**KEY PROPS MATERIALS**

© Martin Mallorie 2017-18

Contents

[PLASTER (HERCULITE No.2) 4](#_Toc494373527)

[CLAY 4](#_Toc494373528)

[POLYURETHANE RESIN 5](#_Toc494373529)

[POLYESTER RESIN 6](#_Toc494373530)

[CATALYST (MEKP) Methy-Ethyl-Ketone-Peroxide 8](#_Toc494373531)

[Catalysing Resin with MEKP 8](#_Toc494373532)

[POLYESTER GEL-COAT 9](#_Toc494373533)

[SOLVENTS 10](#_Toc494373534)

[Acetone 10](#_Toc494373535)

[Dichloromethane (DCM) 11](#_Toc494373536)

[White Spirit 11](#_Toc494373537)

[Methylated Spirit 12](#_Toc494373538)

[PLASTIZOTE FOAM (POLYPROPYLENE FOAM) 12](#_Toc494373539)

[EXPANDED POLYSTYRENE (WHITE) 12](#_Toc494373540)

[EXTRUDED POLYSTYRENE (BLUE) 13](#_Toc494373541)

[E.V.A. FOAM 13](#_Toc494373542)

[RIGID PLASTIC SHEET & PERSPEX 14](#_Toc494373543)

[*Other rigid plastic sheet materials:* 15](#_Toc494373544)

[ABS 15](#_Toc494373545)

[PMMA/ABS 15](#_Toc494373546)

[HIPS 15](#_Toc494373547)

[SAN 15](#_Toc494373548)

[Polypropylene 15](#_Toc494373549)

[HDPE 16](#_Toc494373550)

[Acrylic 16](#_Toc494373551)

[PETG 16](#_Toc494373552)

[Polycarbonate 16](#_Toc494373553)

[PVC 16](#_Toc494373554)

[ASA 16](#_Toc494373555)

[MUSLIN SCRIM 17](#_Toc494373556)

[THERMOPLASTICS 17](#_Toc494373557)

[Worbla 17](#_Toc494373558)

[Rhenoflex 17](#_Toc494373559)

[Varaform 18](#_Toc494373560)

[Airex 18](#_Toc494373561)

[ADHESIVES 18](#_Toc494373562)

[PIGMENTS & PAINTS 19](#_Toc494373563)

[Aerosol paint 19](#_Toc494373564)

[Rosco Supersaturated Pigments 19](#_Toc494373565)

[Water-based Emulsion 20](#_Toc494373566)

[SHELLAC 20](#_Toc494373567)

[LATEX RUBBER 20](#_Toc494373568)

[ALGINATE 21](#_Toc494373569)

# PLASTER (HERCULITE No.2)

(1) First work out how much plaster you need and use this amount to determine how much water you will need to mix it with. The *ideal* mix ratio for Herculite 2 Casting Plaster is 100/42, which means 100g plaster to 42ml water (for example if you need 500g of plaster you will need 210ml of water). This is not critical and can be varied to some extent. You can guess at the proportions if you are a good guesser!

(2) Add the plaster to the water in small amounts, mixing well after each addition. Do this until all the plaster has been added to the water. Do not add water to plaster, this will just make a lumpy mess.

(3) Mix thoroughly until you have a creamy like consistency. If the mix is too watery the plaster will become soft and crumbly; if it's too thick, air might be trapped during the setting process and will weaken the plaster.

Setting time: 6 -20 minutes.

All gypsum casting plasters are either alpha or beta or a blend of both. The basic plaster made in open pans in batches of about 4 tonnes by heating the powdered rock becomes a beta plaster. E.g. Fine Casting, Dental, Pottery Plaster etc.  But if the gypsum is made into a slurry and put into large autoclave (pressure cooker) then heated to around 220o a plaster is produced that forms much longer and straighter crystals on setting- an alpha plaster which is very hard. From these two bases everything in between is made by mixing both. So a plaster such as Herculite No2 (50/50 a/b) is half way up the hardness range. The plant needed to make alpha plasters is very complex and the batches are small this is the reason for the much higher price.

# CLAY

Water based clay: Clay is a fine-grained natural [rock](https://en.wikipedia.org/wiki/Rock_%28geology%29) or [soil](https://en.wikipedia.org/wiki/Soil) material that combines one or more [clay minerals](https://en.wikipedia.org/wiki/Clay_minerals) with traces of [metal oxides](https://en.wikipedia.org/wiki/Metal_oxide) and [organic matter](https://en.wikipedia.org/wiki/Organic_matter). Geologic clay [deposits](https://en.wikipedia.org/wiki/Deposit_%28geology%29) are mostly composed of [phyllosilicate minerals](https://en.wikipedia.org/wiki/Silicate_minerals#Phyllosilicates) containing variable amounts of [water](https://en.wikipedia.org/wiki/Water) trapped in the mineral structure. Clays are [plastic](https://en.wikipedia.org/wiki/Plasticity_%28physics%29) due to that water content and become hard, brittle and non–plastic upon drying or [firing](https://en.wikipedia.org/wiki/Pottery#Firing).

[Depending on the soil's content](https://en.wikipedia.org/wiki/Soil_classification) in which it is found, clay can appear in various colours from white to dull grey or brown to deep orange-red.

Always seal up the bag containing the clay as soon as you have removed what you need. Clay will dry very rapidly in the air and soon become unworkable. Moistening with a fine mist spray can be helpful, but don’t overdo this or you will end up with a muddy mess.

# POLYURETHANE RESIN

Because of its ease of use polyurethane resin is the most common choice for small-scale casting and home craft-work. It is commonly opaque and fast-setting (usually 5-15mins, ready to demould 20-30mins) and mixed in two equal parts (easy to measure). It is not brittle when cured, and it stays ‘green’ for a fairly long time, allowing sanding and trimming easily. Over 48 hours it will harden to its full strength.

This green stage can be advantageous if you want to shape your cast before full cure. For example you could cast a flat plaque or relief and as soon as it solidifies, de-mould it and bend it round a curved surface.

Polyurethane resin is a two component product of very low viscosity (watery). It is free flowing, so it is ideal for filling moulds that are slim or intricate. It gives excellent detail reproduction, and its free-flowing properties make air bubble almost non-existent. This material start out as a slightly yellow transparent liquid, and cures to a white or off-white.

It mixes easily at a ratio of 1:1 (equal parts) and will cure well in very small quantities. It can generate significant heat while curing, so bear this in mind when handling a filled mould and demoulding. For this reason only heat resistant materials should be used for moulds with polyurethane resin.

The product cures to an opaque white or off-white, and is resistant to distortion in the mould. It is low odour and provided you have ventilation, does not present and inhalation hazard. It is irritant to the skin so protective clothing (latex gloves – long sleeves) should be worn.

There is a transparent version which is hazardous to use and should be avoided if possible.

There are many types available (i.e. very low viscosity for detailed work, slow-set for ‘slush’ casting, semi-flexible versions etc. The resin can be coloured with powder pigments or Rosco pigments, although the colours are somewhat muted when the resin cures.

Polyurethane resin can be filled with almost any inert material from fine sand to Fillite (hollow glass micro-spheres) or talc, thus extending the volume of resin used and reducing cost. Experimentation will reveal the best filler for your particular job. Filling will make the resin thicker and more paste-like, so be thoughtful about the quantity you add. Ideally it should still be pourable. Thickened resin will lose it resistant to holding on to air bubbles.

Vaseline makes a good release agent, as does mould wax or spray wax.

The resin cures in 3 – 5 minutes and generate a fair bit of heat while curing.

It can be painted when fully cured but will need a specialist plastic primer, or a coat of shellac which is a lot cheaper and better.

NB. Polyurethane resins are moisture sensitive until cured. Ensure your moulds are properly dry and that you are not working in a high humidity environment.

# 

# POLYESTER RESIN

An inexpensive 2-part resin which is usually either translucent or clear, and which readily accepts appropriate colourants or fillers. When cured it is hard, though brittle compared to epoxy or polyurethane unless reinforced.

Polyester resin is available in a number of different forms, the principal being the general purpose resin commonly used for fibreglass work in conjunction with glass matting. General purpose resin is translucent with a slightly beige/brown tint. The next most familiar is the ‘clear casting’ version which cures glass-clear and colourless and is often used for the embedding of objects in clear blocks. There is also ‘gel coat’ resin which is pre-thickened, and opaque white resins (pre-pigmented) are also common. All are catalysed by mixing a measured amount of the same hardener (containing MEKP methyl ethyl ketone peroxide) ranging from c. 1-4% by weight.

GP polyester resin is often referred to as a ‘laminating’ resin ( i.e. specially for fibreglass work) and the ‘clear’ often referred to as a ‘casting’ resin. Although GP can be used for casting, it is not common to use the clear polyester for laminating partly because it is more expensive.

Because it is transparent it is the perfect resin for so-called ‘cold metal casting’ which is the technique of imitating metal by filling resin with finely-ground metal powder and abrading the cast surface to expose the metal particles and buff the surface.

Polyester resin cannot be used indoors without regulation extractor fans and breathing protection because the styrene emissions are harmful, as is the MEKP catalyst. Some polyesters are formulated to have low styrene emission, which may promote a better working environment, but it doesn’t mean that the same precautions can be ignored!

Strong exothermic reaction (heat generation) may cause cracking in larger volumes (add minimum of catalyst) /- some types e.g. clear casting more prone to surface tackiness (oxidisation) /- brittle if used unsupported for larger forms i.e. without glass matting etc. and smaller solid-cast forms liable to chip if dropped.

WAX should be used as a release agent – never Vaseline!

Whereas polyurethane resins are more suitable for delicate castings and there are extra-thin versions to assist intricate pouring, polyester resins tend to have standard viscosities and it can be more difficult to eliminate air bubbles.

**Replace container lids** straight after working and as often as possible while working. This will help to extend the shelf life way beyond the manufacturer’s guidelines! The containers that resin comes in are not designed for easy pouring of small amounts! In practice one will have to decant a certain amount first into another vessel i.e. a disposable plastic cup (which can be pinched at the side to make a handier pouring point). Whenever possible the decanted resin should be used rather than poured back into the main container.

Pot-life c. 20mins. At 2% catalyst, polyester resin can be safely demoulded in less than 2 hrs but allow 72hrs - 1week for a complete cure to maximum strength. As an average (this will vary according to type/brand and conditions such as room temperature) there will be 15-20mins working time once mixed; touch-hardening in 25-30mins; demoulding and some mechanical work after a few hours, but full curing can take at least a few days.

# CATALYST (MEKP) Methy-Ethyl-Ketone-Peroxide

This catalyst is a commercial product specifically designed for curing polyester resin.

It is always kept in its own specialised storage cabinet, and should never be left out unattended. Treat it with respect. It is a dangerous chemical, especially if used carelessly.

(MEKP) is an [organic peroxide](https://en.wikipedia.org/wiki/Organic_peroxide), a high explosive similar to [acetone peroxide](https://en.wikipedia.org/wiki/Acetone_peroxide) (principal constituent of solid fuel rockets). MEKP is a colourless, oily liquid.

Dilute [solutions](https://en.wikipedia.org/wiki/Solution) of 30 to 60% MEKP are used in industry and by hobbyists as the [catalyst](https://en.wikipedia.org/wiki/Catalyst) which initiates the [crosslinking](https://en.wikipedia.org/wiki/Cross-link) of [unsaturated polyester resins](https://en.wikipedia.org/wiki/Unsaturated_polyester_resin) used in [glass-reinforced plastic](https://en.wikipedia.org/wiki/Glass-reinforced_plastic), and casting. For this application, MEKP is dissolved in [dimethyl phthalate](https://en.wikipedia.org/wiki/Dimethyl_phthalate), [cyclohexane peroxide](https://en.wikipedia.org/w/index.php?title=Cyclohexane_peroxide&action=edit&redlink=1), or [diallyl phthalate](https://en.wikipedia.org/w/index.php?title=Diallyl_phthalate&action=edit&redlink=1) to reduce sensitivity to shock and improve stability in storage.

*MEKP is a severe skin irritant and can cause progressive corrosive damage or blindness*.

Always wear gloves and protective eyewear when using this material. Read the appropriate Safety Data Sheet before use. Seek advice if you are unsure about any aspect of using MEKP.

# Catalysing Resin with MEKP

Catalyse resin between 1 and 4% by weight. In a cold environment a lower proportion of catalyst will result in a slower cure. Conversely, higher catalyst will cure much faster, but will also generate more heat in the exothermic reaction, and in extreme cases can cause cracking and distortion of your cast.

Clean up uncured resin with strong detergent or acetone as a last resort. Resin spills should be wiped up with newsprint and cloths in the first instance.

Catalysed resin left in mixing cups will almost always heat up and can generate considerable heat. Draw a little cold water from the tap onto the top of whatever remains in the cup and allow to stand until cured. The water will prevent the release of fumes, and will cool the resin by increasing the overall mass in the cup

Polyester resins can be easily coloured with small amounts of standard oil paint without affecting cure. There are commercial polyester colourants available, which are strong, intense pigments and are to be used where possible.

# POLYESTER GEL-COAT

Gel Coat is used to provide a high quality glossy surface to a cast. It is often pigmented in the same way as Polyester Resin. After painting inside the mould, as a first layer, the gelcoat will harden but always remain tacky. This is due to waxes and glossing agents added to the resin during manufacture. The part of the gel-coat in contact with the inner surface of the mould is in an anaerobic state (air is not present) and under this condition the outer layer of gel-coat hardens fully. Gel coat is not suitable for painting the outer surface of a resin cast, as it will always remain tacky. In all other ways, use gel-coat exactly as you would use polyester resin.

# SOLVENTS

Acetone is often the primary component in cleaning agents such as [nail polish](https://en.wikipedia.org/wiki/Nail_polish) remover. Acetone is a component of [superglue](https://en.wikipedia.org/wiki/Superglue) remover and easily removes residues from glass and porcelain. [Make-up artists](https://en.wikipedia.org/wiki/Make-up_artist) use acetone to remove skin adhesive from the netting of wigs and moustaches by immersing the item in an acetone bath, then removing the softened glue residue with a stiff brush.

The most hazardous property of acetone is its extreme flammability. At temperatures greater than acetone's [flash point](https://en.wikipedia.org/wiki/Flash_point) of −20°C (−4°F), air mixtures of between 2.5% and 12.8% acetone, by volume, may explode or cause a flash fire. Vapours can flow along surfaces to distant ignition sources and flash back. [Static](https://en.wikipedia.org/wiki/Static_electricity) discharge may also ignite acetone vapours, though acetone has a very high ignition initiation energy point and therefore accidental ignition is rare. Even pouring or spraying acetone over red-glowing coal will not ignite it, due to the high concentration of vapour and the cooling effect of evaporation of the liquid. It [auto-ignites](https://en.wikipedia.org/wiki/Auto-ignition_temperature) at 465°C (869°F). Also, industrial acetone is likely to contain a small amount of water which also inhibits ignition.

Acetone is believed to exhibit only slight toxicity in normal use, and there is no strong evidence of chronic health effects if basic precautions are followed.

At very high vapour concentrations, acetone is irritating and, like many other solvents, may depress the [central nervous system](https://en.wikipedia.org/wiki/Central_nervous_system). It is also a severe irritant on contact with eyes, and a potential [pulmonary aspiration](https://en.wikipedia.org/wiki/Pulmonary_aspiration) risk.

Take care when using acetone. Use appropriate PPE and control sources of ignition.

# Dichloromethane (DCM)

DCM's volatility (very fast evaporation) and ability to dissolve a wide range of organic compounds makes it a useful solvent for many chemical processes.

It is widely used as a [paint stripper](https://en.wikipedia.org/wiki/Paint_stripper) and a [degreaser](https://en.wikipedia.org/wiki/Degreaser). In the [food industry](https://en.wikipedia.org/wiki/Food_industry), it has been used to [decaffeinate](https://en.wikipedia.org/wiki/Decaffeination) [coffee](https://en.wikipedia.org/wiki/Coffee) and [tea](https://en.wikipedia.org/wiki/Tea) as well as to prepare extracts of [hops](https://en.wikipedia.org/wiki/Hops) and other [flavourings](https://en.wikipedia.org/wiki/Flavoring). Its volatility has led to its use as an [aerosol spray propellant](https://en.wikipedia.org/wiki/Aerosol_spray#Aerosol_propellants) and as a [blowing agent](https://en.wikipedia.org/wiki/Blowing_agent) for [polyurethane](https://en.wikipedia.org/wiki/Polyurethane) [foams](https://en.wikipedia.org/wiki/Foam).

A common solvent for use with plastics, it is used as pipe weld by plumbers. It is also useful for solvent gluing a number of different plastics. It is however a fairly dangerous material. It poses a risk through inhalation of fumes and an organic vapour mask should be used in conjunction with this material. Avoid contact with skin and use in a well ventilated area. Only use small quantities at a time, thus limiting the amount of vapour present in the air.

Dichloromethane is only slightly flammable, but take care when working in proximity to heat sources

# White Spirit

White Spirit is a [petroleum distillate](https://en.wikipedia.org/wiki/Distillation) used as a [paint thinner](https://en.wikipedia.org/wiki/Paint_thinner) and mild [solvent](https://en.wikipedia.org/wiki/Solvent). In industry, mineral spirits are used for cleaning and [degreasing](https://en.wikipedia.org/wiki/Degreasing) machine tools and parts.

White spirit is mainly classed as an [irritant](https://en.wikipedia.org/wiki/Irritation). It has a fairly low toxicity by inhalation of the vapour, skin contact (risk of contact dermatitis) and ingestion. However, acute exposure can lead to general [narcotic](https://en.wikipedia.org/wiki/Narcotic) effects (drowsiness, dizziness, nausea etc...) and can eventually lead to unconsciousness. Oral ingestion can cause breathing difficulties.

White spirit (sometimes called mineral spirits) is also highly flammable. Do not use in proximity to heat sources.

Wear gloves and eye protection.

# Methylated Spirit

Methylated Spirit (meths) is ethanol that has additives to make it [poisonous](https://en.wikipedia.org/wiki/Poisonous), bad tasting, foul smelling or [nauseating](https://en.wikipedia.org/wiki/Emetic), to discourage recreational consumption. In some cases it is also dyed purple.

It is used as a solvent in many ethanol based paints and lacquers, especially Shellac and French Enamel Varnish. Meths is highly flammable and must not be used near any sources of ignition. Keep containers closed and return to the safety cabinet as soon as possible. Avoid skin contact and breathing vapours.

# PLASTIZOTE FOAM (POLYPROPYLENE FOAM)

Plastizote is a dense, firm foam sheet – not unlike a camping mat. It is available in a variety of thicknesses and colours. It is used to create a variety of shapes and forms. It can be easily cut with a craft knife or scalpel, it can be sanded with fine sandpaper and it glues well with contact adhesive or hot melt glue.

# EXPANDED POLYSTYRENE (WHITE)

**Expanded Polystyrene (EPS)** is made using small polystyrene beads that are inflated using heat and a blowing agent within a block mould, where they expand. Expanded polystyrene is therefore made up of millions of closed cell spheres. The size of the spheres can be varied in the manufacturing process to produce a variety of densities (or grades) with different mechanical and thermal properties. Expanded Polystyrene is available in blocks 2400 x 1200 x 600mm.

EPS is one of the easiest materials to shape by normal means e.g. slicing with sharp knives or a hot-wire cutter, sawing with serrated blades, rasping with files, and smoothing with sandpaper. The real challenge lies in controlling the shape.

# EXTRUDED POLYSTYRENE (BLUE)

**Extruded Polystyrene (XPS)** is made by mixing liquid chemicals together with a blowing agent, to form a frothing mixture, which is then pushed (or expanded) through a shaping die to give the required size.  XPS is generally only available in sheets 2400mm x 600mm and various thicknesses up to 100mm.   Extruded Polystyrene is about 8 times the cost of Expanded Polystyrene, for a given volume.

XPS is slightly easier to shape accurately than EPS, mainly due to the much smaller cell size. It is also more suitable for small carvings, especially considering the greater cost and the smaller available block size.

# E.V.A. FOAM

Ethylene Vinyl Acetate (EVA) is formulated into a closed cell foam product. It takes on the following characteristics which are of great advantage to the theatrical prop maker:

* good weather and chemical resistance
* low water absorption
* good acoustic properties
* oil resistance
* high energy absorption
* environmentally friendly, safe disposal by recycling, dumping or incineration

This extremely dense foam can be found in many commercial applications from handle grips to flotation safety devices to sports safety equipment. EVA foam readily accepts paint, glues and various finishes which makes it ideal for costume accessories and props.

# **RIGID PLASTIC SHEET & PERSPEX**

Perspex is a trade name for acrylic sheet plastic. It can be clear, coloured opaque or translucent. It can be machined saw cut, heat formed and glued into a variety of simple or complex shapes. It can also be vac’ formed with care. This is more successful with thin sheets, although small bubbles can form internally if the material is even slightly overheated. AVOID USING ALCOHOL of any sort (meths particularly) to clean Perspex as it often causes crazing and minor surface cracks due to the rapid temperature changes from the evaporating alcohol. Some adhesives can also cause surface crazing.

Acrylic sheet can be glued with ‘Tensol’, a methyl chloride based adhesive. There are many specialist adhesives for acrylic sheet, and a small amount of online research will reveal the best one for any particular job.

# *Other rigid plastic sheet materials:*

|  |  |
| --- | --- |
| **Material** | **Properties** |
| [ABS](http://www.plastic-sheets.co.uk/ecommerce/plastic-sheets/abs/) | Acrylonitrile Butadiene Styrene- ABS plastic sheet is amongst the most versatile and widely used of thermoplastics, particularly within the thermoforming industry. The wide forming temperature range of ABS plastic sheet makes it relatively easy to form. ABS plastic sheets have good dimensional stability which makes trimming relatively easy. |
| [PMMA/ABS](http://www.plastic-sheets.co.uk/ecommerce/plastic-sheets/pmma-abs/) | This plastic sheet is ABS with an acrylic capping. This co-extruded sheet has the strength of ABS combined with a capping layer of acrylic producing a coloured and/or UV resistant surface. Finishes are usually gloss, but can be matt or textured. |
| [HIPS](http://www.plastic-sheets.co.uk/ecommerce/plastic-sheets/hips/) | High Impact Polystyrene (HIPS plastic sheet). HIPS plastic sheet is amongst the lowest cost and easiest of materials to thermoform and trimming is easy with the right tools. Moisture absorption is not considered a problem and pre-drying is seldom required. Typical applications include point of sale products. Chemical and impact resistance are not as good as ABS. |
| [SAN](http://www.plastic-sheets.co.uk/ecommerce/plastic-sheets/san/) | Styrene Acrylonitrile (SAN plastic sheet). SAN plastic sheet has similar properties to HIPS, but SAN has better chemical resistance and can be UV stabilised. Clear grades have a blueish tint. |
| [Polypropylene](http://www.plastic-sheets.co.uk/ecommerce/plastic-sheets/pp/) | Polypropylene (PP). PP plastic sheet has good chemical resistance, good fatigue resistance (integral hinge property), and good temperature resistance. The difficulty in forming PP is its narrow thermoforming temperature window, webbing too can be a problem. Because of the semi-crystalline nature of PP, post forming shrinkage rates are high. A filling such as talc can be used to improve these properties. |
| [HDPE](http://www.plastic-sheets.co.uk/ecommerce/plastic-sheets/hdpe/) | High Density Polyethylene (HDPE). HDPE plastic sheet has similar characteristics to polypropylene, but with better low temperature impact resistance. HDPE has poor UV resistance (unless coloured). It is good for welding, good electrical insulation and does not readily absorb moisture. |
| [Acrylic](http://www.plastic-sheets.co.uk/ecommerce/plastic-sheets/Acrylic/) | Polymethylmethacrylate (PMMA plastic sheet) - It is a versatile material; easy to handle, machine, screen print and polish. The two principle types (extruded and cast) have similar properties, but extruded sheet can be vacuum formed whereas cast sheet can be pressed. Grades are available with improved impact resistance, generally termed "impact resistant PMMA". |
| [PETG](http://www.plastic-sheets.co.uk/ecommerce/plastic-sheets/petg/) | Polyethylene Terephthlate (glycol modified) or PETG plastic sheet. PETG has good processing and forming characteristics, doesn't require pre-drying, and has good impact strength and rigidity. PETG is not usually UV resistant. |
| [Polycarbonate](http://www.plastic-sheets.co.uk/ecommerce/plastic-sheets/polycarbonate/) | Polycarbonate plastic sheet has excellent stiffness, impact strength and good fire properties. It absorbs moisture so needs pre-drying before forming. Some grades are UV resistant and some hard coated. |
| [PVC](http://www.plastic-sheets.co.uk/ecommerce/plastic-sheets/pvc/) | Polyvinyl Chloride (unplasticised). PVC plastic sheet has good impact resistance and stiffness. It is easily fabricated and welded or thermoformed, and becomes brittle at low temperatures. |
| [ASA](http://www.plastic-sheets.co.uk/ecommerce/plastic-sheets/asa/) | Acrylonitrile Styrene Acrylate (ASA plastic sheet) has similar properties to ABS, but better weathering and low temperature characteristics. Like ABS, ASA absorbs moisture and needs to be dried before forming. |

Pre-drying requires special equipment such as ovens with desiccant beds through which air is forced. For this reason it is often better to avoid plastics for forming than need pre-drying.

# MUSLIN SCRIM

Muslin scrim is a loosely woven cotton fabric not unlike cheesecloth or Indian cotton. It is usually supplied treated with a light starch to aid handling.

Scrimming is the process of coating a surface such as carved expanded polystyrene in order to increase the strength of the surface and to provide a more regular surface for painting. This is usually achieved by apply a thin coat of diluted PVA glue to the surface of the object being scrimmed and then patching small pieces of scrim carefully onto the surface, excluding air bubbles. Each piece is slightly overlapped with the next until a uniform flat surface is achieved. Do not over dilute the PVA, and don’t allow the glue to dry before you have achieved a flat surface – work quickly!

# THERMOPLASTICS

# Worbla

Worbla is a thermoplastic sheet without an internal structure. When warmed to approximately 50°it becomes flexible and formable. It can be pressed over a former or squeezed and rolled into a ball, or any other shape you need. When cooled it returns to its original hardness and flexibility. Take care not to build up layers that are very thick as your piece can rapidly become quite heavy. Worbla can be painted or coated with a wide variety of surface treatments – limited only by your imagination! Worbla is not a particularly lightweight material unless it is in fairly thin sheets. There are several different types of Worbla, including a transparent version. It’s expensive, but really useful.

# Rhenoflex

Similar to Worbla but with a woven fabric internal structure. It was originally intended for use in shoe manufacture as a stiffener between layers of leather or fabric. It requires higher temperatures than Worbla to soften, typically 60 -70°, so care should be taken when handling the soften material. Both Worbla and Rhenoflex will stick to themselves to a variety of other surfaces. This can be both useful and a nuisance. If you want these materials to release from a former you should use a release agent such as Vaseline, which will need to be cleaned from the inside of the work after forming. Rhenoflex can be surface treated in the same ways as Worbla.

# Varaform

Varaform is a thermoplastic mesh that looks like the fabric from a sting vest, only rigid and springy. It can be heated in hot water at 60 – 70° to soften it. Other heat sources such a hot air gun will be too localised and will not uniformly heat the whole piece ready for forming. It is self-adhesive and often used to provide a lightweight open weave foundation upon which to build layers of other materials. It is also useful as a reinforcement over soft moulding materials such as silicone rubber or alginate to prevent distortion of the mould prior to casting.

# Airex

Airex is a closed cell rigid foam sheet material, available in different grades and thicknesses. It was original designed as a laminate layer in aircraft wings (it is still used for that) because it has high strength, ultra-light weight, good chemical resistance, low flammability and it is thermos-formable. It can be machined, sanded and surface treated – so it is a very useful material for the prop maker. The only downside is it is very expensive. It forms well with a heat gun, but will not vac’ form.

# ADHESIVES

Where do we begin? At my last count I found 76 different adhesives available to buy online. The prop makers mainstays are PVA wood glue, contact adhesives, superglue, hot melt glue and rubber based glues. We have glues for upholstery foams fabrics, and expanded polystyrene in large pre-pressurised canisters in the workshop. We use these glues in a purpose designed spray delivery system because these are glues that are used to cover large areas. Almost all the other adhesives we use are for small structural bonds, and they will rarely, if ever, be the only method of joining two materials. Adhesives should be thought of as *reinforcement* of an otherwise mechanical joint.

As a general rule it is a good idea to test adhesives for suitability and effectiveness before making a decision to use any particular product for any critical work.

# PIGMENTS & PAINTS

Aerosol paint is available in a variety of formulations, with varying degrees of usefulness to the prop maker. It is important to use the correct primer for the type of paint you are using, and also to be sure that the paint is suitable for the particular surface you want to paint. A common fault with spray painting is to apply too much paint in one coat. Lots of light coats are usually better, and will provide a more durable finish. A spray can isn't a camera. Don't point and shoot. To get an even coat of paint, sweep the can horizontally and vertically past the object as you spray. For example, if you're moving left to right, you begin spraying to the left of the object, onto the object, and then to the right of the object.

When you have finished painting hold the can upside down and hold down the nozzle and spray until only solvent is released. This clears the nozzle and the dip tube that goes to the base of the can. If you fail to clear out the nozzle and tube after each use then the can will be blocked when you next come to use it.

If a nozzle does become clogged, use one from another can rather than throwing the whole can away.

When using aerosol paints you should ensure that you have the correct PPE. (Safety glasses, gloves and paint respirator.)

Rosco Supersaturated Pigments are a unique vinyl acrylic paint, packaged in concentrated form. Rosco is designed to be diluted with water, at least 1:1 and more. With such tremendous extendibility, Supersaturated offers the widest range of effects possible while being extremely economical to use. Supersaturated achieves vibrant, opaque colour fields on many different surfaces. It also creates bright, translucent washes. Supersaturated Roscopaint is formulated with a unique binder that gives it superior adhesion, durability, and flexibility even on difficult surfaces like Rosco Projection Screens and Rosco Dance Floors. It can also be used as a tint in other water-based paints, binders and coating.

Water-based Emulsion: Modern Emulsions are water-based, with vinyl or acrylic resins added to make them more hard-wearing than traditional emulsions. This results in varying degrees of sheen in the finish; as the shine increases, the paint tends to be more hard wearing. The ranges usually offer matt, eggshell, silk, satin and full gloss.

Although normally thought of as for internal walls and ceilings, we use them as simple primers and for large areas of floor and scenic flats. Most emulsions are readily tinted or coloured with pigments such as Rosco Super-Sat Emulsion is easy to apply but do not give the same hard-wearing qualities as oil-based paints.

# SHELLAC

Shellac is a resin secreted by the female lac bug, on trees in the forests of India and Thailand. It is processed and sold as dry flakes and dissolved in ethanol to make liquid shellac. Shellac is often used on a moist surface such as sculpted clay. It dries rapidly to a high gloss, and provides an effective moisture barrier prior to subsequent processes such as resin moulding. Shellac can be used as a high gloss varnish, wood sealer or barrier coat between two incompatible paint surfaces.

FEV (French Enamel Varnish) is a translucent high gloss coating similar to shellac, but more refined. It is available in strong, glass like colours and usually used where light transmission is an important factor.

# LATEX RUBBER

Latex as used in prop making is a white, milky liquid that smell strongly of ammonia. The ammonia is present to prevent the latex from solidifying into rubber that is similar to an elastic band or a latex glove.

Latex in its raw state is the rising sap of the rubber tree. If just left to air-dry it will have the consistency of a crumbly pencil eraser. The rubber liquid is heat treated anaerobically in a process called vulcanisation. Vulcanisation enable the rubber to become elastic and strong instead of crumbly. The ammonia is added to keep it liquid until we need to use it. As soon as it is exposed to the air it rapidly dries to a tough elastic.

We use latex for mould making, casting and coating surfaces. Latex id cost effective but it only has a limited life after drying. Over time it yellows and becomes brittle.

Latex in its liquid phase can be coloured with water-based pigments such as Rosco

# ALGINATE

Sodium Alginate is a chemical extracted from brown seaweed. It is widely used in the food industry as a thickener and as a gelling agent. It is also used in dentistry and prop making as a low cost, rapid curing moulding material. Dentists use Alginate to take impressions of teeth while still in the mouth. Prop makers use it primarilty to make casts of human faces and body parts. Alginate sets extremely fast (3 minutes) and has a very short window of usability. It dries and shrinks rapidly after gelling, so speed is of the essence when working with Alginate. Alginate powder is mixed with COLD water to a smooth paste and applied to the surface you wish to take a mould from. It sets to the consistency of cooked egg white and whilst flexible it has extremely low tear strength, so care in handling is essential.

The items described above represent a very small proportion of the range of materials used commonly by prop makers. The truth is, virtually every material in existence could find its way into the prop makers workshop. We re-purpose, re-use, adapt and experiment – every day!