Technical Datasheet

INEOS Composites

DERAKANE™ 510 B-400 Epoxy Vinyl Ester Resin

DERAKANE 510 B-400 epoxy vinyl ester resin is a low viscosity, unpromoted, flame retardant(1) epoxy vinyl ester. This resin offers exceptional processing characteristics including little to no foaming, excellent exotherm control, and industry-leading storage stability. Laminates made with DERAKANE 510 B-400 resin have achieved a flame spread of 25 (ASTM E-84). DERAKANE 510 B-400 resin gives final products with:

- 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

Note: Contact us before using thixotropic agents and fillers. Addition of thixotropic agents and fillers can compromise corrosion resistance.

APPLICATIONS AND USE

DERAKANE 510 B-400 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.

A pre-promoted version called DERAKANE 510 B-400 P resin is available. DERAKANE 411-350 resin is a non-flame retardant epoxy vinyl ester which may be suitable for similar applications that do not require fire retardance. DERAKANE 510 N resin can be used to fabricate laminates with improved thermal resistance. Conditions for these resins are outlined in INEOS Composites's Resin Selection Guide at www.derakane.com. For recommendations on specific services and environments, please contact us at derakane@ineos.com.

TYPICAL LIQUID RESIN PROPERTIES

Property(2) at 25°C (77°F)	Value	Unit
Viscosity, Brookfield # 2 spindle @ 30 rpm	425	mPas (cps)

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Percent Solids	57	%
Color	<5	Gardner
Specific Gravity	1.16	gm/cc

(1) Laminates made with DERAKANE fire retardant resins will burn if provided with a sufficient amount of heat and oxygen. The degree of flame retardancy of the cured 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.
(2) 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.

TYPICAL CURING CHARACTERISTICS

Typical DERAKANE 510 B-400 P Resin Room Temperature Cure	Value	Unit
Gel Time, 1.25% of NOROX (ME)KP 925H(2,3)	23	minutes

MEKP Cure Systems(2)

Typical geltimes at different temperatures using different pre-acceleration systems(4) and curing with Lupersol(5) DDM-9, NOROX (ME)KP 925H (3) and CHP(6).

CAUTION: Thoroughly mix promoters with resin before adding catalyst.

Temperature / Catalyst	Co-nap6% (phr)	DMA (phr)	DDM-9	925H	925H/CHP 50/50
18°C (65°F) / 1.25 phr	0.2	0.1	27 minutes	25 minutes	60 minutes
	0.2	0.075	30 minutes	30 minutes	70 minutes
	0.2	0.05	40 minutes	33 minutes	75 minutes

	Co-nap6% (phr)	DMA (phr)	DDM-9	925H	925H/CHP 50/50
25°C (77°F) / 1.25 phr	0.3	0.04	12 minutes	13 minutes	27 minutes

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	0.2	0.04	20 minutes	20 minutes	40 minutes
	0.1	0.04	40 minutes	36 minutes	74 minutes

	Co-nap6% (phr)	DMA (phr)	DDM-9	925H	925H/CHP 50/50
29°C (85°F) / 1.25 phr	0.3	0.05	8 minutes	8 minutes	18 minutes
	0.2	0.05	12 minutes	12 minutes	24 minutes
	0.1	0.05	25 minutes	24 minutes	50 minutes

(3) Registered trademark of United Initiators. NOROX (ME)KP 925H. (ME) used in NA name, but not elsewhere.
(4) All levels are based on parts per hundred resin (phr)
(5) Registered trademark of Atofina Chemicals Inc.
(6) Cumene Hydroperoxide

Fabricating Tips

Exotherm control formulations - When laminates require a lower exotherm, copper(7) may be incorporated to achieve the desired reduction. High hydrogen peroxide catalysts, such as CADOX(8) M-50, should be used to avoid dramatic moves in gel times. Copper Naphthenate (Cu-nap 8%) may also be used to influence Gel Time, Gel-to-Peak and Peak Exotherm at 25°C (77°F) if a different catalyst is used e.g. Delta X-9. Note that more than 500 ppm of 8% copper may be detrimental to cure.

(7) Can be acquired by Akcros Chemical Inc, Huls America Inc, or OM Group Inc.
(8) Registered trademark of Akzo Nobel

Temperature / BPO Paste 50%	DMA (phr)	Gel Time
18°C (66°F) / 2.0 phr	0.3	25 minutes

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	0.2	35 minutes
	0.1	70 minutes
24°C (75°F) / 2.0 phr	0.3	15 minutes
	0.2	25 minutes
	0.1	50 minutes
29°C (85°F) / 2.0 phr	0.3	10 minutes
	0.2	15 minutes
	0.1	25 minutes

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 ester resins do not demonstrate ultraviolet stability equivalent to non-halogenated vinyl ester resins. Ultraviolet stability may be improved by adding 1.0% CYASORB(9) UV-9 ultraviolet screener to the exterior exposed surfaces where aesthetic appearance is desired.

Property(2) of cured casting(10) at 25°C (77°F)	Value (SI)	Value (US)	Method
Tensile Strength	90 MPa	13,050 psi	ASTM D638
Tensile Modulus	3520 MPa	5.1 psi x 10^5	ASTM D638
Tensile Elongation at yield	4.7%	4.7%	ASTM D638
Tensile Elongation at break	5.5%	5.5%	ASTM D638
Flexural Strength	150 MPa	22,100 psi	ASTM D790
Flexural Modulus	3450 MPa	5.0 psi x 10^5 psi	ASTM D790

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Heat Distortion Temperature	106°C	223°F	ASTM D648
Barcol Hardness	35	35	ASTM D2583

(9) Registered trademark of Cytec Industries
(10) Catalyzed with 1.0% BPO & 0.2% TBPB, cured one hour at 49°C (120°F), one hour at 71°C (160°F), two hours at 93°C (200°F), and post-cured two hours at 121°C (250°F).

TYPICAL FLAME RETARDANCY OF LAMINATES

Tested Material	Class	ASTM E-84 Flame Spread
DERAKANE 510 B-400 resin laminate(11)	I	25
Cement Asbestos Board (control)	I	0
Red Oak (control)	III	100

(11) 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. Laminate thickness = 2.8 mm (0.11 in.) with approximately 30% glass content

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 230 Kgs (507 Lbs)
DOT Label Requirement: Flammable Liquid

COMMERCIAL WARRANTY

Nine months from date of manufacture, when stored in accordance with the conditions stated below.

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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.

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

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