HEXION
Responsible Chemistry

Technical Data Sheet

EPON™ Resin CS-373

Product Description

EPON™ Resin CS-373 is a one-pack, dicy-free, brominated epoxy resin and curing agent solution supplied as 70% by weight solids in a blend of methyl ethyl ketone (MEK) and propylene glycol monomethyl ether (PGME). This resin system meets the increasing demands of FR-4 printed circuit board applications and provides laminates with a nominal glass transition temperature (Tg) of 180°C and excellent thermal stability.

Application Areas/Suggested Uses

- EPON Resin CS-373 is most frequently used for high Tg, flame retardant laminates for printed circuit board (PCB) applications and is resistant to temperatures typical of lead-free soldering operations.

Benefits

- High glass transition temperature
- Excellent thermal stability
- Flame retardance
- Good solder resistance
- Good moisture and CAF resistance
- Increased optical density for UV blocking
- Fluorescence for automated optical inspection (AOI)
- Potential for fast treater speeds and reduced laminate cure times

Sales Specifications

Property	Value	Unit	Test Method
Bromine Content	12.5 - 14.5	% wt.	
Chlorine, Hydrolysable	0.035 max.	% wt.	ASTM D1726
Color	3 max.	Gardner	ASTM D1544
Solids	69 - 71	% wt.	ASTM D1259
Viscosity at 25°C	100 - 600	cP	ASTM D1545
Weight per Epoxide	350 - 400	g/eq	ASTM D1652

Typical Properties

Property	Value	Unit	Test Method
Density	9.4	lb/gal	ASTM D1475

Processing/How to use

General Information

EPON CS-373 offers an alternative for prepreg manufacturers seeking a replacement for conventional dicyandiamide-cured resins. Whereas dicy-cured resins require the use of dimethylformamide (DMF), methyl OXITOL (MeOX), or similar solvents for dicy dissolution, EPON CS-373 can typically be processed with ketone solvents and with lower solvent levels. These features contribute to increased formulating flexibility and reduced health and safety concerns.

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In addition, EPON CS-373 provides prepreg manufacturers with opportunities for improved processing. Because this resin is supplied as a one pack resin and curing agent system, varnish preparation is greatly simplified as only the addition of appropriate amounts of accelerator and solvent are necessary. Prepreg preparation is also enhanced as the higher volatility solvents typically used with EPON CS-373 can enable faster solvent removal from the prepreg and thus faster treater speeds for increased productivity.

EPON CS-373 may also be blended with other one pack, dicy-free resins to tailor laminate properties as needed for specific applications.

Varnish Performance Properties

EPON CS-373 is readily converted to a laminating varnish by addition of the desired quantity of accelerator for cure control and additional solvents for viscosity control. Imidazole accelerators, especially 2-methylimidazole (2-MI) and 2-phenylimidazole (2-PI), are recommended for use with this resin system. As with most resin systems, it is important to understand that the accelerator level must be chosen so as to maintain a balance of processing ease and cured system properties. That is, sufficient accelerator should be used to drive the cure reaction to completion while not accelerating the reaction to such an extent as to negatively impact system processing behavior. For EPON CS-373, a typical 2-MI level is 0.05 to 0.30 parts per hundred of resin solids (phr), but the optimum level is best determined by lab studies and prepreg manufacturing history.

Ketone solvents, such as methyl ethyl ketone and methyl n-amyl ketone are recommended for viscosity control, although other solvents such as glycol ethers may also be used. However, dimethylformamide (DMF) should not be used with EPON CS-373 as it can adversely affect resin cure and performance. Solvent loading will vary by specific need, but a typical level is 65 weight percent solids in the final varnish formulation.

Varnish formulation properties for EPON CS-373 are provided in Table 1.

Table 1 /Typical Varnish Formulation Properties for EPON CS-373

	Units	Value
Solids Content	% wt.	60 – 70
Additional Curing Agent		None
2-Methylimidazole Accelerator Level	phr	0.05 – 0.30
Varnish Gel Time at 150°C		
0.13 phr 2-MI	seconds	180
0.20 phr 2-MI	seconds	160

Varnish formulations prepared with EPON CS-373 may be processed into prepregs using common fiberglass cloth styles and finishes as with conventional resin systems.

Laminate Performance Properties

Once B-staged to the desired level of advancement or resin flow, prepregs laminate well with traditional FR-4 press cycles, although modification of consolidation pressures may be necessary to optimize laminate resin content. A hold time of 60 minutes at 350-360°F is typically more than sufficient to cure EPON CS-373 and provide the laminate properties listed in Table 2 under standard cure conditions; however, optimization of cure conditions for individual situations is suggested to minimize press cycle time and maximize performance.

Table 2 /Typical Laminate Properties for EPON CS-373 for Fast and Standard Cure Conditions

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Laminate Property[1]		Fast Cure[2]	Standard Cure[3]
Tg by DSC midpoint	°C	178	178
Tg by TMA	°C	172	--
Z-Axis CTE (50-250°C)	ppm/°C	150	--
T-260 Time to Delamination	minutes	80 - 100	104
T-288 Time to Delamination	minutes	--	27
TGA 5% Weight Loss in Air	°C	342	--
UL-94 Flammability Rating		V-0	--
Water Absorption [4]	% wt.	--	0.17
Solder Dip (20 seconds at 288°C)		--	Pass (5)
Copper Peel (1 oz. copper[5])	lb/inch	7.0	--

[1] 8-ply, 7628/BGF 643 construction with 0.058 inch nominal thickness.

[2] 2-MI level of 0.20 phr. Cure time of 35 minutes at 360°F.

[3] 2-MI level of 0.13 phr. Cure time of 60 minutes at 350°F.

[4] After 1 hour in 15 psi steam.

[5] Gould Hi-Performance JTCS

While curing EPON CS-373 prepregs for one hour at 350 °F provides good laminate performance, the fast cure nature of EPON CS-373 may provide an opportunity to reduce cure cycles while maintaining laminate properties. In addition to the laminate properties listed in Table 2, an indication of this feature is the rapid build of system Tg with cure time summarized in Table 3. Here, EPON CS-373 achieves near full Tg when cured for as little as 20 minutes at 360 °F for the higher 2-Methylimidazole level.

Table 3 / Summary of Laminate DSC Tg Values for Shortened Cure Times

2-Methylimidazole Level	Tg after Cure Time at 360°F	
	20 minutes	35 minutes
0.13 phr	170°C	178°C
0.20 phr	176°C	178°C

Safety, Storage & Handling

Please refer to the MSDS for the most current Safety and Handling information.

Please refer to the Hexion web site for Shelf Life and recommended Storage information.

Because EPON CS-373 is a one pack system containing both epoxy resins and curing agents, some resin advancement will occur during storage. For this reason, it is desirable to store EPON CS-373 in cool, dry conditions to minimize advancement and solvent loss and maximize shelf life. Resin advancement is indicated by an increase in the epoxide equivalent weight and solution viscosity. Excessive advancement can result in changes in resin processing behavior and loss of cured system performance. In general, EPON CS-373 should not be stored longer than 1 year at 55 °F, 4 months at 75 °F, 1 month at 100 °F, or 2 weeks at 120 °F.

Exposure to these materials should be minimized and avoided, if feasible, through the observance of proper precautions, use of appropriate

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Packaging

Available in bulk and drum quantities.

Contact Information

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