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PRODUCT BULLETIN

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DION FR® 9300

Brominated Bisphenol-Epoxy Vinyl Ester Resins

DESCRIPTION

The DION FR® 9300 series of resins are flame-retardant brominated, bisphenol-epoxy vinyl esters that provide corrosion-resistance in a wide variety of acidic and alkaline environments. These tough, high-strength resins can be used to produce glass-reinforced laminates with excellent impact and stress-fatigue resistance, making them ideal for filament winding operations and applications that require resistance to corrosive environments and thermal cycling.

FEATURES	BENEFITS
• Premium epoxy vinyl ester polymer	• Very good high-temperature stability • Resistance to a wide variety of corrosive environments • Tough, crack and stress-fatigue resistant laminate
• Brominated polymer backbone	• ASTM E-84 Class I flame-spread with 1.5% antimony trioxide or 3.0% antimony pentoxide.
• Laminates based on DION FR 9300 have passed ICBO Acceptance Criteria for Class V Duct	• Ideal for most corrosion-resistant duct applications
• Meets MIL-R-24719(SH) Grade B Class 1	• Can be used for applications requiring Coast Guard approval.
• Manufactured using statistical process control in ISO-9002 certified plants	• Consistent batch-to-batch performance

** DION FR® polyester resins will burn if provided with a sufficient amount of heat and oxygen. The degree of flame-retardancy of laminates prepared using DION FR® resins has been characterized using several standard ASTM test methods. Testing has been performed under strictly controlled conditions. The behavior of composites made using DION FR® resins may vary in an actual fire situation.*

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TYPICAL LIQUID PROPERTIES[1] @ 25°C

Version	Viscosity, cps	Gel Time, Minutes*	% N.V.	Specific Gravity	Shelf Life, Minimum
DION FR® 9300-00	450	Unpromoted	58.5	1.17	6 months
DION FR® 9300-10	300	Unpromoted	54.5	1.16	6 months
DION FR® 9300-54	450	20	58.5	1.17	3 months

[1]Seta Closed Cup Flash Point of all DION FR® 9300 resins is 31.6°C (89°F)

* 1.25% Superox® 46747, 50 g mass

Minimum shelf life performance refers to product in the original, unopened container. Shelf stability is affected by storage conditions. See the "Storage" section of this bulletin for further details.

NOTE: Some versions of DION FR® 9300 may have minimum order quantity restrictions. For more information, contact your *Reichhold* representative or approved *Reichhold* distributor.

TYPICAL MECHANICAL PROPERTIES[1]

	ASTM TEST METHOD	CLEAR CASTING
Barcol Hardness	D-2583	40
Heat Deflection Temperature, °F	D-648	230
Tensile Strength, psi	D-638	10,900
Tensile Modulus, x 10^6 psi	D-638	0.51
Tensile Elongation @ Break, %	D-638	4.0
Flexural Strength, psi	D-790	21,900
Flexural Modulus, x 10^6 psi	D-790	0.52
Specific Gravity		1.26

TYPICAL LAMINATE PROPERTIES AT ELEVATED TEMPERATURES[1]

TEMP. (ºF)	TENSILE STRENGTH (PSI)	TENSILE MODULUS (x 10^6 psi)	FLEXURAL STRENGTH (psi)	FLEXURAL MODULUS (x10^6 , psi)
77	26,600	2.16	31,700	1.53
150	29,100	1.94	30,600	1.35
200	30,100	1.82	30,500	1.22
250	21,200	1.62	5,100	0.23
300	13,700	1.18	2,800	0.19

* Laminate Construction: V/M/M/WR/M/WR/M/M
* Glass Content: 42%
* Thickness: 0.250

[1] Properties reported in this bulletin are typical of those obtained in controlled laboratory tests and will vary in production conditions

DION FR® 9300 CURE DATA

DION FR® resins are formulated for use with methyl ethyl ketone peroxide (MEKP) initiator systems. They can also be used with benzoyl peroxide. Unpromoted versions of DION FR® 9300 require the addition of either cobalt octoate, (or cobalt naphthenate), and dimethylanaline (DMA) before adding MEKP initiator to obtain an optimal cure. Prepromoted versions require addition of initiator only. Vinyl ester resins are acutely sensitive to cobalt. If the gel time must be adjusted, use DMA to accelerate it or a 10% solution of tertiary-butyl catechol (TBC-10) to slow it down. Maintain an MEKP level of 1.00% - 2.0%.

The curing performance of DION FR® 9300 is also sensitive to changes in temperature. For best results, use of less than 1.00% MEKP initiator is not recommended. When long gel times at high ambient temperatures are required, the initiator level should be maintained at 1.00 -1.25% and gel time adjusted by adding TBC-10. At ambient temperatures below 60°F, it may be necessary to add additional dimethylaniline and/or increase initiator to accelerate gel and cure rates.

GUIDELINES FOR DION FR® 9300-00 INITIATOR AND PROMOTER ADDITIONS

Ambient Temperature (°F)	Additive (phr)	Gel Time (Minutes)				
		10	20	30	60	90
55-65	6% Cobalt*	-	0.5	0.4	0.4	0.4
	DMA	-	0.3	0.15	0.075	0.05
	Superox 46747†	-	2.0	2.0	1.5	2.0
70-80	6% Cobalt*	0.4	0.4	0.4	0.3	0.3
	DMA	0.3	0.15	0.1	0.05	-
	Superox 46747†	2.0	1.25	1.5	1.0	2.0
80-90	6% Cobalt*	0.3	0.2	0.2	0.2	0.2
	DMA	0.2	0.1	0.1	0.05	-
	Superox 46747†	2.0	2.0	1.25	1.0	1.5

***Caution:** Excessive cobalt can inhibit cure and degrade corrosion resistance. Do not use more than 0.5% of cobalt 6% or 0.25% of cobalt 12%. If using cobalt octoate (12%), use half of the amount indicated in the chart for cobalt 6%.

†MEKP (9% Oxygen) such as Superox® 46747, HiPoint™ 90 or equivalent. Trigonox™ 239A has been shown to reduce or eliminate foaming upon initiator addition. Other brands of MEKP have also been used successfully. A thorough evaluation of initiator characteristics is suggested prior to fabrication.

FLAME RETARDANCE

TEST	ADDITIVE	TEST VALUE
ASTM E-84 (Tunnel test)	None (C glass veil) 1.5% antimony trioxide 3% antimony trioxide (Nexus veil) 3% antimony trioxide (C glass veil) 3% antimony pentoxide (C glass veil)	30 flame spread (Class II)* 20 flame spread (Class I)** 15 flame spread (Class I)*** 15 flame spread (Class I)**** 25 flame spread (Class I)****
ASTM D-2863 (Oxygen Index)	None (Nexus veil) 3% antimony trioxide (Nexus veil) 3% antimony trioxide (C glass veil)	26.5 LOI *** 33 LOI *** 34 LOI ***

* Laminate construction: Glass Content: 30%; Thickness: 0.13 in.

** Laminate construction: Glass Content: 25-30%; Thickness: 0.118 in.

*** Laminate construction: Glass Content: 25-30%; Thickness: 0.125 in.

**** Laminate construction: Glass Content: 25-30%; Thickness: 0.110 in.

DION FR® 9300 PARAFFINATED TOPCOATS

Even fully cured resin can retain a tacky surface. Surface cure may be improved by incorporating a paraffin wax into the resin used in the final ply. Alternatively, a wax modified resin can be added as a topcoat once the laminate has hardened.

SUGGESTED TOPCOAT FORMULATION

COMPONENT	*PARTS*
DION FR® 9300-00, Parts	100.0
10% Paraffin wax solution	5.0
DMA	0.2
6% cobalt naphthenate	0.4
Tween 20 or 80	0.3
Fumed silica thixotrope*	1.5
Superox 46747 or equivalent initiator	1.3
Approximate gel time, mins.	*20*

* Use in sodium hypochlorite environments will result in decreased chemical resistance. Hydrophobic grades of fumed silica are suggested for vinyl ester resins.

STORAGE

To ensure maximum stability and maintain optimum resin properties, resins should be stored in closed containers at temperatures below 75°F (25°C) and away from heat sources and sunlight. All storage areas and containers should conform to local fire and building codes. Drum stock should be stored away from all sources of flame or combustion. Inventory levels should be kept to a reasonable minimum with first-in, first-out stock rotation.

Additional information on handling and storing unsaturated polyesters is available in *Reichhold's* application bulletin "Bulk Storage and Handling of Unsaturated Polyester Resins." For information on other *Reichhold* resins or initiators, contact your sales representative or authorized Reichhold distributor.

SAFETY

READ AND UNDERSTAND THE MATERIAL SAFETY DATA SHEET BEFORE WORKING WITH THIS PRODUCT

Obtain a copy of the material safety data sheet on this product prior to use. Material safety data sheets are available from your *Reichhold* sales representative. Such information should be requested from suppliers of all products and understood prior to working with their materials.

TECHNICAL SUPPORT

Reichhold's technical support facilities are staffed by people who have extensive practical experience in polyesters and manufacturing techniques. Please do not hesitate to request our assistance through your sales representative.

Copies of test methods noted in this bulletin are available from your *Reichhold* sales representative or distributor.

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