

DOUGLAS and STURGES

Ingredients for ART

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Using Epoxy Resins and Curatives

Description: We offer two epoxy resins and two epoxy curatives which offer a broad range of properties and applications. Epoxy resin type 7828 is a high viscosity (110-150 poise) 100% solids type while the type 7132 is a low viscosity (5-7 poise) version that has been diluted with a reactive diluent. Both of these resins is compatible with any of our hardeners and these resins can be mixed in any ratio to give the best viscosity for your specific application. We offer two different curatives, each one being unique in the cure times, properties and working characteristics, and both of them being compatible with either of the resins we offer. Type 8140 is a medium viscosity polyamide curative which gives relatively slow cures and alllows for casting large masses of material without the concern over excessive exotherm during the cure cycle. This curative also makes an excellent adhesive when using the type 7828 resin. Type 2001 is a low viscosity, general purpose cycloaliphatic amine which is best used for laminating and impregnating various types of fiberglass, graphite and kevlar fabrics. This hardener also finds use when one wants to make small castings with either of our resins up to two inches thick. Another unique property of this curative when used with either of our resins is that it will cure in the presence of moisture as low as 50 degrees F. This makes this system attractive for marine applications. Type 8169 curative is a modified aliphatic amine best used for laminating with fabrics and for small castings up to one inch thick. Curatives may be mixed to give best working characteristics and/or properties for any specific application, but it is important to maintain the proper mix ratio of resin to curative based on the amount of the various curatives that you may have used in your mixture.

The following table gives some of the properties of the three curatives when using with either the 7828 or 7132 epoxy resins. Remember, these figures are given for ideal conditions and will vary significantly when used at lower or higher temperatures. All figures are based on batch sizes of 150 grams and use levels are given in parts per hundred by weight. It is especially important that the resin/curative ratio be adhered to when using both the types 2001 and 8169 curatives. The type 8140 curative is actually a variable ratio hardener and can be used in ratios as much as one part resin to three parts 8140 to as little as three parts resin to one part 8140. Using more curative in this case will actually increase the flexibility and flexural strength but will reduce the heat and water resistance. Generally we recommend that the type 8140 hardener be used in a ratio of one part curative to two parts resin by weight.

Curative Type	8140	2001
Pot Life @ 77 F (min.. 150 gm. mix)	200	40
Thin Film Set Time (hr. @ 77 F)	11	4.5
Viscosity (cps @ 77F)	11000	60
Heat Deflection Temperature (F)	110	120

Color (Gardner)	7	1
Use Level (phr)	50	50

Using the Resins: Epoxies find use for applications ranging from adhesives to home built aircraft to fine art casting. Generally, when using these materials as an adhesive, the type 7828 resin and type 8140 curative are best utilized. This system will bond to properly cleaned wood, metal, glass, ceramic and some plastics. Working time is such that the joint must be held or clamped for at least three to five hours and we recommend that it be clamped for 24 hours so that optimum strength be obtained. Epoxies in general continue to cure for five to seven days, but this may be accelerated with the application of heat. Heating the bond in an oven at 100 to 150 degrees for two to four hours will achieve complete cure in most cases.

When laminating with fiberglass or other reinforcing fabrics the type 7132 resin is best used 2001 curative. This low viscosity curative will allow for good wet out properties and has virtually no color. Another advantage of this curative is that it will cure in the presence of moisture and under relatively low temperature conditions. Again, this curative is compatible with both the type 7828 and 7132 resins; the only criterion being what kind of viscosity is desired for your application.

For situations where one might want to cast filled or unfilled epoxy into a mold of some sort, there are a number of criteria which must be weighed. First of all, how big will the casting be? (Mainly the maximum thickness will be the determining criterion; more thickness=more mass=more exotherm.) Will the resin system be filled? What type of filler will be used and how much? Is there detail in the mold which must be filled? Once these questions have been answered, the proper system may be chosen. As a general purpose casting resin, the 7132 with 8140 system works best, because it will allow one to make very thick castings while still allowing the addition of a maximum amount of filler to reduce cost. In general all fillers will add a certain amount of viscosity to the system being used, so it's a good idea to start with a resin/curative system that is fairly low viscosity to begin with. Remember, that when using fillers, it is important to keep the resin/curative ratio consistent to obtain optimum cures of the system. If an excess of either the resin or the curative is used, incomplete cures will result; which means the material may be softer than it should be. Remember this if you remember nothing else; pay attention only to the weight of the resin and curative whenever using epoxies; fillers and thickeners do not become part of the formula no matter which component you might add them to.

The following chart shows some of the most commonly used fillers and thickeners and how they affect the overall performance of epoxies in general.

Filler/Thickener	Color	Relative Cost	Purpose
Aluminum	Grey, Metallic	Medium	Good heat transfer properties, renders surface of casting fairly hard.
Bronze, Brass, Copper	Reddish to yellow metallic	High	Good materials for creating cold cast metals which can be patinaed to simulate real metal castings
Fiberglass	Translucent	Medium	Reinforcing filler to increase strength characteristics of resin.
Glass Microballoons	White	Medium	Used primarily to lighten castings.
Hydrated Alumina	Translucent	Low	Translucent, fire retardant filler for giving stone-like castings.
Hydrated, Fumed Silica	Translucent	Low	These materials are used as viscosity modifiers. Used by themselves with a resin and create a gel coat; use with metal powder to prevent metal powder from falling out of suspension
Kaolin Clay	Buff	Low	Similar in usage to whiting, but will give harder surface because of nature of clay.
Pecan Shell Flour	Dark Brown	Low	Wood-like filler used for general purpose casting where a lighter weight filler might be needed.
Phenolic Microballoons	Brown	High	Premium weight reducing filler.
Whiting (Chalk, Calcium Carbonate, Marble Dust)	White	Low	Good general purpose filler, reduces cost, increases impact resistance.

Epoxies as a group are highly varied and as such "fine tuning" is possible based on any set of

parameters. The one area where epoxy is not recommended is extended exterior exposure. Epoxies do not do well outdoors. Barring that, epoxies can be modified with any one or combination of the fillers given in the chart above for general purpose casting. They also work well as impregnating materials for wood and a variety of reinforcing fabrics to create structural components.

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