

Changing the Color of Wood

A primer on modern stains

by Chris A. Minick



Gel stains are great for vertical surfaces like cabinet sides because, unlike liquid stains, they don't run off.

Why would anyone want to stain a piece of furniture or cabinetry and cover up the natural color and figure of beautiful wood? While few of us would even consider staining flame-grained mahogany or burl walnut, not all of us can afford to build every project from first-rate cabinet hardwoods. Most woodworkers I know often employ cheaper woods, such as pine, poplar and birch. And the appearance of such plain woods can be enhanced by staining.

In addition to giving inexpensive woods

a richer color, stains are indispensable for matching the color of new woodwork to existing wood furnishings or for evening up natural color variations in boards glued up into wider panels. A judiciously applied coat of stain can even lend a subtle color contrast to bring out the spectacular grain of a highly figured exotic species.

But don't expect to get a perfect staining job by picking up the first can of stain you see on the shelf at your local hardware store and sloshing it on. To get good results for a wide range of staining situations,

you need to know the characteristics and qualities of different types of stains, so you can choose the best one to obtain the desired effect. Good stain jobs also depend on proper surface preparation and application technique, so the wood receives the stain evenly. A further assurance of success comes from making stain samples to test the color before applying the stain.

Pigmented stains

Most stains used in modern woodworking shops can be divided into two broad cate-

gories according to colorant type: pigmented stains and dye stains. Pigmented stains are suspensions of finely ground colored minerals (mostly iron oxides) mixed into a solvent-based solution". Pigmented stains color the wood when pigment granules lodge in the natural crevices and grain pores on the surface of the wood. This quality makes pigmented stains a good choice for accentuating the grain of ring-porous woods like oak and ash. Unfortunately, the pigment particles will also lodge in sandpaper scratches and boldly reveal a poor sanding job. Pigment particles are opaque; therefore, they resist fading well. They also act like thin paint to obscure the delicate figure of wood like fiddleback maple, making them good for covering up unattractive inexpensive species or plywood.

Most of the stains you'll find on your local hardware store's shelves are pigmented, oil-based stains. The solvent, or vehicle, used in these stains is mineral spirits, and stains also contain a binder (usually linseed oil or an alkyd resin) that acts like a glue to hold the pigment particles on the wood. Without the binder, the dry pigments would simply rub off. The oil binder is the reason you must apply a seal coat, such as shellac, before using a water-based topcoat over an oil-based stain.

Dye stains

Unlike pigmented stains with color particles suspended in a liquid vehicle, dye stains are mixtures of synthetically derived colored powders that are completely dissolved into solution. The color in a dye stain never settles out, so dye stains don't require extensive stirring. Also, unlike pigmented stains, which are made from a limited range of earth tones, dye stains are available in a wide range of hues, including brilliant primary colors. They are ideal for color-matching applications because you can combine exactly the colors you need to make the stain yellower, greener or bluer.

Dye stain solutions penetrate deeply into the wood matrix, coloring each individual cellulose fiber, accentuating the subtle grain patterns in figured woods. However, dye stains won't bring out the contrast in non-figured open-grained woods like butternut and oak, creating a monotone look I don't care for. Dye stains are not as fade-resistant as pigmented stains, so care should be taken to keep dye-stained wood out of direct sunlight.

Dye stain powders come in three main varieties based on which solvent they're mixed with: water-soluble, oil-soluble and

alcohol-soluble dyes. Even though dye stains are often referred to as "aniline" dyes, modern dyes contain no aniline. The name is an unfortunate holdover from 19th-century Germany, where the dyes were first developed from derivatives of aniline (a toxic petroleum-based liquid that's a suspected carcinogen). Rest assured that modern synthetic dye powders are safe to use in the shop.

Water-soluble dyes have the greatest penetrating power of all common wood stains. The deep penetration creates the illusion of depth associated with high-quality furniture. Water-soluble dyes are also relatively resistant to fading, so I prefer them over all other dyes for staining fine hardwoods. And, in case you sand through the finish, water-soluble dyes are more repairable than other wood stains.

Powdered water-soluble dye stains are easily prepared in the shop. Merely dissolve the dye crystals in warm water, let the solution cool to room temperature and it's ready to wipe on the wood. No stinky or hazardous solvents are needed, and cleanup is in warm soapy water. The only

real complaint about water soluble dyes is that they raise the wood's grain when applied. But this is easily remedied by wetting the wood before final sanding.

Oil-soluble dyes are closely related to water dyes but are dissolved in a hydrocarbon solvent—usually glycol ether or lacquer thinner. These dyes are often sold premixed as "NGR" (non-grain-raising) stains, so called because the solvent base does not fuzz the grain when applied to raw wood. Oil-soluble dyes form the bridge between pigmented stains and dye stains, giving woodworkers the best of both worlds. But the relatively poor penetration and poor lightfastness of NGR stains somewhat limits their use for fine furniture.

Alcohol-soluble dyes are primarily used for tinting or special effects that can be applied with a spray gun. They dry too fast for any other application method. This feature makes alcohol-soluble dyes popular with production furniture finishers. In the small shop, they're normally used only for touch-ups or finish repairs.

Though they are harder to apply evenly

Stain conditioner prevents a blotchy look



I spent the better part of two months building my first major woodworking project: an Early American-style pine corner cupboard. But when I applied the stain, my would-be masterpiece was instantly transformed into a blotchy mess (even though I carefully followed the directions on the can). I've since learned to eliminate the blotchy stain problem by applying a pre-stain conditioner to the raw wood before applying any solvent-based stain. The stain conditioner evens out the absorbability of the wood, allowing it to take color more uniformly.

Stain controllers made by Minwax and McCloskey are available at most hardware stores, but I home-brew my own conditioner that works fine and costs a lot less. Simply dissolve 1 to 2 cups of boiled linseed oil into 1 gal. of mineral spirits. Brush a heavy coat of the mixture over the entire project, making sure porous areas are kept wet. After 10 minutes or so, wipe off the excess, and follow your normal finishing routine.

Pre-stain conditioners work best on resin rich woods like pine (see the photo at left) cherry or birch. But regardless of species, any parts with lots of exposed end grain (raised panels for instance) will benefit from this treatment, but make a test sample just to be sure. —C.M.

Pre-conditioning wood prevents blotchy staining. *The author's shop-brewed wood conditioner, applied only to the top half of this pine sample before staining, ensures that all areas of the grain will absorb stain evenly.*

than water dyes, alcohol-dye stains have one major advantage over all other stains: They're perfect for tinting or shading wood to create special finishing effects. The best example of this shading technique is the sunburst finish commonly used on guitar bodies.

Any type of dye stain can be a little hard to find locally. The best way to buy them is from woodworking supply catalogs. Woodworker's Supply (1108 North Glenn Road, Casper, Wyo. 82601; 800-645-9292) has a finishing supply catalog that has a complete selection of all types of dye stains. If you don't like to order through the mail, try regular fabric dye from your local grocery store; it's basically a dye stain. A pre-mixed, water-soluble dye gel made by Clearwater Color is available from Garrett Wade Co. (161 Avenue of the Americas, New York, N.Y. 10013; 800-221-2942). This product is good for staining vertical surfaces, such as cabinet sides, because the thick gel doesn't run down and make a mess (see the photo on p. 66). Bartley's makes a pigmented gel stain, which is available at hardware stores.

Chemical stains

While certain woodfinisher advocate the use of chemicals for changing wood's color, I'm thoroughly against it for several reasons. First, most chemicals used for wood coloring are strong oxidants or are highly caustic and dangerous if they come in contact with your skin. Further, some chemicals, such as potassium dichromate are very poisonous and potentially fatal if ingested. Worse, potassium dichromate looks like a bright orange-colored kiddie drink when mixed in solution.

The second reason to avoid chemical colorants is that they are unpredictable. They create color by reacting with chemicals naturally present in the wood, and results can vary, even in different sections of the same board. Worst of all, these chemicals can deteriorate (oxidize) the clear finish applied over them! Given the low cost and convenience of modern wood stains, there are plenty of reasons to steer clear of chemical colorants.

Mixing different stains together

If you don't see the color you want on the manufacturer's chart, you can often mix stains from different cans in various proportions to achieve the desired color. The catch is that not all stains have the same vehicles (water, oil, alcohol); some types can be mixed and others can't. Further, all oil-based stains will mix with all other oil-based stains regardless of brand. To be



Sludge settles out of a pigmented stain because the color particles are in suspension. The particles are not dissolved in solution as in a dye stain.



Stains can be mixed or applied in layers. Solvent-compatible stains can be mixed together in the can and applied at once, here over cherry (left sample). Note the difference in the right sample showing the same three stains applied one at a time (from top to bottom): unstained cherry, yellow, reddish mahogany and medium-brown dye stains.

safe, you can always restrict yourself to the same brand name and type. The same goes with water-based stains. Manufacturers sometimes mix two different types of stains together, say, an oil-based pigmented stain and an oil-based dye, for certain colors or special applications. But I'd avoid this practice because it usually brings out the bad qualities of both types and minimizes the good ones.

If you're unsure about the vehicle type of a stain, there are a couple of simple tests you can do. First, smell the stain before-it's stirred. It's probably an oil-based pigmented stain if it smells like mineral spirits, and there's a layer of sludge on the bottom of the can (see the photo at left). In contrast, if a drop of stain in a glass of water dissolves, the mixture is probably a water-soluble dye stain. A drop of oil-soluble dye stain will just sit on the surface of the water.

Layering stains for better effects

If you are trying to match an existing finish of a commercially produced piece, chances are the original stain was applied in *layers* rather than all at once. Even if you mix exactly the right shade and hue of color in the can, sometimes the results just aren't satisfying on wood. It is not uncommon for commercial finishers to apply a brightly colored dye stain first to bring out the grain, followed by a wood-toned pigmented stain to even up the color. In practice, I often stain the wood initially with a yellow dye stain before applying additional layers of reddish or brownish stains (see the photo at left). I find this tends to bring out the inner figure and heighten the luster of woods, such as cherry, mahogany and walnut.

Another advantage of layering is that it allows you to mix different stains, even if they're not compatible. Nine times out of ten, you'll get away with it. Even if there's a problem, you can try changing the order in which the stains are applied (save any oil-based/self-sealing stains for the last layer). For a dramatic effect, try applying a dark stain to an open-grained wood (such as oak or ash); then lightly sand before applying a lighter-color stain. The dark color remains only in the open grain while the lighter stain colors the surrounding areas, creating a high-contrast effect. Again, experimenting will show you the true effects, and perhaps you'll discover a color effect you couldn't have gotten out of a can. □

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