

SAFE AND SUCCESSFUL USE OF SYNTAC EPOXY RESINS AND HARDENERS

SYNTAC epoxy resins and hardeners are manufactured with many different types of raw materials that are selected to provide particular properties such as cure speed, strength, flexibility, adhesion, viscosity, water or oil resistance, etc.

All epoxy resins molecules contain at least one reactive epoxy group $\begin{matrix} \text{CH}_2 & \text{---} & \text{CH} & \text{---} \\ & \diagdown & / & \\ & \text{O} & & \end{matrix}$ although most have two or more. Figure 1 shows a molecule of a common epoxy resin made with bisphenol A.

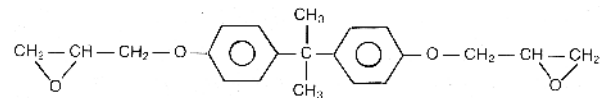


Figure 1

The epoxy groups at each end of the molecule can react with numerous other types of chemical molecules but amines are predominately used for the manufacture of 'hardeners'. Figure 2 shows a polyamidoamine hardener molecule.

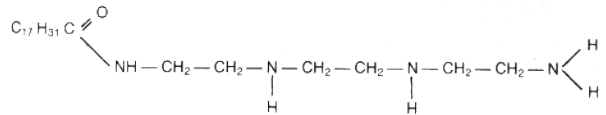


Figure 2

An epoxy group can react with an amine group (NH₂ or NH) by displacing its hydrogen atom. The polyamidoamine molecule in figure 2 has 5 amino nitrogen atoms and can therefore react with 5 epoxy groups.

In order to obtain the best properties and maximum performance from a cured epoxy system it is necessary for all of the epoxy and amine groups to have reacted together to form a cross-linked thermoset resin. It follows that it is essential that the correct amounts of each component are intimately mixed together before use.

Slightly out of balance ratios will only cause minor reductions in the physical properties of the cured resin but large proportioning errors will reduce heat and water resistance and strength, and increase elongation. Serious proportioning errors will cause the resin not to cure at all and to form a sticky mass. Never try to accelerate or retard pot life by varying the amount of hardener.

WEIGHING RESIN & HARDENER We recommend the use of digital scales to weigh out the resin and hardener. Digital kitchen scales are sufficiently accurate to obtain excellent results and are much easier to use than the spring type. The scales shown are accurate to 1 gramme and cost less than £10.00. Simply tare off the scale, pour out an approximate amount of resin, calculate the amount of hardener required, tare off the scales again and accurately weigh out the hardener. Proportioning pumps can be used with low viscosity resin but they can be inaccurate and often clog if left unused.



Digital kitchen scales are ideal for weighing out small amounts of material

MIXING Thorough mixing is also critical to the correct curing of the product and although small amounts can easily be mixed by hand, a spiral mixer used in a pneumatic or cordless drill is essential for mixing larger amounts. The pot life that is stated in the products literature will depend on the amount mixed and the ambient temperature. Large volumes and higher temperatures will shorten pot life. Pot life can be extended by pouring the mixed material into trays which will allow the exothermic heat generated by the curing reaction of the resin and hardener to dissipate.

CURING SYNAMIN ambient cure hardeners will cure down to 8°C but the physical properties of the cured resin will be less than when cured at higher temperatures, SYNAMIN heat cure hardeners must be cured according to the specified schedule.

FILLERS & ADDITIVES

There are numerous fillers and additives that can be mixed with epoxy resin to make it suitable for a wide range of applications. A few examples are given below.

Cellulose fibres are excellent for giving body to the resin to enable it to be used more easily as an adhesive and improve its gap filling properties. Grey cellulose fibres are inexpensive and can be used where the finished product will not be visible. White cellulose fibres are more expensive but are better where the finished work will be seen.

Hard fillers such as powdered calcium carbonate, dolomite or solid glass micro-spheres can be incorporated with epoxy resin to make a moulding or casting compound. The viscosity of the mixed product varies according to the amount of filler added.



Cellulose fibres thicken epoxy resin to make an excellent gap filling adhesive.

Low density fillers such as hollow glass micro-spheres and phenolic micro-spheres can be mixed with epoxy resin to make an easy to sand low density filler. However, a pre-mixed filler such as Easy Fair is easier to use and is dust free.

Fumed or colloidal silica is used as a thixotropic (thickening) agent but it must be mixed in with a high shear mixer to avoid making the resin brittle. Garamite is a better thixotropic agent because it can be stirred in by hand.

Reactive Resins stocks numerous other fillers and additives. Please ask if you do not see what you require.

HEALTH AND SAFETY

Reactive Resins provide safety data sheets for all products. We send them automatically with commercial orders and they are available from our web site or by post upon request.

Our epoxy resins are non toxic but they are irritants and being viscous and sticky are difficult to remove from skin. Our hardeners are also non toxic but some are corrosive and will cause nasty burns if allowed to stay in contact with skin for any length of time.

Always use rubber gloves when using epoxy materials. Long nitrile gloves are best because they resist solvent better than most other types. If rubber gloves are to be worn for long periods also use barrier cream and wear cotton under-gloves to prevent dermatitis. Always clean gloves with a solvent soaked rag before removing them. Do not clean hands with solvent, it will penetrate through the skin and also remove the natural oils from the skin and cause cracking and dermatitis.

Some of our coatings contain solvents. Some solvents are potentially more hazardous than epoxy resins and hardeners. In addition to being flammable they have low occupational exposure limits, therefore coatings that contain solvents should be used outdoors or in areas with adequate ventilation. If ventilation is inadequate or if the product is being sprayed, it is essential that all personnel in the area wear air fed masks or masks fitted with filters that are approved for use with organic solvents. Dust masks will not offer protection from solvents.

When sanding epoxy coatings, fillers etc always wear a dust mask. Partly cured resins contain free amines and other chemicals that may be potentially dangerous if inhaled.

[Please visit our web site at www.reactiveresins.com for details of our other products. They include resins and coatings for marine and industrial applications.](http://www.reactiveresins.com)