Georgia-Pacific Chemicals

GP® 5018/GP® 4839 Phenolic System for FRP

PRODUCT INFORMATION

DESCRIPTION

GP® 5018 industrial resin system is a two-component resin/catalyst system developed for use in the manufacture of fiber reinforced plastic (FRP) products. The GP 5018 resin system was specifically developed for filament winding, but is suitable for other FRP processes including pultrusion, RTM, and hand layup.

FRP products manufactured with the GP 5018 resin system demonstrate the flame resistance and low smoke generation required in many composite applications where fire and smoke are a concern; i.e., in aerospace, construction, and mass transportation industries (see Table I).

USES AND APPLICATION

The best performance of the finished FRP product is achieved when gelation and cure occur below 90°C. Curing at temperatures under 90°C requires the use of an acid catalyst. GP® 4839 phenolic resin catalyst was developed for use with GP 5018 resin to provide longer working life and greater flexibility when processing (see Table II).

Cure time generally depends on the nature of the application, the mass of the material, and the type and amount of catalyst. For non-volatile curing at atmospheric pressure, the temperature of the resin during gelation must be maintained under 90°C, thus preventing volatilization of the water in the resin as well as the water of condensation generated during cure.

Mechanical strength and glass transition temperature can be enhanced by post-cure at 180°F - 210°F (see Table III). Slow heating rate and gradual increase in post-cure temperature are suggested to avoid blistering and to optimize the performance of finished FRP products. For fiberglass reinforcement, phenolic-compatible glass should be used.

STORAGE AND HANDLING

GP 5018 resin and GP 4839 catalyst should be used in areas with good ventilation. Storage at temperatures below 50°F is recommended for the resin. The catalyst should be stored at temperatures above 70°F. The resin and catalyst should be brought to room temperature prior to use.

As with any two-component resin system, thorough mixing of the resin and catalyst is essential to achieve uniform cure and optimum quality. Georgia-Pacific Chemicals supplies GP 5018 resin and GP 4839 catalyst in drums and bulk quantities.

Additional information on the safe handling of GP 5018 resin and GP 4839 catalyst is in the Safety Data Sheets available from Georgia-Pacific Chemicals.

See page 2-3 for Typical Properties and Test Data

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Typical Properties of GP® 5018 Resin	
Type	Phenol-formaldehyde resole
Appearance	Amber to brown liquid
Non-Volatiles, %	70 – 76
Viscosity at 25°C, cps	800 – 1,400
pH	6.5 – 7.5
Specific Gravity at 25°C	1.22 – 1.24
Weight per gallon, lbs.	10
Flash Point, °C	>200
Free Formaldehyde, %	1.0 maximum
Storage Life at 25°C	30 days

Table I – Fire and Smoke Properties of GP® 5018 Resin

Test and Method	Results
OSU Heat Release (KW-min-m_{-2}/KW-M_{-2}	54/45
Flame Spread Index, ASTM E-162	4
NBS Smoke Density, ASTM F-814	5
Smoke Density at 90 sec., ASTM E-662	0
Smoke Density at 4 min., ASTM E-662	5
Smoke Density, max., ASTM E-662	18
Pittsburgh Toxicity Protocol – LC50	59

Test specimens: 6-ply laminate with fabric 7781 and A-1100 finish prepared at room temperature and then post-cured at 90°C for one hour. Resin content: 32.2%

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See page 3 for Additional Testing

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Table II – Pot Life and Stroke Cure of GP® 4839 Catalyst

Parts per hundred (pph) of Catalyst	Pot Life at 25°C, Minutes[1]	Stroke Cure at 90°C (seconds)
6	90	120
8	60	100
10	30	80
12	60	15

[1] *Specimen size = 1 gallon*

Table III – Effect of Post-Cure on Tg and Flexural Strength – GP® 5018 Resin and GP® 4839 Catalyst

Sample	Tg °C (Dynamic Mechanical Analysis (DMA) at 10°C /minute)	Flexural Strength, psi
A	86	39,742
B	121	49,390
C	142	47.945
D	167	48,490
E	220	43,202

Sample Preparation

Test specimens: Laminate made with CertainTeed® 9-oz. 625 fabric. Resin Content: 60%.
"A" = no Post-Cure, 7 days at Room Temperature
"B" = 60 minutes (mins.) Post-Cure @ 90°C
"C" = 60 mins. Post-Cure @ 90°C + 60 mins. @ 110°C
"D" = 60 mins. Post-Cure @ 90°C + 60 mins. @ 110°C + 60 mins. @ 130°C
"E" = 60 mins. Post-Cure @ 90°C + 60 mins. @ 110°C + 60 mins. @ 130°C + 60 mins. @ 150°C

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