LORD
THERMOSET
Advanced Electronic Materials

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No.70

HIGH IMPACT STRENGTH EPOXY CURING AGENT

Description:

Hardener No. 70 is a low viscosity, room temperature curing epoxy hardener which produces thermal shock resistant, high impact strength cured resins. Resins catalyzed with this hardener will have a comparatively low viscosity and low surface tension which generally enables the casting of void free parts without a vacuum step. In electrical applications, these resins bond extremely well to various lead materials such as PVC and synthetic rubbers to prevent cracking when the leads are flexed.

The chart following lists several Thermoset resins cured with Hardener No. 70. The working lives for these resins range from thirty to seventy minutes at room temperature. The resins will cure in 24 hours at room temperature or two hours at 65°C. (Consider the mass and higher exotherm whenever using an elevated temperature cure.) As always, ultimate cured properties are most expediently obtained by elevated temperature post curing.

Thermoset 70 Hardener may be used with several **Thermoset** epoxy resins to obtain a variety of handling and cured properties.

Thermoset 300 is a filled epoxy resin. It has superior thermal shock, improved thermal conductivity, and a lower coefficient of thermal expansion then unfilled epoxy resin.

Thermoset 600 is an unfilled epoxy with a moderate viscosity. It is transparent with an amber tint. The black version of 600 is EP-20.

Thermoset 340 is a very highly filled, thermally conductive resin. It has the lowest coefficient of expansion and the highest viscosity of Thermoset's standard resins.

Typical Properties:

The following values are averages and they are not intended for specification purposes. Contact Thermoset when establishing specifications. In the interest of achieving optimum properties in a minimal amount of time. The cured physical and electrical properties were developed by using a cure schedule of 24 hours at 25°C plus 2 hours at 100°C. The choice of cure schedule will vary with the application and users must establish their own optimum cure schedules.

Handling Properties: (No. 70 Hardener)

Thermoset Resins:	**600**	**300**	**340**
Mix Ratio (resin to hardener)			
By weight	100:30	100:15	100:7.0
By volume	100:35	100:24	100:16.5
Working Life (minutes)	30	35	100
@25°C	(130g)	(130g)	(130g)
Mixed Viscosity @ 25°C (cps) STM 1	550	2,000	10,000
Typical Cure Schedule @ 25°C	24 hrs	24 hrs	24 hrs

Physical Properties:

Thermoset **Resins:**	**600**	**300**	**340**
Water Absorption (24 hours) (ASTM D 570)	0.36%	0.21%	0.17%
Hardness (Shore D) After 1 week @ 25°C STM 5 (ASTM D 2240)	82	88	90
Izod Impact Strength (ft lbs/in of notch) (ASTM D 256)	1.52	0.54	0.48
Tensile Strength (psi) (ASTM D 638)	8,650	9,800	9,400

Physical Properties (cont'd)

Flexural Strength (psi) (ASTM D 790)	13,600	15,700	15,000
Compressive Yield (psi) (ASTM D 695)	13,200	15,000	16,000
Temperature Rating Guide*, ºC	130	130	130

***Temperature Rating Guide:** Is based on average design requirements and the guide is not intended as a guarantee of suitability for all applications operating at that temperature. The guide is based on the weight loss.

Electrical Properties:

Thermoset Resins:	**600**	**300**	**340**
Dielectric Strength (volts/mil 1/8" thick)			
(ASTM D 149)	350	380	430
Dielectric Constant (1 MHz @ 25°C) (ASTM D 150)	3.4	3.9	3.4
Dissipation Factor (1 MHz @ 25°C) (ASTM D 150)	0.025	0.032	0.034
Volume Resistivity (ohms-cm)			
@ 25°C	$2x10^{15}$	$7x10^{15}$	$6x10^{15}$
@ 105°C	$4x10^{11}$	$2x10^{11}$	$4x10^{11}$
@ 130°C	$5x10^{9}$	$1x10^{10}$	$3x10^{10}$
(ASTM D 257)			

In most cases, Thermoset Standard Test Methods STM correspond with standard ASTM tests. Copies are available upon request.

Proportioning and Mixing:

In order obtain a homogeneous resin prior to catalyzing with No. 70 Hardener, pigmented and filled resins (i.e. 300, 340, and EP-20) should be thoroughly stirred.

Thermoset epoxies can be proportioned by weight or volume. These ratios are stoichiometrically calculated and should be closely followed. Automated meter-mix dispensing equipment may be used for high volume production. (A list of dispensing equipment manufacturers is available from Thermoset.)

When mixing small amounts of epoxy, it is best to use a balance and disposable containers. The containers should be large enough to hold both resin and hardener and still have ample room for mixing. After allowing for the weight of the container the correct amount of resin is added to the container. The scale is then set for the total weight of both resin and hardener and the hardener is added slowly until the total weight is reached.

To insure thorough mixing, periodic scraping of the sides and bottom of the container is necessary. Even small amounts of improperly mixed material can cause soft spots or irregular curing.

Deairing and Evacuation:

Unless a closed-chamber, mechanical mixer is to be used, air will be introduced into the epoxy system either during premixing or when catalyzing the mixture. The electrical properties of an epoxy are best when air bubbles and voids are minimized. Therefore, in extremely high voltage or other critical applications, vacuuming may be appropriate.

Should vacuuming prove to be necessary for the application, the mixed epoxy should be deaired in a container large A vacuum of 2 mm of Hg for two to five minutes is generally adequate for small (one quart or less) batches. Larger batches may require longer vacuuming, lower pressures (<2 mm Hg), or introduction of the epoxy into the chamber in thin streams. Once the epoxy has been adequately deaired, the vacuum should be slowly released

Mold Release:

When encapsulating a unit in a nonporous mold, a mold release should be used. Most mold releases evaporate quickly and, when properly applied, leave a surface that will release easily from **Thermoset** epoxies. As with other flammable solvents, appropriate precautions should be observed.

Clean-Up:

It is recommended that customers use disposable containers and utensils when working with epoxies. However, when disposable materials are impractical, uncured epoxy can be removed by cleaning equipment with solvent. Observe appropriate precautions when using flammable solvents. Solvent-cleaned utensils should be thoroughly dried before reuse. Any remaining solvent can contaminate the next mixture.

Shelf Life:

Thermoset No. 70 Hardener has a shelf life of approximately twenty four months at room temperature (25°C) in closed containers.

Thermoset Resins	Shelf Life
300	12 months
340	6 months
600	24 months
EP-20	24 months

(Material is to be stored at room temperature (25°C) in closed containers)

The filler in 300 and 340 resin may slowly settle with time. Therefore, the 300 and 340 resin containers should be periodically turned upside down to minimize settling.

Occasionally 600 and EP-20 resins may crystallize during storage. They can be dissolved by loosening the lids and applying moderate heat.

Handling Precautions:

The labels on containers of Thermoset materials contain current information on the hazards associated with each particular product. Most epoxy resins and hardeners are skin and eye irritants and some may actually be corrosive to the skin and eyes. Other problems, such as skin sensitization or serious health hazards, may exist. Further information on each product is contained in the Material Safety Data Sheet which will be sent upon request.

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