

CRAFT WORK IN PLASTIC – POLYESTER RESIN

The following is an extract from some old craft leaflets that still may be useful.

“Clear plastic, or to give it its correct name polyester resin, is the newest and most exciting craft material to have appeared on the horizon for many years. It is such a versatile substance that you can manufacture with it a wide range of objects, from useful articles for the home, to jewellery and ornaments in the form of mementoes inside crystal-clear resin.

The raw materials and equipment needed are not expensive to buy, nor do you need a special workroom or any complicated machinery. However usual health and safety precautions apply. Polyester resin is easy to use once you have mastered the few basic rules of the craft.

Polyester resin is a treacly substance which, when mixed with a special hardener or catalyst, and left to set for a few hours, becomes extremely hard.

There are many different types of resin. Perhaps the easiest one for the beginner is the crystal-clear resin, which can be used to embed things so that they look as though they are set in glass. Resins can also be mixed with other substances, have pigments added to them, be thickened or used with fabric, glass fibre, or many other things, depending on what is required. But however it is used, and whatever it is used with, once the catalyst has been added to the resin and it has set, it has set forever. Ensure the result is what you want. Hardened resin can be sawn and sandpapered into shape.

Resin

This is usually sold by weight in cans or in thick, lightproof containers, when they have a life of about six months. They should be kept in a cool place, and, as they are flammable they must not be used near a naked flame. Most craft kits sold in hobby shops contain the very clear embedding resin, but it is also possible to obtain thicker resins for laminating and molding work, and a thixotropic paste resin which will stay in place on a vertical surface without dripping off. It can be added to ordinary resin to stop it flowing uncontrollably but it will make clear resin opaque. Its main use is in gel coats, that is, the first coat applied to a mold, when working with glass fibre. Laminating and molding resins do not usually harden crystal clear, but tend to have a pinkish tinge which can affect very delicate colours, so if delicate colours are wanted, it is best to use them with clear embedding resin.

Resin is very sticky, and has a strong, but not unpleasant smell. It is quite safe to use as long as the simple safety precautions are followed carefully. Masks and gloves are usually required.

Catalyst

Resin has to have catalyst added to it before it can harden. Once the catalyst has been added to the resin, hardening (sometimes called curing) begins, giving you about half an hour before it begins to gel. The stages of setting are: liquid, jelly, and soft rubbery consistency, and very hard.

You have to work quickly therefore, once the catalyst has been added. It is important to prepare everything beforehand, laying out all tools and materials and it is also advisable not to mix up too much catalysed resin at once, otherwise, it may be wasted.

The amount of catalyst to be added to the resin varies from 1% to 2%, depending on the temperature of the room, whether colour or other fillers are used, and how fast you want the cure to be.

Curing time is dependent on two factors:

1. The temperature of the room. Normal room temperature is taken as 20° C. The colder the room, the longer the resin will take to set.
2. The thickness of the casting. Average measurement of ratio of hardener is for pourings of 1/2". Greater thicknesses can be poured, but if they are, the hardener must be reduced, and it therefore follows that for thinner castings, the hardener should be increased.

If you happen to have a 5ml medicine spoon, or a measuring cup or beaker calibrated in mls, it is useful to know that 5mls of hardener is equal to about 1% of 500gm resin; 10mls of hardener is equal to about 2% of 500gm of resin.

Resin cures by heat, so if the temperature of the room is high, you will need a little less hardener than you would if the room was cold. Catalysed resin in bulk will set more quickly than catalysed resin spread thinly over a large surface. Too much catalyst added to resin causes it to crack when it cures. Too little catalyst, and the resin will remain tacky.

Most resins are sold already accelerated and it is strongly recommended that pre-accelerated resins be used. If un-accelerated resins are purchased, it is necessary to add a few drops of accelerator to help the hardening process. Follow the manufacturer's instructions precisely. Accelerator and catalyst must never be mixed together directly. First one is added to the resin and stirred until it has dispersed, then the other. These two substances should be stored well away from each other.

Molds

As polyester resin is a liquid until the catalyst is added to it causing it to cure, it has to be contained until it hardens. This means that a mold of some kind will be always be needed.

Molds can be purchased from craft shops, household utensils can be used, or you can improvise by setting the resin in frozen food containers and the like. Look around the kitchen. Spoons, ashtrays, dishes, waxed milk cartons, egg cups, foil trays, acetate box tops, detergent containers, can all serve as molds. Pottery, Pyrex, polyurethane, glass, Gypsum plasters, metal, epoxy resin or silicone rubber, are all suitable mold materials.

When pouring resin onto a flat surface, an excellent container can be made by sticking masking tape round the edge of a waxed board, or by building a low bank of modelling clay round the edge of a piece of acetate.

When using kitchen utensil or an improvised mold remember: -

- the shape must be such that the article will come out easily when it has solidified – there must be no undercuts or awkward bumps or curves.
- the mold should have a smooth shiny surface if possible to help with the removal process, and to impart a high gloss to the finished product.
- do not use a mold made of polystyrene, as the resin will dissolve it. Test a doubtful mold beforehand by putting a little resin on it and waiting to see what happens.
- molds must be firm enough to support the weight and volume of the liquid.
- molds must be able to withstand a considerable amount of heat during curing, some plastic containers buckle under heat.

Release Agents

Resins bond extremely well to most surfaces, so in spite of the fact that the resin will slightly shrink when cured, it is important to treat the surfaces of all molds with a release agent before pouring in the resin.

Wax is one of the best of all release agents. Polish the surface of the mold twice with nonsilicone wax, until there is a high shine, then, with a sponge add a thin film of PVA Water-soluble release agent. Do not leave any ridges of wax or the resin will reproduce their impression. Once the release agent has been applied to the mold, do not touch it, or the protective film will be broken

If you have an awkwardly shaped mold, run hot candle wax evenly round the inside before pouring in the resin, to ensure an easy release. Cellophane, acetate and waxed paper are all good release materials.

Glass Fibre Chopped Strand Mat (CSM)

When reinforced with glass fibre, resin is strong, flexible and weatherproof, whereas by itself unless it is in block form it will break easily. When making mats, trays, lampshades, panels or anything with a flat exposed surface, therefore, it is best to reinforce the polyester resin with glass fibre. Glass fibre mat comes in various weights and widths, and can be cut with scissors.

A layer of resin is applied to the mold, and left to cure, and then a layer of CSM is applied. It is stippled with a brush loaded with resin; until the mat becomes impregnated with it, when its white surface gradually changes appearance until it is almost transparent. When dry, the glass fibre gives the hard resin a slightly milky appearance. A very fine glass fibre mat is best for finished surfaces, and for translucent panels.

Colours

Pigments for use with resins come in many types. They can be transparent, opaque and also metallic, pearly and luminous. It is not advisable to use colours other than those specifically made for use with resins. Colours can be mixed completely in the resin, marbled for interesting effects, or layered to give depth.

Cleaner

Brushes and tools become rock hard if they are not cleaned immediately after use, so it is important to have in a good supply of cleaner. This is bought in craft shops as resin solvent, but acetone will also clean off resin.

To clean brushes, wash them in solvent, wipe on rags or paper, and then wash in detergent and hot water. Don't use wet brushes for further work, but wait until they are dry.

Water can inhibit cure. Never pour resin solvent that has been used for cleaning brushes down the sink. Resin solvent has toxic fumes, and should not be used in unventilated or confined space. It is also flammable and must be used away from naked flames. Dispose of by pouring onto paper or other dry material, and dispose of appropriately. Do not use resin solvent on hands. To clean hands, use a hand-cleaning product, a cleansing cream or wash hands well in soap and water.

Barrier Cream

This will protect sensitive skins, though many people prefer to wear rubber gloves.

Calibrating cups and measuring beakers

Invaluable for mixing resins as they are measured off in ounces or mls (use glass or polythene mixing containers for embedding, as resin may pick up fluff which will show in the clear block).

Other useful equipment

A roll of cellophane can be used when making mats and impregnating fabrics with resin. It is also recommended as a working surface. Newspaper quickly sticks to the work in hand, often ruining it, while cellophane (or acetate or waxed paper) can be peeled off cured resin easily.

Wooden or paper sticks for mixing resins. Cocktail sticks for delicate work, Enamelling and jewellery.

Rags for cleaning brushes and hands.

Roll of kitchen paper, for cleaning.

Masking tape, for making containers to hold resin.

Modelling clay for the same purpose.

Brushes, for stippling resin onto glass fibre.

Foil cups, for mixing colours. Plain waxed paper cups, useful for pouring.

An electric drill with sanding and buffing attachment, for finishing work.

Wet and dry sandpaper and metal polish for finishing.

Small hand drill for boring holes in jewellery castings.

Safety Precautions

1. Always follow the manufacturer's instructions implicitly.
2. Sensitive skins may be irritated by resin, so a good barrier cream or protective cream or protective gloves are advisable. Don't use resin solvent to clean hands, clean instead with cleansing cream.
3. Catalysts may irritate the skin, so take care not to splash or spill them. If you do drop some on the skin, wash off at once. If catalyst should splash in the eyes, wash them immediately with clean water for 15 minutes, and then do not fail to consult a doctor.
4. Using small amounts of resin for craftwork is not likely to cause vapour irritation, but work in a well ventilated but warm room if possible.
5. Resin, hardener and resin cleaner are all flammable. Keep away from naked flame.
6. Do not pour resin down a drain. Soak up with dry material and dispose of appropriately.
Use goggles to protect the eyes when polishing and sanding with a high-speed drill.
Use a facemask to protect lungs from dust when sanding with a high-speed drill.

Large Castings

When making a large casting, it is advisable to pour no more than a quarter of an inch at a time; otherwise the heat produced by the curing will be so great that the resin will crack. To reduce heat and prevent cracking in large castings, the mold can be placed in cold water (but keep water from the resin surface). If larger castings are planned, reduce the amount of catalyst, or seek a slower setting catalyst.

Embedding Objects in Clear Resin

Having decided what you want to embed in resin, make sure that the object is clean and dry. Water will cloud the resin. Find a suitable mold and clean and dry it. Wipe it with a mold release wax (non-silicone wax).

Allow wax to dry, and then polish with a soft cloth. Do this twice; making sure that no excess wax is left in the corners to ruin the final molding. To be quite safe, add a film of PVA water-soluble release agent, spreading it on thinly but evenly. Do not, however, use a PVA release agent unless you have finishing and polishing equipment.

Pour the quantity of liquid resin you need into a measuring cup. Add a little transparent colour, just enough to tint, if you want it. Mix well, but gently, avoiding bubbles, then add catalyst, again mixing well so that it is evenly dispersed throughout the resin. The thicker the casting, the less catalyst will be needed. Resin spread thinly over a large surface will need more catalyst. Make up only as much resin and hardener as you need, to prevent waste. A good way to find out how much you do need is to fill the mold with water beforehand, measure it and then substitute the same amount of resin, but if you do this, be sure to dry and prepare the mold before you start.

Embedments are usually in three layers. The first is the foundation for the object, the second contains the object and the third is the backing – often opaque and coloured. Pour a thin layer of the catalysed resin into the mold – enough to cover the bottom. Place the mold in a warm place on a level surface, cover it to prevent dust falling on it, and leave it to set until the resin will not move when the mold is tilted (about 3 –4 hours).

Make sure the object to be embedded is dry. If necessary dry it in the oven, or on a radiator, as water will make the resin hazy. Place the object on top of the first layer of resin, facing downwards. Prepare more catalyst and resin and stir thoroughly. If the object to be embedded is very elaborate, saturate it in catalysed resin beforehand to prevent air bubbles. Slowly pour the second layer of liquid until the object is completely covered. If it has a flat surface and is facing downward, move it about under the liquid to ensure that no air is trapped. If it is likely to float, pour a little catalysed resin over it, and allow it to set before covering it with the next layer of resin.

For an interesting, 'exploded' effect, as when embedding, for example, the inside of a watch, pour on several thin layers of resin, placing objects on each layer to give depth to the finished product. Finish with another layer of resin and hardener, adding a little colour pigment, opaque or translucent, if desired to give it a base, but make sure when pouring on the last layer of colour onto clear resin, that the first two layers of clear resin have not shrunk – they sometimes do this, leaving a small gap all around the sides, into which coloured resin will seep. If there is a gap around the edge, remove the shrunk casting, pour a little clear catalysed resin into the mold, and re-set the clear casting into it. When the new resin has set, then add the coloured resin.

To remove from mold, completely immerse the mold in boiling water for ten minutes, then transfer and immerse the mold upside down in very cold water for ten minutes. Repeat this until the casting drops out of the mold. Don't chip away at the casting in the mold trying to get it out. It is not necessary and will spoil it.

Resin hardens most satisfactorily on surfaces which are not in contact with the air, so it is a good idea to cover exposed surfaces with a sheet of waxed glass or a piece of cellophane paper while setting. After the hardened resin has been removed from the mold, it should be allowed to cure further by leaving it as long as possible at room temperature before final polishing.

Using Resin with Glass Fibre

Glass fibre is used with resin to add strength and resilience. A coat of resin is painted onto the surface of the mold, then a piece of glass fibre is laid on top of the resin, then more resin is stippled on with a brush until the glass fibre mat is soaked with it. It is important to stipple the resin and glass fibre, rather than try to paint it, as a painting motion will produce a lumpy surface. Stippling also helps to work out air bubbles. When the glass fibre has absorbed the resin, its appearance will change from white to almost transparent. Fabric, paper or any other suitable material is laid on top of the glass fibre and impregnated with resin to make decorative trays, lampshades, tablemats and waste bins.

Using Colour

Transparent colours give clear, jewel-like effects, which when set into the resin and held up to the light, glow like stained glass. With opaque colours, pleasant subtle shades can be achieved by mixing, or the colours can be used direct from the pot. Metallic, pearling and luminous colours are also obtainable, giving an effective finish to some types of work.

Colours are mixed in the resin carefully to prevent the formation of bubbles. Only small amounts are necessary, from 2% to 10%, depending on strength of colour required. Too little pigment will result in a pale colour, too much will prevent the resin curing. Different colours will affect the curing time of the resin slightly and in varying degrees, which will be discovered with experiment. After the colour has been mixed into the resin, the catalyst is added in the usual way, and the mixture is then ready for use. When working on a small scale, mix colours and resins separately in foil cups and catalyse each colour only as you use it to prevent colours hardening before you can use them. Another way to prevent waste is to pour left over coloured resin into a plastic ice-cube container to harden. When there are enough little coloured cubes, they can be used to make a mosaic panels or broken up and added to new resin. Don't mix colours in a measuring beaker it will ruin it. One way to get the feel of working with colour is to use an opaque shade for the final backing layer of a piece of embedding – a brooch, for example, when it will hide the pin. Make sure when using colour on top of clear resin, that the resin has set completely, or the colour will bleed into it.

Cold Enamelling

Cold enamel is one of the most interesting ways of using colour with resin. You can either buy thick resin and the hardener necessary for it, in a kit, or you can make your own cold enamelling resin by mixing thixotropic paste resin with ordinary clear resin to the required thick consistency. Colourful hard surfaces can be produced by this technique, on a base of glass, metal or china, or indeed on any surface. Things made by this method do take longer to set hard than embedded objects or the glass fibre technique, often as long as a week. Cover a square of cardboard (with a small piece of glass fibre set at the back to prevent it warping) with thick catalysed resin in one colour. Drop very small amounts of two or three colours into it. The colours will slowly develop and set into a pattern by themselves. Don't use more than two or three colours on a small surface.

With this enamelling technique, you can also: -

1. Drop two or three pools of colour onto a base, and mix them by drawing a matchstick through them.
2. Allow a basic colour to harden, then drop colour onto it, to give a sharper definition.
3. Allow drops of colour to harden on waxed paper or cellophane. Later, press them into unset pools of colour for a raised effect.
4. Add glass beads or sequins to the resin surface before it goes hard.
5. Put transparent colour on metal foil sheet, so that the silvery colour shows through.
6. Bend copper wire into a pattern, and stick it to a base with clear resin. Pour different colours into the fields created. Each field will retain its separate colour – as in cloisonne enamel.

Marbling

For a marble effect, first choose two or three suitable, marble like colours. Two or three shades of green or white, or grey and white would look convincing. Place each colour to be used with resin, in separate containers, and then add catalyst to each one and mix. Pour all the colours into one large container, swirl them slightly then pour the mixture onto the surface to be covered, tilting and swirling to control the flow. A brush is not used at all. Transparent colours swirled onto an opaque base, give an interesting variation. If in doubt about how much resin you need for an area, measure first with water, dry off and then replace the water with resin.

Tiles

Many different sorts of tiles can be made using either the marbling or the cold enamelling technique. As a mold use either another tile or the lid of a square tin box if it is the right size. Cover the surface with release wax and stick masking tape round the edges to contain the resin. When the first pouring is complete, back with glass fibre for additional strength. It is possible to make opaque tiles with translucent insets, by placing waxed objects on the mold, allowing the opaque resin to set around them, then withdrawing the objects and filling the spaces with transparent coloured resin. This tile is then backed with glass fibre in the usual way.

Transparent Colours

Set different colours of transparent resin in small metal sweet molds. When they have hardened, remove from the molds, and set in clear resin on a sheet of glass fibre, which has already been impregnated with resin and allowed to harden. Fill in the spaces between the 'sweets' with black coloured resin. Held against the light, the colour will show through the 'sweets' only. If you make four such panels, they can be turned into a lantern. Trim each panel square to make sure they are the same size. Join them to each other with thixotropic paste resin (catalysed) and a strip of glass fibre.

Finishing Casting

Some manufacturers produce resins that need little or no polishing. A glass or ceramic mold ensures a smooth surface, which needs no finishing, apart from smoothing the back. Most other molds leave a surface, which will need a final polish. If final polishing is necessary, an electric drill with a sanding attachment will save time. When sanding hardened resin, it is best to use a facemask, as the dust is unpleasant and should not be inhaled. Goggles will protect the eyes from possible flying chips of resin. Wrap up well against the dust. When a straight edge is to be sanded level, draw a guideline in pencil, and sand to that line. Use coarse sandpaper, or a non-clogging sanding disc, at first,, then go on to a smoother sandpaper, to 'wet and dry' Sandpaper, then use a buffing wheel and finally, polish with a soft cloth and metal polish.

On complicated pieces of work, it is not always possible to use a sanding machine, but a high gloss is still possible by coating the surface with a clear varnish, or a coat of clear, heavily catalysed resin. If the surface remains tacky, wash with strong detergent or acetone then sand smooth and buff with metal polish. As a short cut, a piece of felt can be cut to fit the base and stuck over the tacky area.”

All technical advice and recommendations given in selection of products is given in good faith, however the customer must do their own tests for suitability of products.