REICHHOLD

PRODUCT BULLETIN

Revision date (March, 2011)

DION® FR 9300

Brominated Bisphenol- A Epoxy Vinyl Ester Resins

DESCRIPTION

- The DION® FR 9300 series of resins are flame-retardant brominated, bisphenol-A 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. DION® FR 9300 resins are 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 • Resistant to a wide variety of corrosive environments • Produces tough, crack and stress-fatigue resistant laminates
• Brominated polymer backbone	• ASTM E-84 Class A flame-spread with 1.5% antimony trioxide or 3.0% NYACOL® APE3040 antimony pentoxide
• Meets MIL-R-24719(SH) Grade B, Class 1	• Can be used for applications requiring Coast Guard Approval
• Manufactured using statistical process and quality controls	• Consistent batch-to-batch performance

VERSIONS

Version	Viscosity, cps	Gel Time, Minutes	Description
9300-00	400 - 500	--	Unpromoted
9300-10	200 - 260	--	Unpromoted, lower viscosity version

919-990-7500 • 800-448-3482 • P.O. Box 13582, Research Triangle Park, NC 27709 USA • 2400 Ellis Road, Durham, NC 27703 USA • www.reichhold.com

TYPICAL PROPERTIES [1]

TYPICAL LIQUID PROPERTIES AT 25°C/77°F

Properties	Unit	Value	Test Method
NV	%	53 - 60	18-001
Viscosity RVF #2 @20 rpm	cps	200 - 500	18-021
Thix Index	--	--	--
Room Temperature Gel	min	18 - 23	18-050
Gel to Peak	min	8 - 16	18-050
Peak Exotherm	°C/°F	121-162/250-324	18-050
Spec. Gravity		1.12 – 1.17	18-030
Flash point (Seta Closed Cup)	°C/°F	31.6/89	

TYPICAL NON REINFORCED MECHANICAL PROPERTIES AT 25°C/77°F

Properties	Unit	Value	Test Method
Tensile Strength	psi	10,900	ASTM D 638-02
Tensile Modulus $x10^5$	psi	5.1	ASTM D 638-02
Tensile Elongation	%	4.0	ASTM D 638-02
Flexural Strength	psi	21,900	ASTM D 790-02
Flexural Modulus $x10^5$	psi	5.2	ASTM D 790-02
Heat Deflection Temperature	°C/°F	110/230	ASTM D 648
Hardness, Barcol Model 934-1		40	ASTM D 2583-99

TYPICAL LAMINATE PROPERTIES AT ELEVATED TEMPERATURES

Temp ° C/°F	Tensile Strength (psi)	Tensile Modulus ($x10^5$, psi)	Flexural Strength (psi)	Flexural Modulus ($x10^5$, psi)
25/77	26,600	21.6	31,700	15.3
65.5/150	29,100	19.4	30,600	13.5
93/200	30,100	18.2	30,500	12.2
121/250	21,200	16.2	5,100	2.3
149/300	13,700	11.8	2,800	1.9

Laminate Construction: V/M/M/WR/M/WR/M/M
Glass Content: 42%
Thickness: 0.25 inch

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

GUIDELINES FOR INITIATOR AND PROMOTER ADDITIONS

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 or 2,4 Pentandione. 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
	MEKP†	-	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	-
	MEKP†	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	-
	MEKP†	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 MEKP 925, 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.

SUGGESTED TOPCOAT FORMULATION

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.

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
MEKP 925, HiPoint 90 or equivalent initiators	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.

CERTIFICATIONS

ASTM E-84 Flame Spread Ratings

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 **NYACOL® APE3040** (C glass veil)	30 flame spread (Class B)* 20 flame spread (Class A)** 15 flame spread (Class A)*** 15 flame spread (Class A)**** 25 flame spread (Class A)****
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.

STORAGE

To ensure maximum stability and maintain optimum resin properties, resins should be stored in the original closed container at temperature below 24°C/75°F and away from heat ignition sources and sunlight. Resin should be warmed to at least 18°C/65°F prior to use in order to assure proper curing and handling. All storage areas and containers should conform to local fire and building codes. Copper or copper containing alloys should be avoided as containers. Store separate from oxidizing materials, peroxides and metal salts. Keep containers closed when not in use. 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, additives or initiators, contact your sales representative or authorized Reichhold distributor.

SHELF LIFE

Shelf life is six months from date of shipment. Minimum shelf life performance refers to product in the original, unopened container.

STANDARD PACKAGE

This product is available in non-returnable 55-gallon metal drums (**452 lbs net**) or 42,000 – 44,000-lb. tank truck.

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 or contact the Reichhold service center 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.

DIRECTLY MIXING ANY ORGANIC PEROXIDE WITH A METAL SOAP, AMINE, OR OTHER POLYMERIZATION ACCELERATOR OR PROMOTER WILL RESULT IN VIOLENT DECOMPOSTION. WHEN ADDING ORGANIC PEROXIDES TO A RESIN SOLUTION, PROMPTLY AND THOROUGHLY MIX THE RESULTING PRODUCT. NEVER ADD ORGANIC PEROXIDES TO A HOT DILUENT OR PROCESS. PREVENT CONTAMINATION WITH FOREIGHN MATERIALS, INCLUDING WITHOUT LIMITATION, ACCELERATORS (SUCH AS DIMETHYL, ANILINE, OTHER AMINES OR COBALT COMPOUNDS), HEAVY-METAL OXIDES OR SALTS (PARTICULARLY THOSE OF COBALT, IRON AND COPPER), STRONG ACIDS AND SANDING DUSTS. USE CLEAN CONTAINERS MADE OF GLASS, POLYPROPYLENE, TEFLON, POLYETHYLENE, OR CERAMIC TO PREVENT CONTAMINATION OF ORGANIC PEROXIDES DURING ITS HANDLING.

TECHNICAL SUPPORT

Reichhold's technical support staff has extensive practical experience with various composites resins, end use performance and manufacturing techniques. Please do not hesitate to request our assistance through your Reichhold sales or technical representative.

Copies of test methods used to determine reported properties are available through your Reichhold representative.

Each user must determine the suitability of this product to his/her particular mode of operation and intended end use application. A Reichhold representative will be available to assist in the proper selection of all Reichhold products available for commercial use.

Properties reported in this bulletin are typical of those obtained in controlled laboratory tests and may vary in actual production; therefore, we require our customers to inspect and test our products before using them to satisfy themselves as to contents and suitability. We warrant that our products will meet our written specifications. **Nothing herein shall constitute any other warranty express or implied, including any warranty of merchantability or fitness for a particular purpose, nor is protection from any law or patent to be inferred.**

.