Technical Datasheet

DERAKANE™ 455-400 Epoxy Vinyl Ester Resin

Derakane 455-400 resin is an unpromoted, highly crosslinked novolac epoxy vinyl ester. This product allows the use of standard MEKP, exhibits excellent exotherm control, and industry-leading storage stability. DERAKANE 455-400 resin also contains less than 35% styrene. It is the same as HETRON™ 980/35 Epoxy Vinyl Ester Resin.

DERAKANE 455-400 resin offers a higher heat distortion temperature (HDT) compared to DERAKANE 451-400 resin

Equipment fabricated with DERAKANE 455-400 resin will exhibit:

- Excellent solvent and acid resistance
- High flexural strength
- High heat resistance

APPLICATIONS AND USE

DERAKANE 455-400 resin can be used for hand lay-up and spray-up, filament winding, flake glass and filled linings and coating compounds.

For recommendations on specific services and environments, please contact us at derakane@ashland.com.

TYPICAL LIQUID RESIN PROPERTIES

Property(1) at 25°C (77 °F)	Value	Unit
Viscosity, Brookfield # 2 spindle @ 30 rpm	425	mPas (cps)
Percent Solids	65	%
Specific Gravity	1.08	g/ml

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

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TYPICAL CURING CHARACTERISTICS

MEKP Cure System

Typical(1) gel times at different temperatures using different pre-acceleration systems and curing with high quality MEKP-50 type catalysts.

CAUTION: Thoroughly mix promoters with resin before adding catalyst.

Temperature / Catalyst	DMA (phr)(2)	Co 6% (phr)	MEKP
18°C (65°F) / 1.25 phr	0.05	0.55	18 min.
	0.05	0.40	28 min.
	0.025	0.40	40 min.
25°C (77°F) / 1.25 phr	0.025	0.40	21 min.
	0.025	0.30	27 min.
	0.025	0.20	36 min.
30°C (85°F) / 1.25 phr	0.025	0.30	21 min.

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	0.025	0.25	24 min.
	0.015	0.20	36 min.

BPO / DMA Cure System

Temperature / BPO Paste 50%	DMA (phr)	Gel Time (min.)
18°C (65°F) / 2.0 phr	0.40	13
	0.30	25
	0.20	36
25°C (77°F) / 2.0 phr	0.30	14
	0.20	25
	0.10	52
30°C (85°F) / 2.0 phr	0.30	12
	0.20	18
	0.10	38

(2) Amounts of DMA and Co-0ct (6%) are in phr.

Effects of Copper Naphthenate

When laminates require a lower exotherm, copper naphthenate(3) (Cu-nap 8%) may be incorporated to achieve the desired reduction. High hydrogen peroxide catalysts should be used to avoid dramatic moves in gel times. Copper naphthenate will influence gel time, gel-to-peak and peak exotherm temperature at different temperatures and pre-accelerations. Catalyst used is MEKP at 1.25 phr.

CAUTION: Thoroughly mix promoters with resin before adding catalyst.

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Temperature / Cu-nap 8%	Co 6%	DMA	Gel Time	Gel-Peak	Peak Exo	Peak Exo
18°C (65°F) / 0 phr	0.3 phr	0.06 phr	14 min.	8 min.	168°C	(335°F)
18°C (65°F) / 0.04 phr	0.3 phr	0.06 phr	11 min.	9 min.	138°C	(280°F)
25°C (77°F) / 0 phr	0.3 phr	0.02 phr	30 min.	14 min.	160°C	(320°F)
25°C (77°F) / 0.04 phr	0.3 phr	0.02 phr	26 min.	26 min.	110°C	(230°F)
30°C (85°F) / 0 phr	0.3 phr	0.01 phr	32 min.	15 min.	160°C	(320°F)
30°C (85°F) / 0.04 phr	0.3 phr	0.01 phr	31 min.	46 min.	113°C	(235°F)
35°C (95°F) / 0 phr	0.25 phr	0 phr	48 min.	24 min.	155°C	(310°F)
35°C (95°F) / 0.04 phr	0.25 phr	0 phr	49 min.	48 min.	46°C	(115°F)

(3) Can be acquired by OMG Borchers GmbH, www.borchers.de. More than 500 ppm of 8% copper may be detrimental to cure.

Effect of Copper Levels at 25°C (77°F). Catalyst used is MEKP at 1.25 phr.

CAUTION: Thoroughly mix promoters with resin before adding catalyst.

Cu-naphthenate 8%	DMA	Co 6%	Gel Time	Gel-Peak	Peak Exo	Peak Exo
0 phr	0.02 phr	0.3 phr	28 min.	14 min.	166°C	(330°F)
0.01 phr	0.02 phr	0.3 phr	24 min.	14 min.	155°C	(310°F)
0.02 phr	0.02 phr	0.3 phr	25 min.	17 min.	138°C	(280°F)
0.03 phr	0.02 phr	0.3 phr	25 min.	22 min.	121°C	(250°F)
0.04 phr	0.02 phr	0.3 phr	25 min.	26 min.	110°C	(230°F)

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TYPICAL MECHANICAL PROPERTIES / Casting

Property[1] of cured casting[4] at 25°C (77°F)	Value (SI)	Value (US)	Method
Barcol Hardness	45	45	ASTM D2583
Tensile Strength	88 MPa	12,700 psi	ASTM D638
Tensile Modulus	3.3 GPa	4.8 psi x 10^5	ASTM D638
Tensile Elongation at break	4.2%	4.2%	ASTM D638
Flexural Strength	150 MPa	22,000 psi	ASTM D790
Flexural Modulus	3.4 GPa	4.9 psi x 10^5	ASTM D790
Compression Modulus	3.4 GPa	490 ksi	ASTM D695
Deformation at Yield	7.9%	7.9%	ASTM D695
Heat Distortion Temperature	133°C	271°F	ASTM D648

(4) 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).

TYPICAL MECHANICAL PROPERTIES / Laminate

Physical properties [1] of laminates [5] at various thicknesses. V = 0.25mm glass surfacing veil, M = 450g/m^2 (1.5oz/ft^2) chopped strand mat, R = 800g/m^2 (24oz/yd^2) woven roving.

Laminate thickness (mm)	Ten Str	Ten Mod	Flex Str	Flex Mod
3.2 (V, 2M; 20% glass)	75 MPa	7.4 GPa	135 MPa	5.9 GPa
6.4 (V, 2M, 2(RM), M; 35% glass)	115 MPa	11.1 GPa	200 MPa	7.7 GPa
12.7 (V, 4M, 4(RM); 42% glass)	130 MPa	12.8 GPa	200 MPa	9.5 GPa

(5) Promoted with 0.1% cobalt (6%), 0.05% dimethylaniline, catalyzed with MEKP, post-cured two hours at 140°C (280°F).

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CERTIFICATES AND APPROVALS	The manufacturing, quality control and distribution of products, by Ashland Performance Materials, comply with one or more of the following programs or standards: Responsible Care, 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
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 Ashland's Bulk Storage and Handling Manual for Polyesters and Vinyl Esters. A copy of this may be obtained from Ashland Performance Materials at +1.614.790.3333 or 800-523-6963. All things being equal, higher storage temperatures will reduce product stability and lower storage temperatures will extend product stability.
COMMERCIAL WARRANTY	Nine months from date of manufacture, when stored in accordance with the conditions stated above.
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 Ashland 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 Ashland, Ashland makes no warranty or representation regarding the results which

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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.

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

More Information

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