Technical Datasheet

INEOS Composites

# DERAKANE™ 470-300 Epoxy Vinyl Ester Resin

DERAKANE 470-300 resin is a novolac-based vinyl ester designed to provide exceptional mechanical properties at higher temperatures. This resin offers a high resistance to solvents and chemicals, good retention of strength and toughness at elevated temperatures, and excellent resistance to acidic oxidizing environments.

DERAKANE 470-300 resin offers an economical alternative to exotic alloys by allowing the use of lower-cost FRP over traditional materials. This resin resists solvents, chemicals, and acidic oxidizing environments to provide long lasting, reliable equipment for corrosive materials. DERAKANE 470-300 resin retains strength and toughness at elevated temperatures which enables users to operate the equipment in a variety of applications. It contains only 33 weight percent styrene, resulting in reduced styrene emissions and allows fabricators to meet California's South Coast Air Quality Management District Rule 1162.

## APPLICATIONS AND USE

DERAKANE 470-300 resin is suitable for applications involving high temperature chlorination or caustic scrubbing and storage, industrial waste treatment facilities and solvent extraction processes used in mining. It is also used for hydrochloric acid transport, tank, truck and railcar linings, and gasohol storage.

DERAKANE 470-300 is recommended for most commercial FRP fabrication processes including hand lay-up, spray-up, pultrusion and resin transfer molding. The higher viscosity of DERAKANE 470-300 resin facilitates filament winding and contact molding applications.

DERAKANE 470HT-400 resin can be used for even higher temperature applications.

Recommendations for specific services and environments can be provided by contacting us at derakane@ineos.com.

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

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## TYPICAL LIQUID RESIN PROPERTIES

| Property[1] at 25°C (77°F) | Value | Unit |
|---|---|---|
| Dynamic Viscosity | 325 | mPa·s (cps) |
| Kinematic Viscosity | 300 | cSt |
| Styrene Content | 33 | % |
| Density | 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.

## TYPICAL CURING CHARACTERISTICS

BPO Cure System

Typical[1] geltimes[2] with Benzyl Peroxide (BPO) catalyst and Dimethylaniline (DMA) and Diethylaniline (DEA). This and other information are available at www.derakane.com.

| Geltime at 15 - 21°C (60 - 70°F) | BPO (phr)[4] | DMA (phr) |
|---|---|---|
| 10 - 20 minutes | 1.50 | 0.125 |
| 20 - 40 minutes | 1.00 | 0.100 |
| 40 - 60 minutes | 1.00 | 0.075 |

| Geltime at 21 - 27°C (70 - 80°F) | BPO (phr) | DMA (phr) |
|---|---|---|
| 10 - 20 minutes | 1.25 | 0.100 |
| 20 - 40 minutes | 1.00 | 0.075 |
| 40 - 60 minutes | 1.00 | 0.050 |

| Geltime at 27 - 32°C (80 - 90°F) | BPO (phr) | DMA (phr) | DEA (phr) |
|---|---|---|---|
| 10 - 20 minutes | 1.00 | 0.100 | --- |
| 20 - 40 minutes | 1.00 | 0.050 | --- |
| 40 - 60 minutes | 1.00 | --- | 0.050 |

CHP Cure System

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Typical(1) geltimes(2) using Cumene Hydroperoxide (CHP) catalyst, Cobalt Naphthenate-6%(3) (Co-nap6%), Dimethylaniline (DMA) and 2,4-Pentanedione (2,4-P). This and other information are available at www.derakane.com.

| Geltime at 15 - 21°C (60 - 70°F) | CHP (phr) | Co-nap 6% (phr) | DMA (phr) |
|---|---|---|---|
| 20 - 40 minutes | 2.00 | 0.30 | 0.15 |
| 40 - 60 minutes | 2.00 | 0.20 | 0.05 |

| Geltime at 21 - 27°C (70 - 80°F) | CHP (phr) | Co-nap 6% (phr) | DMA (phr) | 2,4-P (phr) |
|---|---|---|---|---|
| 10 - 20 minutes | 1.50 | 0.40 | 0.15 | --- |
| 20 - 40 minutes | 1.50 | 0.20 | 0.0-0.10 | --- |
| 40 - 60 minutes | 1.50 | 0.20 | --- | 0.0-0.05 |

| Geltime at 27 - 32°C (80 - 90°F) | CHP (phr) | Co-nap 6% (phr) | DMA (phr) | 2,4-P (phr) |
|---|---|---|---|---|
| 10 - 20 minnutes | 1.50 | 0.40 | 0.10 | --- |
| 20 - 40 minutes | 1.50 | 0.20 | --- | 0.0-0.05 |
| 40 - 60 minutes | 1.00 | 0.20 | --- | 0.05-0.10 |

MEKP Cure System

Typical(1) geltimes(2) using Methyl Ethyl Ketone (MEKP)catalyst, Cobalt Naphthenate-6%(3) (Co-nap6%), Dimethylaniline (DMA) and 2,4-Pentanedione (2,4-P). This and other information are available at www.derakane.com.

| Geltime at 15 - 21°C (60 - 70°F) | MEKP (phr) | Co-nap 6% (phr) | DMA (phr) |
|---|---|---|---|
| 10 - 20 minutes | 2.00 | 0.30 | 0.20 |

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| | | | | |
|---|---|---|---|---|
| 20 - 40 minutes | | 2.00 | 0.20 | 0.05 |
| 40 - 60 minutes | | 1.50 | 0.20 | 0.05 |

| Geltime at 21 - 27°C (70 - 80°F) | MEKP (phr) | Co-nap 6% (phr) | DMA (phr) | 2,4-P (phr) |
|---|---|---|---|---|
| 10 - 20 minutes | 1.50 | 0.30 | 0.05 | --- |
| 20 - 40 minutes | 1.50 | 0.20 | 0.0-0.05 | 0.0-0.05 |
| 40 - 60 minutes | 1.25 | 0.20 | --- | 0.05-0.10 |

| Geltime at 27 - 32°C (80 - 90°F) | MEKP (phr) | Co-nap 6% (phr) | DMA (phr) | 2,4-P (phr) |
|---|---|---|---|---|
| 10 - 20 minutes | 1.50 | 0.20 | 0.0-0.05 | --- |
| 20 - 40 minutes | 1.50 | 0.20 | --- | 0.0-0.05 |
| 40 - 60 minutes | 1.25 | 0.20 | --- | 0.05-0.10 |

(2) Thoroughly test any other materials in your applications before full-scale use. Geltimes may vary due to the reactive nature of these materials. Always test a small quantity before formulating large quantities.
(3) Use of cobalt octoate, especially in combination with 2,4 P can result in 20-30% slower gel times.
(4) phr = parts per hundred resin molding compound

TYPICAL MECHANICAL PROPERTIES

Casting Properties

| Property(1) of clear casting(5) at 25°C (77°F) | Value (SI) | Method | Value (US) | Method |
|---|---|---|---|---|
| Tensile Strength | 85 MPa | ISO 527 | 12,500 psi | ASTM D638 |
| Tensile Modulus | 3600 MPa | ISO 527 | 520 kpsi | ASTM D638 |
| Tensile Elongation at Yield | 3-4% | ISO 527 | 3-4% | ASTM D638 |
| Flexural Strength | 130 MPa | ISO 178 | 19,000 psi | ASTM D790 |
| Flexural Modulus | 3800 MPa | ISO 178 | 550 ksi | ASTM D790 |
| Heat Distortion Temperature(6) | 150°C | ISO 75 | 300°F | ASTM D648 |

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| Glass Transition Temperature, Tg[2] | 165°C | ISO 11357 | 330°F | ASTM D3418 |
|---|---|---|---|---|
| Volume Shrinkage | 8.3% | | 8.3% | |
| Barcol Hardness | 40 | EN 59 | 40 | ASTM D2583 |
| Density | 1.17 g/cm$^3$ | ISO 1183 | 1.17 g/cm$^3$ | ASTM D792 |

(5) Cure schedule: 24 hours at room temperature and 2 hours at 155°C (310°F).
(6) Maximum stress: 1.8 MPa (264 psi)

Laminate Properties

| Property[(1)] of 6mm (1/4in.) laminate[(7)] at 25°C (77°F) | Value (SI) | Method | Value (US) | Method |
|---|---|---|---|---|
| Tensile Strength | 130 MPa | ISO 527 | 19,000 psi | ASTM D3039 |
| Tensile Modulus | 12,000 MPa | ISO 527 | 1700 kpsi | ASTM D3039 |
| Flexural Strength | 210 MPa | ISO 178 | 30,000 psi | ASTM D790 |
| Flexural Modulus | 8500 MPa | ISO 178 | 1200 kpsi | ASTM D790 |
| Glass Content | 40% | ISO 1172 | 40% | ASTM D2584 |

(7) Cure schedule: 24 hours at room temperature and 6 hours at 80°C (175°F); laminate construction of 6 mm (1/4")is V/M/M/Wr/M/Wr/M where V=Continuous veil glass, M=Chopped strand mat 450 g/m$^2$ (1.5 oz/ft$^2$) and Wr=Woven roving 800 g/m$^2$ (24 oz/yd$^2$).

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

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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.<br><br>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.<br><br>All other conditions being equal, higher storage temperatures will reduce product stability and lower storage temperature will extend product stability. |
| COMMERCIAL WARRANTY | Six 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 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.<br><br>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.<br><br>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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