

WOOD STAINING AND COLORING

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Coloring wood is often associated with cheaper furniture, when it can be used to cover poor quality construction and materials. And in the case of contemporary design work with good wood selection, it is often a step that can be bypassed. However, when used with care and finesse, artificial colors can enhance many surfaces either by blending unavoidable natural color mismatches, or by adding vibrant new visual dimensions.

Coloring wood is a large subject, and I can only touch on the basics here - the bibliography in the first article is a useful reference point for additional information. Briefly, altering the natural color of wood involves the use of stains to add color, as well as bleaches to remove it. Stains can include liquids and gels applied to raw wood, or glazes and toners which are applied in or between coats of finish. The difference in these materials is in the sequence that they are applied during the finish process.

Stain types:

A simple way to understand stains is to divide them into categories; although there are large numbers of different products available, they all divide into three groups: pigmented, chemical and aniline dye stains. Pigments are finely ground opaque mineral particles which obscure the natural color of the wood - a heavy concentration such as in paint will totally obscure the wood grain. In stains, these pigment particles are dispersed in a solvent and a binder. When applied to a wood surface, the particles lodge in crevices in the wood structure - the larger the pore size, the more pigment will collect. To some degree, pigmented stains can also build on top of the wood surface, when applied heavily enough. The purpose of the binder is to lock the particles onto the surface after the solvent evaporates. Although the binder is typically oil, varnish, lacquer or water-based, in most cases it is easier to note the characteristic solvent type used in the stain: mineral spirits, alcohol, lacquer thinner or water.

Dyes are much smaller, molecular sized particles; unlike pigments, which color the wood by lying on the surface, dyes saturate the wood fiber

structure. Consequently they do not require a binder to hold them onto the surface, only a solvent to deliver them into the wood fibers. Dyes are crystals which dissolve into tiny particles called ions, so small that they appear transparent. Their electrochemical structure (polarity) gives them a strong bonding affinity with wood. Unlike pigmented stains with a binder (polymeric stains), dyes must be top coated to saturate the color. The transparency of the medium produces a totally different effect on the wood: on highly figured wood such as ripple sycamore, a dye will enhance the quilted figure where a pigment would obscure it more; on a strongly grained wood such as ash, a dye would give a fairly even tone overall where a pigment stain would emphasize the contrast in the grain lines. Likewise on end grain, a dye stain will give lighter, more even tones than pigments.

Chemical stains have seen wide use historically, but suffer two major drawbacks. Many, such as potassium dichromate and ammonia, can be highly toxic; they are also very unpredictable: as they produce color through reaction with chemicals in the wood, different cuts of the same species can produce widely varying color tones. In a nutshell, I can't think of anything that chemicals stain do that can't be done better by regular coloring mediums, with one notable exception: potassium dichromate can be used to color mahogany with maple or holly string line without darkening the inlay color.

The choice of solvent or binder will not affect the final color produced, but the chosen stain should be compatible with the clear finish to be used. If the solvent base is alcohol, lacquer thinner or water in both the stain and finish, there may be an adverse reaction between the two. If the solvent is mineral spirit in either the stain or the finish, you will avoid any compatibility problems, with the exception of applying oil or varnish over an oil-based stain. Reactions are almost invariably caused by mechanically applying incompatible finishes over stains with a brush or rag (which highlights one big advantage of spray applied finishes!)

The most common vehicle for pigment stain has been oil thinned with white spirit. Varying the ratios of pigment to binder and solvent produces anything from artist's tube paints (almost no solvent) to Japan colors (with metallic salts added to speed drying) to commercial D.I.Y. stains (added mineral spirit). Thickening materials can be added to produce wiping and gel stains. Water based pigmented stains have recently become a low-

toxicity alternative to the oil-based forms, and are compatible with almost all finishes.

Pigments are generally more fade resistant (lightfast) than dyes. Dyes are soluble in oil, lacquer thinner, alcohol or water, and come either as a powder or premixed. Alcohol soluble dyes are probably the most problematic due to their very fast drying time, resulting in lap marks, and their relatively poor fade resistance. Water aniline dyes penetrate the deepest and are the most lightfast; they also avoid the problems of lap marking, flammability and toxicity.

Mixing:

Some people find just the color they want straight from a can; for those of you who can't find what you have in mind, you can either combine different proprietary stains or mix your own. If you keep to the same solvent type there should be no problem; avoid mixing oil with water or dyes with pigments, but stains of the same type - even from different manufacturers - can be mixed at will. If in doubt about compatibility, stick to the same brand in a manufacturer's line. Dye stains can be purchased as dry powders and mixed with the appropriate solvent (alcohol, white spirit/lacquer thinner or water), typically at 1 oz. powder to 1 quart solvent, in a non-metallic container. I recommend warm distilled water for mixing water based stains as the minerals in tap water can alter the final color. Straining the dye mixture after several hours will remove undissolved powder.

But what to do when the mixed stain is the wrong hue? A whole book could be written about color theory (and a lot can be learnt by simple experimentation with different stains), but some points to remember are: complimentary (opposite) colors will neutralize or subdue each other. Useful pairs are blue/orange, red/green and purple/yellow: if your stain is too red, add some green; too orange, add some blue and so on. Earth tones can be used in the same way: a cool green raw umber will tone down the red in burnt sienna. Earth pigments are generally much more useful as colorants than pure colors. Black added to any color will reduce its intensity and, added to orange or red, will produce brown - probably the most useful color in wood finishing.

One factor that is seldom mentioned in finish coloring is 'metamerism' - the capacity for colors to change hue under different light sources. Check your color work under the light source that it will be displayed under, be it incandescent, fluorescent or daylight.

Application:

Applying stains is simplicity itself: flood it on and wipe it off before it dries. Virtually anything can be used as an applicator (rag, brush, sponge, spray gun). Applying generously will also help to keep the whole surface wet and avoid lap marks (darker streaks over already dried stain). Pigmented stains will be lighter with the more you wipe off and each successive application will add more color and obscure more grain. Dye stains can be darkened by adding more powder to the mix and lightened with more solvent. As a rule, wait until the first coat is fully dry before restaining; with dye stains, additional applications of the same mix will not generally change the final dry result.

Gelled pigment stains are a new addition and tend to penetrate less than regular liquid stains. They excel on woods that absorb liquid stains unevenly such as cherry and pine as the gel causes the pigment to lie evenly over the surface.

In addition to straight stains, wood can be coloured by using pigments and dyes to shade, tone and glaze during the finishing process. Stain can often look rather flat when used alone, so additional colors can be added on top of seal coats to increase the appearance of depth. One trick is to use a dye stain under a pigment stain to emphasize different parts of the wood structure. Pigments can be used between layers of finish to add graining and character to bland wood or impart an aged antique look with darker material in recesses as in carved or turned wood. These are traditionally Japan colors which are manipulated while still wet to produce a variety of different possible effects. Avoid applying too thickly and allow to fully dry before over finishing - both these two faults can cause top finish coats to peel off. 'Pickling' or limed finishes are similar - instead of dark glaze colors, light pigment paints are used instead. Dyes can be used in clear finishes to add tinting colors (known as toners), which can be used to shade and blend varying color tones. Spray application works best with this, although I have used both polishing rubbers and brushes to good effect.

Bleaching:

Coloring wood can also involve the removal of colors with bleaches. There are three types of wood bleaches: oxalic acid, which removes iron and water stains, as well as weathered 'silvering' on exterior wood (often sold as proprietary 'deck brightener'). Chlorine bleach (often available as swimming pool bleach - calcium / sodium hypochlorite) is effective only on dye stains, and can remove an aniline stain without lightening the natural wood colors. The standard household Clorox form (about 5% strength) can be used initially to tackle many stains. Two-part bleach (A/B bleach) contains both a strong alkali and hydrogen peroxide which are often applied separately but work together on the surface to lighten natural wood colors as well as neutralize dyes and pigments. It also leaves no crystalline residue when dry, unlike the other two. Neutralize this A/B bleach if needed with a mild acid (vinegar and water) and rinse chlorine and oxalic acid bleach residues with plenty of water. This latter process can 'raise the grain' on wood, so careful subsequent sanding is needed so as not to penetrate the bleached surface. Remember, bleaches do not actually remove stains but only neutralize the color molecules to make them appear invisible.