl.oz/56 cc
0.4%	28.9 fl.oz/855 cc	2.6 fl.oz/77 cc

DMA Quantity for:	55-Gal (205 kg, 452 lbs)	5-Gal (19 kg, 41 lbs)

Technical Datasheet

INEOS Composites

HETRON™ 922 Corrrosion/Heat Resistant Epoxy Vinyl Ester Resin

0.05%	3.6 fl.oz/106 cc	0.36 fl.oz/11 cc
0.10%	7.2 fl.oz/213 cc	0.66 fl.oz/20 cc
0.15%	10.8 fl.oz/319 cc	0.98 fl. oz/29 cc

Copper Naphthenate 8% Quantity for:	55-Gal (205 kg, 452 lbs)	5-Gal (19 kg, 41 lbs)
0.02%	1.4 fl.oz/41 cc	0.13 fl.oz/4 cc
0.03%	2.2 fl.oz/65 cc	0.20 fl. oz/6 cc
0.04%	2.9 fl.oz/86 cc	0.26 fl.oz/8 cc

9% MEKP Quantity for:	0.95 liter (1 quart)	2kg (5 lbs)
1.25%	0.39 fl.oz/11 cc	0.90 fl.oz/27 cc

CERTIFICATES AND APPROVALS

The manufacturing, quality control and distribution of products, by INEOS Composites, comply with one or more of the following programs or standards: ISO 9001, ISO 14001 and OHSAS 18001.

STANDARD PACKAGE

Non-Returnable Drum with Net Weight of 205 Kgs (452 Lbs)
DOT Label Requirement: Flammable Liquid

COMMERCIAL WARRANTY

Six months from date of shipment, when stored in accordance with the conditions stated below.

STORAGE

Drums - Store at temperatures below 25°C (77°F). 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 containers sealed to prevent moisture pick-up and monomer loss. Mild mixing is recommended after prolonged storage. Rotate stock.

Bulk - See INEOS Composites's Bulk Storage and Handling Manual for Polyesters and Vinyl Esters. A copy of this may be obtained from INEOS Composites at +1.614.790.3333 or 800.523.6963.

HETRON™ 922 Corrrosion/Heat Resistant Epoxy Vinyl Ester Resin

All other conditions being equal, higher storage temperatures will reduce product stability and lower storage temperature will extend product stability.

Notice

All information presented herein is believed to be accurate and reliable, and is solely for the user's consideration, investigation and verification. The information is not to be taken as an express or implied representation or warranty for which INEOS Composites assumes legal responsibility. Any warranties, including warranties of merchantability, fitness for use or non-infringement of intellectual property rights of third parties, are herewith expressly excluded.

Since the user's product formulations, specific use applications and conditions of use are beyond the control of INEOS Composites, INEOS Composites makes no warranty or representation regarding the results which may be obtained by the user. It shall be the sole responsibility of the user to determine the suitability of any of the products mentioned for the user's specific application.

INEOS Composites requests that the user reads, understands and complies with the information contained herein and the current Material Safety Data Sheet.