The Art of COLORING WOOD

A WOODWORKER'S GUIDE TO UNDERSTANDING DYES AND CHEMICALS

BRIAN MILLER
MARCI CRESTANI
PHOTOGRAPHY BY MARC CARTER

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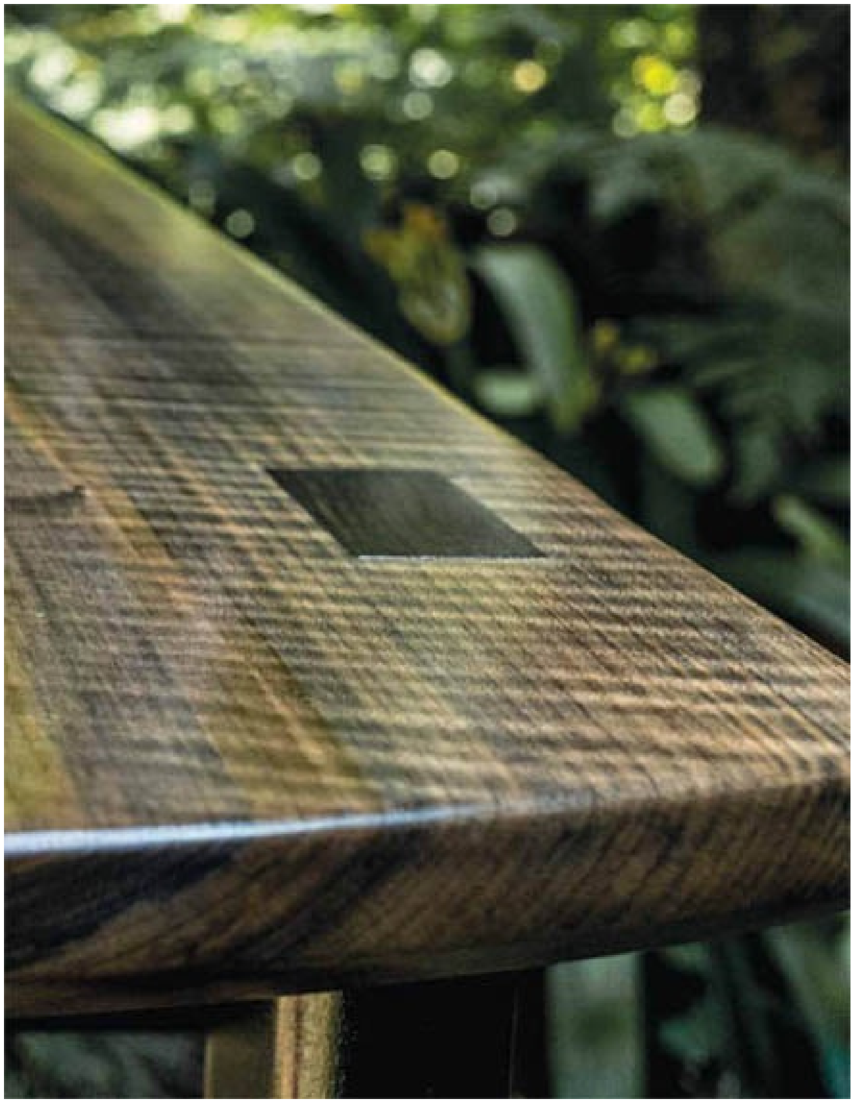

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Linden Publishing
Fresno

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by Brian Miller and Marci Crestani

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Critical Warnings to Read and Heed Before You Begin!

Most chemicals presented in this book are poisonous and/or carcinogenic if ingested and/or inhaled. Take care to keep all chemicals from contact with bare skin and clothing.

Cautionary Notes:

1. ALWAYS wear gloves, eye protection and a respirator mask when handling chemicals.
2. NEVER use chemicals to color any wood that will be used in food preparation or serving, such as cutting boards, salad bowls or serving utensils.
3. ALWAYS thoroughly clean your work surface after working with chemicals.
4. ALWAYS properly dispose of your chemicals and solutions under the guidance of your local waste management or environmental agency.
5. NEVER mix chemicals at the same time in the same container within the same solution. Each chemical should always be formulated in its own solution in its own container. If you want to use more than one chemical to color your wood, make up a solution of the first chemical, apply it and let it dry. Then make up a separate solution in a clean container for the second chemical and apply it.
6. NEVER SPRAY CHEMICALS. Always apply chemicals with a brush or sponge.
7. ALWAYS properly store your chemicals in non-reactive containers (such as glass or plastic) in a dark, cool location.
8. ALWAYS KEEP CHEMICALS OUT OF THE REACH OF CHILDREN!

One Final Note:

The most efficient (and least confusing) way to research the potential health, safety, environmental and reactivity risks of a particular chemical is to look up its MSDS (Material Safety Data Sheet) or its SDS (Safety Data Sheet). It is much more efficient to search by the chemical's precise name than to search the internet under the broad category of "SDS for Chemicals." Many of the latter sites require a subscription or are very easy to get lost in!

So for example, if you are interested in using potassium dichromate, search "SDS for potassium dichromate." And by reading through several of the results pages, you should gain an understanding of the risks involved. This book shows you the rewards.

Introduction: Why Color Wood?

For centuries, wood has been colored with chemicals and dyes. The question is: Why? The answer has remained the same: Chemicals and dyes enhance the color of wood and impart a deeper aged richness by accentuating the grain pattern in a way that stains and clear coat finishes do not.

As you will notice throughout this book, we refer to the process of “coloring wood.”

If there is only one thing that you take away from this book, we hope it is this: that you no longer use the words “dye” and “stain” interchangeably! They are two separate processes with two separate results. The one thing they share in common is that they both *color* wood . . . but with quite different effects. Chemicals and dyes color the fibers of the wood without leaving a residue. Light is able to travel into the wood and reflect back, revealing the grain pattern with a great degree of clarity. Stains deposit pigments into the pores of the wood and trap the light, which obscures the grain pattern.

Woodworker Lilly Plasencia wanted to do something outside of her comfort zone by trying some of the techniques she learned in Brian's finishing class. Her oak table is spray-dyed with Arti-Dye #138 blue and then grain-filled (highlighted) with gold Cres-Lite metallic powder.

The base of Marci Slade Crestani's table is actually made of maple dyed a deep brown color. She wanted the durability, weight and quiet grain pattern of hard maple but preferred a darker colored wood base to highlight the quilted maple top.

To illustrate the difference in terminology, it's as if you ask someone what they are cooking for dinner, and they say, "I'm going to boil some steaks." Then you ask someone else, and they tell you, "I'm going to grill some steaks." Both steaks are cooked. But the flavor and appearance between the two is very different. So it is with coloring your wood with chemicals and dyes versus coloring your wood with stains. Chemicals and dyes improve the flavor of the wood without masking it as stains do.

Beyond the choice of coloring agents (chemicals, dyes or pigments) available, there are also a number of additional methods for coloring wood that are covered.

Wanting to give an old-world patina to the contemporary design of her walnut table, Marci Slade Crestani applied a solution of potassium dichromate to it.

The point of coloring your wood by any method or medium, however, is to take your project to the next level of craftsmanship. As you are about to discover, there are many reasons to color wood: to heighten or shift tones that are already present in the wood or to completely alter the wood's color to the tone of another species or to let loose and play with non-wood colors. The results—as you can see by a few of these projects—are worth it.

An admirer of Charles and Henry Greene's Craftsman designs, German Lucero made this stunning mahogany nightstand and wanted to recreate the Greene & Greene signature patina. Instead of using potassium dichromate as they did, German color-matched the chemical's effect with Mohawk Ultra-Penetrating Stain (inaccurately named because it is actually a dye) Dark Red Mahogany and Raw Sienna.

Gene Leslie is not intimidated by working with sodium hydroxide (lye), having colored his kitchen cabinets with it. He applied a very mild solution of the chemical on this cherry box and colored the walnut sides with India ink.

Both of these quartersawn white oak boxes crafted by Tony Fortner were fumed with ammonium hydroxide for the same length of time. One is notably darker than the other due to the presence of more tannins in the wood.

1

How the Art of Coloring Wood Developed

The centuries-old art of coloring wood with chemicals and dyes owes a huge debt to the textile industry. It was craftsmen in the latter trade who developed coloring techniques that were formulated with plant materials, chemicals and/or animal parts.

Some of these old methods may seem outright weird to us nowadays. For example, back in the 1800s, if you wanted to achieve a red color, you were advised to use the intestinal liquor of a sheep, along with its dung and blood. And you were instructed to advise the butcher to stir the blood really well to prevent its coagulating. Animal urine was also a frequent ingredient in dye solutions. If you were dying textiles, you were sometimes further advised to soak the fabric in water containing animal bones in order to make the color more long-lasting.

Historically, wood furniture had been “colored” primarily through decorative inlays of other non-wood materials, such as mother-of-pearl, tortoise shell, ivory, brass, pewter and precious stones for example. Over time, the increasing availability of exotic woods—due to the growth of the worldwide shipping trade—spurred advancement in the art of marquetry, which was referred to as “painting in wood.” Veneers of various exotic woods were cut and pieced together to form pictures.

However, some colors, like blue and green and true red, are just not found in any species of wood. At best they may be discovered in very light shades inside timber when the wood is first cut, but these colors quickly fade after cutting as the wood is exposed to oxygen and light.

As coloring techniques in the textile industry advanced rapidly, the desire to color wood with chemicals and dyes gained momentum. Textile dyers were highly specialized craftsmen. For example, you could specialize in coloring silk while another person would be an expert in coloring cotton. Or else you could be an expert in a particular color, such as red, and you would know how to treat any type of fabric with this color. A sub-specialty of these branches would be to specialize in coloring whole cloth or just the threads or yarns of a particular type of fabric.

While most dyers took their secrets with them to the grave and because books were prohibitively expensive, the art of coloring with chemicals and dyes was largely learned through private practice. General knowledge of which plants or chemicals produced which colors was easy to obtain but the fine art of doing it well was achieved overwhelmingly through individual trial and error.

A Sampling of Historical Plants for Dyes

AMERICAN BARK, aka **QUERCITRON** produced a yellow color and was obtained from the bark of quercus nigra. Its discovery is largely attributed to Dr. Edward Bancroft in the late 1700s and his name for the dye combines references to its source material (quercus) and its color (citron). Books published in that time noted that the English government passed an Act of

Parliament granting Dr. Bancroft the exclusive privilege of using quercitron as a dye. Perhaps explaining this great honor is the fact that decades after his death, Dr. Bancroft was outed by the British government as being a double agent for both the United States and Britain.

Some coloring agents do not produce the same results across all species of woods. They may highlight the red tones on one species and the yellow tones on another.

INDIGO produced many shades of blue depending on the plant variety used. Written recipes from the 1700s and 1800s would often instruct the reader to use "the best indigo."

MADDER produced a red color. An 1830 recipe for dying a pound of cotton instructed you to thoroughly mix 20 pounds of liquid sheep's blood in a kettle of water before adding two pounds of madder.

SAFFLOWER produced both yellow and red colors, depending upon which plant variety was used for the source material. The yellow color was sometimes referred to as "bastard saffron."

TURMERIC produced a yellow color but it was referred to as a "fugacious" (fleeting) color. Dyers were known to add a little dragon's blood to the solution to tame the intense yellow. The name "dragon's blood" is more dramatic than its actual source. It is a resin that comes primarily from the treelike dracaena plant and was often used for medicinal purposes.

BRAZILWOOD and **COCHINEAL** were also used extensively as a red dye, and we cover both in this book. Unlike our recipes for these dyes, recipes from the 1700s and 1800s called for extra ingredients. To cochineal they added the intestinal liquor of the sheep, along with its dung and blood. Their recipe for brazilwood was bolstered by dissolving the dye in stale urine. Don't worry—we prefer using distilled water.

A Sampling of Historical Chemicals for Dyes and Mordants

Chemicals were used primarily—but not exclusively—as mordants in previous centuries. (We discuss the role of mordants in Chapter 15 of this book.)

A mordant is a chemical that "fixes" a dye in the wood. The most popular chemical mordant was **ALUM** (also known as aluminum potassium sulfate).

AMMONIA, NITRIC ACID, and **IRON ACETATE** were all used for centuries to color wood and we cover them in this book.

COPPER produced a greenish shade to use on light-colored wood. Historical recipes from the early 1800s call for the dyer to expose copper plates to the husks of grapes, which are high in acetic acid. A bluish-green rust develops on the plates and this rust (called verdigris) is scraped off and used as the dye. It was widely agreed that the best verdigris is made in France. Hmmmm . . . any relation to the widely held notion that the best wine also comes from France?

COPPERAS is now widely known as ferrous sulfate (which we cover in this book) but in books from the 1800s it was considered to be too well-known to need description! It produces bluish/grayish tones.

SULPHERET of **ARSENIC** produced a yellow color. We think there are plenty of more pleasant ways to achieve a yellowish color.

TIN produced a scarlet color when dissolved in nitric or muriatic acid, according to books from the 1700s.

While the use of plants and chemicals as dyestuff remains current, the use of animal parts in the coloring process for wood has died off over the years. Excuse the pun.

2

Wood Samples

The funny thing about woodworkers is they typically have very decided tastes on which woods they like. . . . and even more decided tastes on which woods they don't like! We debated which six species should be the "guinea pig" samples for the coloring processes presented in this book and decided upon maple, quartersawn white oak, mahogany, walnut, cherry and alder. These woods are probably the most consistently popular with woodworkers across the country and across a variety of design styles.

Now there are a few considerations in choosing a coloring treatment for wood.

Three of the species in this book—*oak, mahogany and walnut*—are open-grained woods, which means that no matter how highly sanded they are, there will still be open crevices in the wood so that when finish is applied, there will not be a glass-like smoothness and sheen to it. If you were to run your fingernail across (rather than with) the grain pattern, you will find that it catches in the crevices. This feature expands the choices you have in ways to color your wood—for example, you can do grain filling!

Another aspect of wood to take into account is how *UV stable* it is. Over time, wood either lightens or darkens to varying degrees as it is exposed to light and polishes. Wood does not necessarily have to be in direct sunlight for these color changes to occur. The aging process that shifts the color of the wood is called patination. You may have heard of someone referring to an antique piece of furniture as having a "beautiful patina." This means that the wood has developed a deeper, richer coloration that imparts a sense of history. Even the tones on the simplest of woods—such as pine, for example—will become heartily enhanced over time through patination. Chemicals and natural dyes will instantly lend a patinated effect to wood.

Mahogany, cherry and walnut are relatively quick to patinate—with mahogany and cherry going darker and walnut lightening over time. Oak, alder and maple are the most UV stable in this group of six. Consequently oak, alder and maple tend to patinate more slowly but they all do eventually darken as they age. Chemicals and dyes will not prevent lightening or darkening from occurring. Therefore, you should always consider the background color of the wood and in which direction it will patinate over time in choosing a coloring process—and in deciding how strong to make your formula.

One of the most prized features in wood is when it has *chatoyance*. This refers to a radiant, shimmering effect in which undulating rays of light seem to ripple across the grain, and these rays appear and disappear depending on the angle from which you view the wood. Chatoyance is amplified with chemicals and dyes, but deadened with stains because the pigments in stains trap the light.

The downside of some woods is that they are prone to blotching. Even though they are closed-grained woods, cherry and maple will have varying densities within their cell structure which means that these species will absorb liquid unevenly. This leads to notably darker patches in what is referred to as the "softer" part of the wood.

Some people think blotching adds a more "real" look to the wood, highlighting its character. And then there are others who regard blotching as a disappointing mistake.

Fortunately there is no shortage of advice on how to prevent it. The blotch issue provokes as much passion amongst woodworkers as the chili issue does amongst cooks. And everyone thinks their way is the best. You can go online to one of the woodworker forums for a range of ideas. The typical way to prevent blotch is to pre-treat your wood with a thinned-down version of your finish coat before applying chemicals or dyes. Brian typically does not pre-seal the wood to prevent blotch if he is applying chemicals or water-based dyes. However, he will do it if he is applying a stain because stains will make blotch much more apparent.

Another issue to consider when coloring wood is the presence of *sapwood*, which is the newest growth found directly under the bark. Obviously all species have sapwood, but its presence is more visually dramatic in walnut and cherry because sapwood is significantly lighter in color in contrast to the inner, older heartwood. Some woodworkers cut away the sapwood and use it for less visible aspects of a project, like the bottom of a drawer for example.

If sapwood is present on the outside of a project, though, you should know that it will not accept chemicals the same way as heartwood because sapwood does not contain tannins, which is what chemicals react to. (This issue is more thoroughly discussed in the Introduction to Chemicals chapter.) You can always apply a synthetic dye to the sapwood to bring it up to the color of the heartwood, but the heartwood will still patinate over time, while the sapwood will not—so in effect, you are just delaying the inevitable difference in tones that will ultimately prevail.

Of the six wood species featured in the book, alder and mahogany probably undergo the most significant transformation into a richer and more diversely colored wood when chemicals and dyes are applied.

Maple

Maple is characterized by its strikingly pale (critics would say boring) tones, subdued grain pattern, and dense pore structure. It is a closed-grain wood, and as it ages, it eventually develops a warmer yellowish patina. However, in the meantime, some people are not keen on maple's light color and yet they desire its durability. This is where chemicals and dyes make the difference, providing a dramatic and immediate change in the appearance of the wood.

Woodworkers are more attuned to the differences between hard maple and soft maple, but basically hard maple (also called rock maple or sugar maple) is more frequently used for flooring, cutting boards, workbench tops and other things that require a high-density pore structure.

Soft maple is an umbrella term for any maple that is not hard maple—such as big leaf maple, box elder, and red maple for example. While not the workhorse that hard maple is, soft maple is nonetheless quite tough compared to other hardwoods.

Unfortunately, maple does not accept stain well. The pigments in stains lodge more heavily in the softer parts of the wood, which leads to a blotchy look. This is much more apparent with lighter stains. With darker stains, the blotching tends to add a background character.

Oak

Oddly enough, the distinguishing feature between red and white oak is not necessarily the color but pore structure. While both are open-grained wood, white oak has much finer pores and an inherently straighter grain pattern. This book features quartersawn white oak.

White oak in particular is also known for its sometimes striking *medullary rays* (also known as *ray fleck* or *ray flakes*)—highly pronounced semi-translucent ribbons of either a lighter or darker color that swim across the overall grain pattern. These medullary rays are greatly enhanced when oak is colored with chemicals—especially with the fuming process.

Well-known designers Gustav Stickley and Frank Lloyd Wright often chose quartersawn white oak as the best fit for their furniture—furniture which now resides in museums or in the homes of collectors with deep pockets. They typically fumed their wood to both darken it and to accentuate the medullary rays.

On the other end of the oak spectrum, flat-sawn red oak has the dubious distinction of being associated with the orangey-stained, coarse-grained kitchen and bathroom cabinetry of the 1970s and 1980s. Often the wood for these cabinets was milled to optimize a log's yield rather than the lumber's beauty.

The best way to minimize the jarring effects of mismatched boards and dark-grained cathedrals in this case is to darken the wood with stains. Even though we are not big fans of stains—as you will discover over the course of reading this book!—they are the best solution for improving the look of flat-sawn red oak. This is because the porosity of the wood is very even so it accepts stains well. The other option is to ebonize it.

Cherry

In addition to its luminous reddish coloration, cherry has two distinctive identifiers. First are the pitch pockets or gum spots. These appear as black streaks of varying short lengths. Also interrupting the grain line are occasional pin knots—tiny dark spots with a mini-whorl of lighter brown encasing them.

Most cherry that is milled today is black cherry. It is widely available across the United States and was commonly used in kitchen and bathroom cabinetry in rural areas of the country.

> If, when working on a project, some cherry boards are lighter than others, a quick way to "marry up" the color is to leave the lighter boards out in the sun to darken them.

Cherry is notoriously UV-unstable—its color deepens almost majestically over time. However, a cautionary note is in order. If, for example, you place a cherry table directly in the sun and have a lamp on it, you will discover that the covered wood is notably lighter than the rest!

Like walnut, cherry has sapwood; like maple, it is prone to blotching. Despite these caveats, cherry has an undeniably friendly warmth that is accentuated with the application of chemicals and dyes.

Alder

Alder is so similar to cherry that it is sometimes affectionately (and sometimes derisively) referred to by woodworkers as “poor man’s cherry” because you get a surprisingly similar look for a lower price.

The grain pattern of alder can be confusingly similar to cherry, although it tends to generally be more uniform. The dark streaking caused by pitch pockets in cherry is replaced by what look like fine cracks of varying lengths on the face of alder. Both woods have pin knots. Alder is not as prone to blotching as cherry is, although it is more pronounced when coloring with stains as opposed to chemicals or dyes.

However, alder has a more subdued and consistent coloration than cherry. Also, alder weighs less because it is softer and not as dense. Unfortunately, this means it is more susceptible to dents and dings. Another characteristic of alder that distinguishes it from cherry is that it has no sapwood.

Mahogany

Like oak, mahogany also has a history of being both a high end and a low end wood.

Cuban mahogany is hands-down the premium mahogany, but it is no longer available due to extreme over-harvesting. A deep, lustrous coloration and an extremely tight grain pattern made it a prized wood for high-end furniture, particularly Chippendale and French empire.

Honduran mahogany—also known as genuine mahogany, or big leaf, American or Brazilian mahogany—is a somewhat expensive substitute. More commonly available is African mahogany, which can sometimes have an undesirable pinkish cast to it. (There is a dye recipe here for how to neutralize that tone!) “Ribbon-striped mahogany” is an African mahogany that features bands of lighter and darker colors that are best revealed when the wood is quartersawn.

Mahogany imposters include Philippine mahogany (aka lauan), Santos and red mahogany.

> You can easily make inexpensive mahogany look like the good Honduran mahogany through the use of chemicals.

Walnut

Most walnut that’s available in this country is black walnut. A considerably more expensive type of walnut is claro walnut, which features exquisitely deep warm reds, browns, yellows, and maybe even purples swirling alongside each other down the length of a board.

However, usually when we think of walnut, we envision a warm, rich brown hue. This idea of walnut’s coloration is what furniture manufacturers reproduce through stains nowadays when they advertise products made of less expensive woods as having a “walnut finish.”

In truth, though, black walnut can sometimes have a pinkish or grayish cast to it and the depth of its brown color can vary from light brown to an even lighter brown. As a rule, walnut goes lighter over time rather than darker. Applying chemicals and dyes will not prevent this lightening but will make it less noticeable.

African, Caribbean, Patagonian and Brazilian “walnut” (also known as “ipe”) are not true walnuts because they come from a different genus.

Alder

Cherry


Mahogany


Maple

Oak

Walnut

3

Supplies You Will Need

In the recipes that follow, you will need some of the following supplies. Bear in mind that it is usually far less aggravating if you gather in advance all the supplies you'll need before you begin.

Brushes

For most recipes, you will need two brushes. The first brush will be used to wipe off the sanding dust and *swarf* (miniscule wood chips from machining that have lodged into crevices and corners) before applying color. A chip brush (one of those inexpensive throwaway bristle brushes) works well for this.

A dedicated dust brush will serve you well. Typically this is an older high-quality brush that is past its prime but still works well for removing dust on flat surfaces. To remove dust and swarf out of corners and filigrees, compressed air is most effective.

The second brush is for applying the final formulation of chemicals and/or dyes to your actual project. For water-based recipes, you'll need a high quality synthetic brush that's made of nylon bristles or a blend of nylon and polyester. You don't want to use a natural bristle brush for any compound that is water-based because the water dries out these bristles, causing the ends to splay as the brush dries.

Oil-based formulations, such as some grain filling and stain recipes, will require a high quality natural bristle brush.

What is a "High Quality" Brush?

For starters, the bristles are cut to different lengths, and the bristles have split ends called flags. There will also typically be three rows of bristles in the ferrule. Pronounced "feral" like the wild cat, the ferrule is the metal band that wraps around the bristles on the handle.

A high quality brush has a raw wood handle—not a painted or varnished one, because paint and varnish can dissolve in acetone when you clean the brush. Consequently you could end up with flecks of paint and/or varnish lodged in between the bristles, and these could flow out onto your project the next time you use the brush.

Finally, a high quality brush is packaged inside a cardboard "keeper" that snugly fits the bristle part of the brush, helping to maintain its shape. Keep the keeper! It's for everyday storage.

It is well worth spending money on a good brush for three reasons: a good brush holds more material, it releases the material more evenly, and it will give you years of decent service.

Brush Rest

If the container holding your solution is rightly sized, you can simply rest your brush across the top of it while working. Otherwise a piece of scrap wood or even the clean top of a plastic food container will suffice. Never rest your brush in the solution.

How to Clean a Natural Bristle Brush

Always clean your brushes as soon as possible after you are finished using them.

It is not good practice to clean a pure bristle brush in water. Water contributes to drying out the bristles, which will eventually lead to their ends splaying. Water is fine for cleaning synthetic brushes but it is preferable to clean natural bristle brushes in solvents. Here's how to do it:

1. Prepare three containers of solvents. You will need three one-gallon containers: two filled with an inch of acetone and one filled with an inch of paint thinner.

Tip the first container of acetone to make a deeper pool. (This minimizes the amount of acetone you have to use!) Dip the brush into it, squishing it down against the bottom and sides of the container and jostling it around to get as much of the material out of the brush as possible. Remove the brush and turn it upside down so that the solvent flows back up into the heel of the brush where the bristles meet the ferrule.

Use a wire brush to pull the material down out of the bristles.

2. Spin the brush. Use a brush spinner—a great investment for high-quality brushes!—to remove the excess liquid. If you don't own a spinner, then put the brush between the palms of your hands and energetically rub your hands back and forth. Just be sure to do this away from your face! Or tap the brush against a hard surface to rid it of the excess.

3. Repeat this process by dipping the brush into the second container of acetone, cleaning the bristles as before. Again, spin the brush to remove the excess liquid.

4. Repeat this process by dipping the brush into the container of paint thinner and thoroughly doing a final cleaning. The paint thinner serves as the rinse coat and will not hurt the bristles. Then vigorously spin the brush.

5. Wrap the brush in its keeper. A high quality brush comes in a cardboard keeper that typically comes with a velcro tab to close it up. The keeper helps the brush maintain its shape and will also prevent the bristles from separating into individual strands at the ends.

If you don't have the original keeper, then wrap the brush in heavy butcher paper or rosin paper to keep the bristles nicely aligned because they do want to splay out if left unwrapped. Newspaper isn't the most ideal paper because it wants to tear and isn't stiff enough. Lay the wrapped brush flat or hang it up to store it so that the bristles don't dry in a bent shape.

Cleaning a synthetic brush is much simpler than cleaning a natural bristle brush. Wash it in warm soapy water and rinse with clear water. Vigorously spin it with a brush spinner to remove the excess water. Wrap it in its keeper.

Before using a new brush, first clean it with the solvent you're going to subsequently use to clean it. Most new brushes will lose a few bristles. This is particularly true with a natural pure bristle brush.

Distilled Water

You *always* want to use distilled water instead of tap water when working with chemicals and dyes because there is no chlorine or other trace elements in distilled water like you might find in your tap water. Distilled water is pure and will not interfere with the color.

Gloves

Wearing gloves is absolutely essential when working with chemicals (some of which are carcinogenic) and dyes (which can be difficult to wash off your skin). Disposable latex or nitrile gloves are fine. Big-box stores and many paint stores carry them.

An easy way to put on latex or nitrile gloves is to blow into them first—like you are blowing up a balloon. Be sure to get your fingers all the way down into the tips of the gloves so there are no loose creases. This makes it easier to handle measuring spoons and a brush. Also if you are applying solutions to your project with a rag and are dipping your fingers into the solution, it will prevent the liquid from pooling within the creases and then dripping onto your project.

Mask

You should always wear a mask when working with chemicals and dyes. If you want to prevent your glasses from fogging up, buy a mask with an exhalation valve. An N95 polypropylene disposable mask is suitable.

Measuring Spoons and Cups

Don't ever use your kitchen measuring spoons and cups! Buy your own dedicated set. Really cheap sets are fine because the point is not that the measurements are dead-on accurate. What matters is to have consistent ratios of ingredients so that the solution is the same whether you mix and apply it in one session or in ten sessions.

If the spoons or cups you will be using come on a ring, remove the ring and only put the ones you need on your work surface. This way you only have to wash one spoon or cup instead of an entire set. Even if you haven't used the others, there is a chance that they could have been in contact with toxic material or dye powders.

Some of the recipes call for very small measurements that sound like colloquialisms—a pinch and a smidgen—but you can buy a set of mini-measuring spoons that have individual spoons that are actually labeled a tad, a dash, a pinch and a smidgen.

Mixing Cups

The containers in which you mix the materials must be clean and non-reactive, such as glass or plastic. Large yogurt, butter and cottage cheese tubs work well. You can also use mixing cups that have measurements on them from paint stores, big box stores, or from online sites.

Rags

You will use rags to wipe the solution off your project and some people may even find it easier to use a rag instead of a brush to apply the color in some situations. Old white cotton tee-shirts are perfect because they are lint-free after so many washings. Cut around and discard the tee-shirt seams because they will remove the coloring material unevenly. Similarly, don't use sections of the tee-shirts that having printing on them because you don't know how that ink will react to chemicals and dyes.

Cut the rags to roughly 5" x 5" for small projects or furniture, or to 12" x 12" for wall panels. Of course, you could always buy a box of rags at a paint or big box store and these typically come pre-cut to 8" squares.

Rosin Paper

A clean surface is paramount for coloring wood because it enables you to keep better track of any spills of chemicals or dyes. Rosin paper—that weird shade of pink paper that comes in rolls and is available at home improvement stores or paint stores—is ideal. You can blue-tape it to the top of your work surface and you can write your recipes on it as you make up your color samples.

Rosin paper is preferred over newspaper because it's absorbent while simultaneously providing a good barrier between spills and your underlying work surface. Layers of overlapping newspaper don't provide the same protection and also, liquids can easily wend their way through the overlapping sections, and the print can transfer onto your wood.

Sandpaper

Stearate coated sandpaper is best because it doesn't clog up with sanding dust nearly as much as garnet sandpaper or aluminum oxide sandpaper. The samples in this book were sanded through five grits:120, 150, 180, 240 and 320.

However, some woodworkers don't like to use stearate coated sandpaper on bare wood because it can leave traces of zinc stearate behind, which can possibly lead to adhesion issues when you apply a clear coat finish. If you do plan on using it, be sure to thoroughly remove all the sanding dust before you begin.

Stir Sticks:

When mixing the formulas, the best stir stick is a tongue depressor because it is both wide and flat in the way that a spatula is when mixing batter. Their other advantage is that they are a neutral color so you can get an idea of the basic tonality of your solution before factoring in the background color of the wood. Tongue depressors are available from medical suppliers or from your friendly local doctor or nurse who is looking the other way.

If you run out of strainers and don't have time to go to the store to buy some, an alternative method is to use women's fine-mesh stockings. Cut about an 8" length that includes the foot. Strain your liquid through the foot.

Everyone Needs a Laugh

Brian ran out of cone strainers on a job one time. There were no nearby paint or hardware stores but there was a drug store, so he went there to buy a pair of nylons to use as a strainer.

"That's really sweet of you to buy your wife some nylons,"the older checkout woman said to him.

"Oh no, I'm not married!" Brian—who never wears his wedding ring when he's working with chemicals—told the woman. "I'm buying these for myself!"

The woman avoided looking at him for the rest of the transaction until she finally asked, "Do you want a bag?"

Brian replied enthusiastically, "No, that's okay! I'm putting these on in my truck as soon as I get to the parking lot!"

Later that evening when Brian recounted his mischievousness to his wife, Nancy, she told him, "That is wrong on so many levels!"

Coffee stirrers and chopsticks are not wide enough to be quickly effective. You could, of course, use scrap wood that is suitably dimensioned but it must be clean of shavings, dust and residue.

Strainers

Cone strainers made of heavy paper with mesh bottoms will capture any undissolved particles of chemicals or dyes, which could potentially leave a streak of color on your project if they were picked up by your brush. Of course, an acceptable alternative is a coffee cone filter. Paper towels are a last resort option because their natural absorbency presents additional challenges.

4

Prepping Your Wood for Color

It is best that the wood is sanded to 320 grit because this leaves it satin smooth to the touch without closing up the grain so tightly that it won't easily accept the color. The preferred progression of grits on unfinished, milled wood is 100, 120, 150, 180, 240, 320. However, everyone has their own comfort level with what grit they want to stop sanding. And most likely this goes without saying, but of course you should always sand with the grain and not across it.

Remove all sanding dust from your wood by either blowing it out with an air compressor, sucking it out with a high-intensity vacuum cleaner hose attachment or by sweeping it out with a soft, clean, dry brush. The air compressor is hands-down the most effective method.

Once you have sanded your wood to the highest grit that you've decided is appropriate for your project, you need to "raise the grain" if you are using a water-based chemical or dye. This is because when liquid is applied to your finish-sanded wood, small fibers will kick up—rise up—which will give the wood a slightly rough, furry feel when you run your hand across it. You want to mitigate the effects of this happening when you apply the color by intentionally raising the grain in advance. Then you will lightly sand these nibs off. Nonetheless, the grain will still rise when you apply the coloring but it won't be as severe.

It is imperative that you sand your project's scrap wood. You will need this scrap wood as test pieces for your formulas. It is more difficult to determine the true color effect of chemicals and dyes on unsanded scrap wood.

Even if you want to maintain a sharp edge on the wood you are about to color, you still need to gently break the edges with sandpaper so that the color can penetrate. Otherwise there is no surface area on that edge for the color or finish to adhere to, and you will be left with a visible line where the edge grain and face grain meet.

1. Use either a clean chip brush or a sponge for the most even application of water. The advantage of a sponge is that it will hold a lot of water; however, be sure to squeeze out the excess before using it. You can also use an old white cotton tee-shirt because it will be lint free. Do not use paper towels for this step because they can leave fuzz behind.
2. Dampen the applicator so that it is thoroughly wet but not dripping. You don't want the water to pool on the surface of the wood. Quickly wet the wood in the direction of the grain.

3. ALWAYS wet the face of the wood first and then the edges and ends. If you start with the edges and/or ends first and then get called away—or if the water dries too quickly—it can wick into the face and leave a watermark.
4. While the wood is wet, look for sanding scratches. If you see any, go back to the first grit and re-sand through all the grits. Also look for glue squeeze-out that may not have been as apparent when the wood was dry—and remove the glue because it will not accept any color or finish.
5. Let the wood dry thoroughly and naturally. Don't use a heat gun or let it dry in the sun because this could lead to warping. When the wood returns to its natural color again all the way around, give it a very light sanding with worn-down sandpaper (of the last grit you used) to de-whisker it. If you over sand at this stage, then you're defeating the purpose of raising the grain. In other words, you're just putting yourself back to square one. You just want to knock the nibs off. That's it.
6. Remove the sanding dust once again because it will interfere with the coloring process. You want to color the wood, not the sanding dust! Never use a tack cloth.

You can always use a UV light to inspect your wood for glue squeeze-out and fingerprints.

Fresh sandpaper is too aggressive for de-whiskering the wood after raising the grain. Take two pieces of the highest grit you used last and rub them against each other to knock the newness off . . . or just older, worn sandpaper of the highest grit you last used.

Also, don't sand with steel wool because steel wool fibers may break off and lodge in the wood—especially in open grain woods—and if you use a water-based coloring process or clear coat finish, the steel wool fibers can rust.

It is a pretty safe bet to say that despite raising the grain, there will still be whiskers after applying your color. Therefore, you don't want to do any sanding or de-whiskering until after you put your first coat of clear finish on because you run the risk of sanding through the color.

Sand very lightly with worn-out 400 grit sandpaper.

Tack rags do not get the dust out of the valleys in opened-grain woods and also they might leave a residue behind that will interfere with the finish.

If you are finishing your wood with an oil/varnish blend after coloring it, then apply one coat of the finish after the color solution has dried, following the directions on the can regarding how long to wait before wiping it off. Let it dry overnight. Totally flood the surface with your second coat and wet-sand it with 600 to 800 grit sandpaper in one long sweep—end to end across your project—rather than spot sanding. This will result in a much smoother finish after you remove the excess.

How These Samples Were Finished

In order to present an accurate comparison of the color effects of different processes, all the wood samples in this book were finished with the same clear coat finish process. This process used Deft Lacquer Sanding Sealer and Deft Clear Wood Finish Satin Lacquer that come in spray cans. Because lacquer dries quickly, airborne particles don't have much time to attach to it, which leads to a smoother finish with less sanding required. And satin lacquer photographs well!

Lacquer is an evaporative finish, just like shellac. Each coat melts into the previous coat. They don't layer on top of each other, like a varnish or a poly finish will. Because successive coats melt into each other, you get a perfect mechanical bond.

Hold the can about two inches above the wood and spray in a sweeping motion, beginning to spray before reaching the wood and ending the spray after passing beyond its edges. If you hold the can too high, the lacquer will evaporate before it hits the wood. Spray with swift confidence and always keep a fifty percent overlay with each pass! Spray in a cross-hatch pattern: first with the grain, and then across the grain.

Bear in mind that when using lacquer, you always spray the edges first and then spray the face of a project. Why? Because if you spray the face first and it's flawless, then you run the risk of having over-spray ruin that surface finish when you spray the sides and edges. Even though coats of lacquer melt into each other, over-spray is not going on wet enough to maintain that flawless finish. You will feel the over-spray when it dries.

After the sanding sealer has dried, sand the samples with worn-out 400 grit paper, applying very light pressure as you sand from one end to the other. Avoid spot sanding as it could leave marks.

The samples were subsequently sprayed with three coats of Deft clear satin lacquer. Lacquer should never dry in the sun because it is susceptible to "solvent entrapment" whereby the lacquer "skins over" before the solvent has completely off-gassed. This may lead to a blistered finish with tiny pimples.

The faster a finish dries, the less opportunity for airborne particles to attach to it. This is why the furniture industry usually chooses lacquer, because there's little to no sanding involved.

5

A Few Reminders Before You Begin

Always review the supply list and gather everything you'll need before you begin mixing formulas so that you are not left scrambling for necessary tools at an inopportune time.

Don't over sand after raising the grain. Just lightly knock off the nibs with highly worn sandpaper of the last grit you used. Always cover your work surface with rosin paper that is taped down.

Always level off the powder in the measuring spoon with a knife or a razor blade or a credit card before adding it to water. You need to keep the amounts exactly the same if you ever need to duplicate the recipe.

Always add the chemical or dye substance a little at a time while stirring the water to prevent splashing and/or clumping (in the case of powder).

Always strain the solution before applying it to the wood to prevent undissolved specks from leaving color streaks.

Don't mix up more solution than you need. Chemicals and dyes lose their potency when dissolved in water so don't make more than what you'll need for just a few days.

Always wash your hands before handling the wood to be colored so that the oil from your skin doesn't interfere with how the wood accepts the color. Even if you are wearing gloves, it's a good idea to minimize touching the bare wood because unbeknownst to you, you might have picked up a speck or two of chemicals that could rub off on your project.

Always write the formula on blue tape and stick it on its mixing container so that if you are working with multiple formulas—or multiple chemicals—you'll know which is which.

Remember that the color of the wood while it is wet with the solution on it is the color the wood will be after you've applied your coat of finish. The solution will dry lighter but then the clear coat finish will kick up the color again. With stains, however, it works in reverse: the stains dry lighter.

"Trust me. I have made every mistake there is to make in coloring wood, so if I say don't do something, don't do it!"
—Brian

Always use a synthetic brush for water-based solutions and a natural bristle brush for solvent-based solutions. Clean your brush immediately after you're finished.

Always apply the color to the face first and then the edges to avoid wicking. (The exception to this is nitric acid, whereby you apply color to the edges and end grain first.) And always brush the solution on with a fifty percent overlap of the previous brush stroke. You want to keep a wet edge going to prevent lap marks.

Don't dip your brush all the way into the solution or rest your brush in the solution because the chemicals can react to the metal ferrule. Also any excess solution trapped in the ferrule can possibly leak through when you resume work. You really only need to dip the first quarter of the brush's bristles into the solution because that is the only effective part of the brush. Dipping your brush deeper than that is pointless, because it can lead to dripping and makes the task of cleaning the brush more time-consuming. After dipping your brush into the solution, tap one side of the bristles against the inside of the container, turn it around and tap the other side to remove the excess liquid. When pausing while working, rest your brush across the top of the container.

Always use a rag to wipe the solution off the wood after you've applied it so that you will have an even application of the chemical or dye. This also prevents pooling.

Always write your recipes on the back of your samples immediately—so keep a pencil or Sharpie handy—and also mark which recipe you ultimately chose for your project.

Don't sand after applying color because you can easily sand through it. You may sand lightly after applying the first coat of finish. Always practice this sanding on scrap wood first so that you get a feel for how much pressure to apply.

Always clean off your work surface to remove any chemical dust or particles when you are finished. Similarly, always seal up and/or dispose of your solutions immediately.

Remember that chemicals don't work their magic on sapwood as they do on heartwood. Instead they merely deposit their own color there.

Always contact your local environmental or waste management agency for their particular directions on the proper disposal of hazardous waste materials.

Remember that all of the recipes presented here are merely starting points for you. You can make them stronger by adding more of the coloring agent or you can weaken the effect by diluting the solution with distilled water or solvent. Have fun experimenting with different formulas on your scrap wood! Just be sure to keep track of the formulas!

6

Introduction to Chemicals

Don't be intimidated by working with chemicals! Yes, some of them are carcinogenic (potassium dichromate) and others are caustic (lye, aka sodium hydroxide) or corrosive (nitric acid). And let's be honest here; the word "chemicals" these days makes people wary in light of the trend toward more natural products.

Handled properly, though, chemicals will bring a startling clarity to your wood by imparting an elegant patina, making the wood look richer, warmer and with a greater depth of character. This is due to the way chemicals—unlike stains—highlight(rather than hide) both the subtleties of grain patterns and the range of natural colors within the wood.

Before synthetic dyes were invented in 1856, furniture makers not only colored their wood with natural dyes but also with chemicals. Potassium dichromate, for example, was favored by Napoleon for its dramatic effect upon Cuban mahogany furniture created during the French Empire period in the beginning of the 1800s. Charles and Henry Greene were champions of applying ferrous sulfate followed by potassium dichromate to cedar and mahogany. Ammonium hydroxide, widely used for fuming oak, was favored by Gustav Stickley, and he was also a fan of iron acetate. When you think of these periods and/or designers, a particular color of wood comes to mind along with their designs—and that color was produced by chemicals.

You won't be working with a huge volume of chemicals. A little bit goes a long way in these recipes. The amounts of various chemicals presented here vary from as little as ⅛ teaspoon up to 1½ ounces. You can always adjust the amount of the chemical to darken or lighten the color.

The mound on top is potassium dichromate, below left is ferrous sulfate and below right is sodium hydroxide (lye).

Over the course of the last century, many woodworkers abandoned chemicals in favor of the less toxic synthetic dyes. Coloring wood with chemicals is now a specialized art.

The Advantages of Chemicals Over Synthetic Dyes:

- Chemicals are not as monochromatic as synthetic dyes. They produce a wider range of color variations within a board that is not as achievable with synthetic dyes. This is because chemicals and plant-based dyes react to tannins in the wood and the amount of tannin present can vary even within a single board.
- Chemicals don't impart a fake, manipulated color to the wood. Instead they enhance the wood's natural tones.
- Certain chemicals—like ferrous sulfate, for example—are more light-fast than synthetic dyes, which is an advantage if you are working outside or if your piece will ultimately be in a sunlit location.
- Chemicals impart a greater degree of clarity than dyes, whereby the wood's grain pattern is more delineated. It's as if you can see deeper into the wood.
- Blotching on maple and cherry is less evident with chemicals than with most dyes (excluding NGR dyes—non-grain-raising dyes) and stains.
- Sometimes you may need to use chemical treatments to be historically correct on a project, or to bring new wood up to matching an older wood's patination.
- All chemicals are oxidizers, which means they lend an aged look to the wood that penetrates deep into the fibers, thus resulting in a distinctive patina.

As they say, "Better living through modern chemistry!" We want to celebrate everything that the wood is and can be. We don't want to mask the grain pattern—which is what stains do. Chemicals accentuate it!

Tannic Acid Content in Wood

Species containing tannic acid include:
Birch
Cedar
Cherry
Douglas Fir
Lacewood
Mahogany
Oak
Redwood
Walnut
Zebrawood

Species containing little to no tannic acid include:

Alder
Ash
Beech
Maple
Pine
Poplar
Any kind of sapwood

This means that cherry and walnut will respond heartily to chemicals because they contain tannic acid but the sapwood in these species will not have the same chemical reaction.

Disadvantages of Chemicals Over Synthetic Dyes

- Many chemicals are carcinogenic and therefore must be handled properly to avoid coming in contact with your skin or being inhaled.
- Chemicals absolutely cannot be sprayed.
- People who prefer more monochromatic, even tones should use synthetic dyes to color their wood.

How Chemicals Work: Tannic Acid is the "Secret Ingredient"

There are three factors influencing the color imparted by chemicals: the background color of the wood, the strength of the chemical solution, and the presence of tannic acid in the species.

Applying Tannic Acid

Make sure you've raised the grain and dewhiskered the nibs before applying a tannic acid solution to your wood!

A starting formula for tannic acid to apply to finish-sanded wood is:

1 tsp of fluffy tannic acid added to
8 ounces of HOT distilled water.
Strain before applying.

Apply the tannic acid solution while it's hot because this enables it to penetrate more deeply into the wood fibers, which in turn will promote a more effective reaction when a chemical is subsequently applied.

Be sure the wood is completely dry before applying whatever chemical you have chosen to color your wood. And you do not have to lightly sand the wood after applying the tannic acid, even if the grain is slightly raised. Wait until after you've applied the chemical and the first coat of finish before de-whiskering the wood.

Always wear gloves and a mask when working with tannic acid, and be sure to store in a sealed container in a dry, dark place.

Basically, chemicals impart their color by reacting to tannins (popularly referred to as "tannic acid")within wood. This chemical reaction occurs immediately when the solution is applied to the wood. The higher the level of tannic acid that is present in a board, the more dramatic of a color change. Similarly, the stronger the chemical solution, the more dramatic the color change will be. Even within a single board there can be varying degrees of tannin.

A caveat: the exception to this explanation of how chemicals work is nitric acid. It works on any species—including those that do not contain tannins, such as maple and pine.

However, not all wood species contain tannins. Consequently, when a wood is void of tannins, there is no chemical reaction but the chemical may deposit its own color.

The solution to getting chemicals to work on woods that possess little to no tannic acid is to add tannic acid to the wood first. Fortunately, this is a simple fix! You can easily purchase various types of tannic acid powder that dissolve into hot distilled water and can be brushed onto woods like maple and alder prior to adding chemicals to it.

Tannic acid can be bought online as a dry powder in several different forms:

- Generic "fluffy tannic acid" is a light brown powder and is the most commonly used. It is derived from various sources but is typically refined to 75 to 80 percent concentrations. Because of this high concentration, chemicals achieve their most pronounced reactions with fluffy tannic acid compared to quebracho and catechu.
- Quebracho is a brown powder that comes from the quebracho tree and is used extensively for tanning leather. It is typically sold in 20 to 30 percent concentrations of tannic acid. You would use this as a less expensive alternative to fluffy tannic acid.
- Catechu—sometimes sold as "cutch"—is derived from acacia trees and is a light-colored granular powder. However, it also imparts a brownish tone and for this reason is sometimes used as a mild dye.

Fluffy tannic acid does not impart any of its own color to wood, so you might feel as if you are simply brushing water onto the wood. There is no set formula for how much tannic acid to add to wood that doesn't have it, but bear in mind that a stronger solution of tannic acid will produce a greater reaction when chemicals are applied.

The Effects of Tannic Acid

Chemicals will accent different tones within different species. This is why it is so important to test your recipes on scrap wood from your project. For example, potassium dichromate produces a hearty reddish cast on cherry, whereas it results in more golden hues on oak and meatier brown shades on walnut.


Maple has no tannic acid so this is the effect you'd achieve by just applying potassium dichromate. The chemical merely deposits its own color. (Surprisingly, however, potassium dichromate looks quite orange in the mixing bowl!) Note how the dichromate makes the maple look weathered as opposed to aged.


A sample of maple with a solution of tannic acid applied first, followed by potassium dichromate. You can see how the reaction of the potassium dichromate to the tannic acid has significantly altered the color of the maple, producing a blend of harmonious coloration. Why would you want to do this to maple? Perhaps you want maple's durability but not its color.

Ferrous sulfate is a tricky chemical on maple because it can produce a vast range of color effects with or without first applying a wash of tannic acid. On some maple, ferrous results in a grainy gray to dark blue cast while on other maple, you will see a spectrum of light blues and greens and browns. This variation in effect can occur on both hard and soft maple so it is imperative that you test the chemical and the particular concentration of it on samples of the same wood that you intend to color.

This soft maple sample with no tannic acid applied has one effect; the figured maple tabletop featured on pages ii and 31 has a totally different effect, and it too had no tannic applied in advance.

It is fairly obvious with this sample that the application of tannic acid did not improve the effect of ferrous sulfate on the maple. Tannic acid will improve the final flavor of maple with some chemicals but with others, the effect is not worth the effort of the 2-step process. As we have said repeatedly, you must make a sample because when it works, the results can indeed be spectacular. It all depends on the type of maple you have.

Warning!

Chemicals are poisonous if ingested. Do not let chemicals come in contact with bare skin.

Cautionary Notes:

1. ALWAYS wear gloves, eye protection and a respirator when handling chemicals.
2. NEVER use chemicals to color any wood that will be used in food preparation or serving, such as cutting boards, salad bowls or serving utensils.
3. ALWAYS thoroughly clean your work surface after working with chemicals.
4. ALWAYS properly dispose of your chemicals and solutions under the guidance of your local waste management or environmental agency.
5. NEVER SPRAY CHEMICALS! Always apply them with a brush or sponge.
6. ALWAYS properly store your chemicals in a dark, cool location. Use non-reactive containers such as glass or plastic.
7. ALWAYS KEEP CHEMICALS OUT OF THE REACH OF CHILDREN!

Most chemicals, once mixed into a solution, have a short shelf life of up to approximately two weeks before they lose their potency. It's always better to simply make up a new solution than to store a used one—unless, of course, you plan to use it within a day or two.

Potassium Permanganate

Originally we were going to include samples of wood that Brian colored with potassium permanganate, but we decided against it for two reasons:

1. The permanganate led to a uniform "just okay" color on most of the samples. Brian describes it as "generic brown furniture color." It is too much work for the color you get, and it is not as light-fast as other chemicals.
2. It is an incredibly labor-intensive process to apply permanganate for results that don't lead you to say "WOW!" when you see them. Because it is such a very strong oxidizer, potassium permanganate presents a mottled color when it dries. This means you have to lightly abrade the surface with a white Scotchbrite pad to even out the color before you apply the first coat of finish. You sand the whole surface but work the darker spots a little more intently. This is especially tricky because you don't want to sand through the color!

7

Ammonium Hydroxide for Fuming

This is the chemical name for ammonia, but the one used for coloring wood is an intensely more concentrated strength than the product you purchase for typical household cleaning, which varies from 5 to 10 percent concentrations. Ammonium hydroxide in a 28 percent concentration—found at pool supply stores—is used in a wood-coloring process known as fuming.

This color change is achieved by placing the wood inside a container—along with small open dishes of ammonium hydroxide. The container is then tightly sealed and left undisturbed for anywhere from 12 to 24 hours while the fumes work their magic. Historically, this process has been primarily identified with coloring quartersawn white oak but it works on any wood containing tannic acid or on wood to which a solution of tannic acid has been applied.

Be sure to wash your hands before handling wood that is going to be fumed because the natural oils in your skin will leave a telltale fingerprint mark on the wood during fuming!

Now technically speaking, you can brush the ammonium hydroxide onto the wood to achieve the same effect, but it is far less of a user-friendly process because of the intensity of the fumes! Also, brushing the ammonium hydroxide onto your project leads to grain-raising issues that are not found in fuming. The beauty of fuming is that the fumes do all the work for you. However, during the fuming process the color penetrates much more deeply than with other methods. Because of this it is very difficult to undo a fumed finish.

How to “Contain” Your Wood

The wood must be placed in an airtight container for the ammonia to work. So, how do you do that? “Airtight” is the critical component here because otherwise the fumes will leak out, effectively undermining the whole process.

Small projects can be placed inside a plastic storage container that you find at a hardware store or home store. The ammonia can be poured into small condiment cups available at fast-food restaurants for ketchup. Place these around the perimeter of the project. After the container’s top is snapped closed, take a roll of plastic-wrap from your kitchen drawer and wrap it several times around the perimeter of where the lid meets the container to thoroughly seal in the fumes.

Medium-sized projects require a little more ingenuity. Typically what is referred to as a fuming tent is constructed around the project. This involves constructing a frame using either 1" x 2" lumber or even PVC piping that is cut and taped together. The PVC elbow joints make this an easy process, and when you are finished fuming, you can break down the frame and store it for future use.

Brian Miller lightly fumed this quartersawn white oak office cabinetry to accent the striking medullary rays. Fuming it for a longer period would have darkened the wood. He then gave it a very light wash of potassium dichromate.

Cover this frame (with the project already inside) with painters' plastic sheeting that is at least 2 mm thick and tape the plastic along any seams to create a tight seal. Be sure the plastic is not touching the project. You want some airflow around the top of the project.

Fill the dishes with ammonia and position them around your project, then tape the whole thing closed—making sure to tape securely where the plastic meets the floor.

Large projects can go inside a rented box truck with the door sealed shut.

Rooms—Brian has fumed interior architectural millwork made of oak, cedar and mahogany by completely sealing the windows and doors in the room with plastic and/or tape and placing ammonia dishes inside the room before sealing up the exit door. The next day, wearing a respirator and goggles, he opened up the doors and windows, and fans were brought in to blow out the fumes.

Recipe for Fuming with Ammonium Hydroxide

You will need non-reactive dishes, such as glass or plastic (no metal) for holding the ammonia. Small margarine containers or the condiment cups from fast-food restaurants are perfectly sized for this.

There is no mixing formula. Instead, there are four variables that determine how dark your wood will become:

- The amount of ammonia you use.

- How long you leave the wood sealed up in the “tent” with the ammonia.
- The amount of tannic acid in your wood.
- The amount of air space in the tent. The less cubic feet of air space, the more concentrated the fumes will be.

You should experiment on scrap wood with how many dishes of straight ammonia are required, but bear in mind that a little ammonium hydroxide goes a long way! You must wear gloves, eye protection and a respirator mask. The key is to have everything set up and ready to go so that you can put the dishes of ammonia in the tent you’ve constructed and immediately seal it up.

The fumed samples pictured here were placed inside an ordinary plastic storage bin. Two two-ounce plastic condiment cups were filled about two-thirds of the way to the top with ammonia and placed in diagonal corners of the plastic storage bin. The bin’s top was put on and the lid was sealed with kitchen plastic wrap that was wound multiple times around the point where the lid meets the bin. It was then taped securely.

The project was left inside the container for twenty-one hours.

Half of the maple sample was treated with a basic solution of tannic acid before being placed in the bin. The treated half is significantly darker than the untreated half.

You will notice that two samples of oak were fumed, and yet one is significantly darker than the other. This is because the woods contain different amounts of tannic acid. If we had left the lighter one in the bin for longer, it may have darkened more. However, based on the amount of tannic acid in the wood, the color will eventually reach a saturation point where it will not darken further.

You can dispose of the ammonium hydroxide by placing the containers out of your way and letting the liquid evaporate.

Be sure to store the sealed container of ammonia out of the sun, because the sun will cause vapor expansion and the plastic bottle will swell. Store it lower to the ground, where the temperature is cooler. The shelf life of the ammonia is from two to three years.

If you want the bottom of the project to be fumed as well, elevate your project using painters’ pyramids or something similar.


Cherry


Mahogany


Maple


Oak 1


Oak 2


Walnut

8

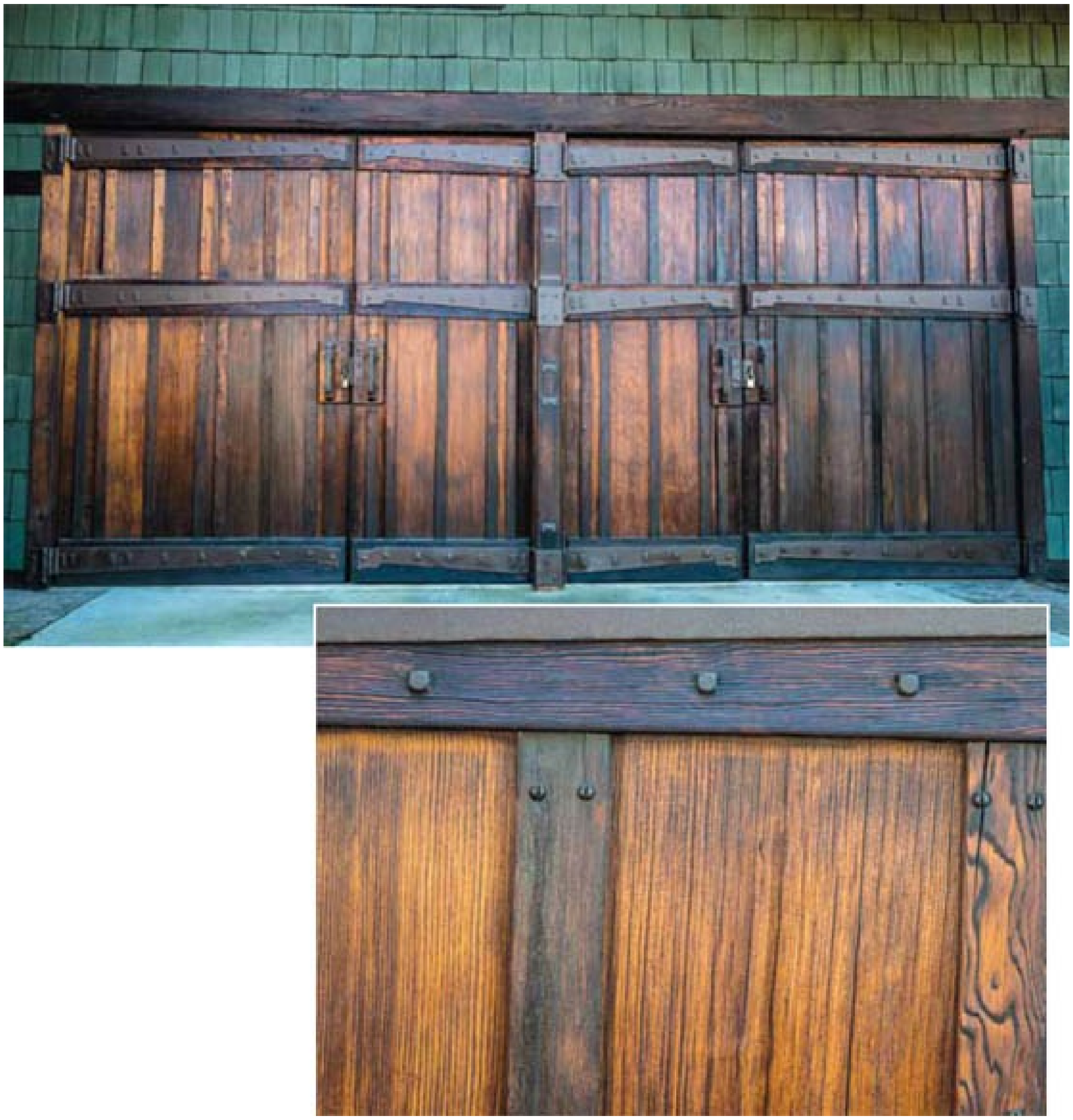
Ferrous Sulfate

Movie studios love ferrous sulfate when building outdoor sets because it instantly imparts a very natural-looking weathered—as opposed to aged—effect, particularly when applied to woods that contain tannic acid.

Maple entryway table by James Farrell. Maple contains little to no tannic acid. The top and drawers were treated with a wash of ferrous sulfate. the resulting array of blue, gray, gold and brown tones all highlight the maple's striking figuration. A pre-wash of tannic acid was not necessary to produce these results. The legs were ebonized.

Its gradations of gray tones on light wood are reminiscent of driftwood. If you want to retain the driftwood look of ferrous sulfate, don't use a lacquer finish because it has an amber cast. Use an acrylic finish, which is clear. Also bear in mind that ferrous sulfate darkens over time.

Sometimes ferrous sulfate is mistakenly called iron, but technically speaking, ferrous sulfate is a chemical compound while iron is an element. Over-the-counter ferrous sulfate available in pharmacies to treat iron-deficiency anemia contains additional ingredients and is therefore not a suitable substitute for the pure compound required to color wood. You can purchase the preferred ferrous sulfate from online companies specializing in wood finishing products.



Charles and Henry Greene treated the Douglas fir carriage-house doors of their famed Blacker House with ferrous sulfate. Subsequent owners painted the doors. In 2004 the paint was removed and the doors were again treated with ferrous sulfate.

Ferrous sulfate comes in the form of light greenish/gray powdery crystals. As long as it is stored in a tightly sealed bottle and kept in a dark place, it has an *almost* infinite shelf life. It is fine to dispose of ferrous sulfate down the drain because it is often used in conjunction with other compounds in the treatment of waste water to control odors and remove phosphates!

Other names for ferrous sulfate include green vitriol, copperas, and iron (II) sulfate.

As with all chemicals, you do not want to inhale or ingest ferrous sulfate. Always wear gloves, a mask and eye protection when handling it.

Architectural timbers on port cochere.

Charles and Henry Greene treated the massive Douglas fir timbers on the port cochere of their famed Blacker House with ferrous sulfate, knowing that it would patinate to a dark brown color over the years rather than a gray color. The timbers were last treated with ferrous sulfate in 1995.

Recipe for Ferrous Sulfate

⅛ tsp of ferrous sulfate
4 oz. hot distilled water
4 oz. cold distilled water

Slowly stir the ferrous sulfate into 4 ounces of hot distilled water. Mix until thoroughly dissolved and then add 4 ounces of cold distilled water. Mix thoroughly. Strain this solution into a clean container and apply when it has come to room temperature. Wipe the surface with a rag before the solution dries. Do not sand until after you have applied your first coat of finish.


Alder


Cherry

Mahogany

Maple

Oak

Walnut

9

Ferrous Sulfate + Potassium Dichromate

One of the most celebrated chemical combinations used to color wood is ferrous sulfate followed by potassium dichromate.

At the turn of the twentieth century, brothers Charles and Henry Greene were highly esteemed architects who had a prominent influence on the American Arts and Crafts movement. The scope of their work eventually evolved into designing the whole house: furniture and interior finishes as well as architecture. Perhaps their most well-known creations are the Gamble house and the Blacker house, both historical landmarks in Pasadena, California.

Brian has restored several Green & Greene homes, and worked with his team for two years refinishing the entire interior and exterior of the Blacker house after it was bought by Harvey and Ellen Knell in 1995. Although Brian came highly recommended to the Knells, they were understandably apprehensive about hiring someone they didn't know for a job that was so critical to the home's overall appearance.

"Don't worry!" Brian reassured the couple. "I just finished a six-week correspondence class in finishing, so I know what I'm doing!" Fortunately for Brian, the Knells know a joke when they hear one.

However, it was back when he was restoring Charles Greene's personal residence that he discovered the secret to the Greene's signature coloration. He knew they often used ferrous sulfate to color their wood, but he knew there was more than ferrous sulfate on the Port Orford cedar that figured prominently as architectural millwork throughout the house. He scraped a small sample of the wood and sent it to a chemical-analysis facility. The report listed evidence of chromium as well as ferrous sulfate, and Brian had an "Aha" moment when he realized the second chemical influencing the wood's color was potassium dichromate.

After much experimentation, Brian determined that the Greene's applied ferrous sulfate first, and after that chemical dried, they applied potassium dichromate. This was a very popular method for coloring wood in Europe during the early part of the twentieth century.

You can vary the strengths of both solutions to achieve different colors, but here is a starting formula:

Recipe for Ferrous Sulfate + Potassium Dichromate

First apply the ferrous sulfate:

⅛ tsp of ferrous sulfate
4 oz. of hot distilled water
4 oz. cold distilled water

Slowly add one-eighth teaspoon of ferrous sulfate into four ounces of hot distilled water, stirring continuously. When the crystals have dissolved, add four ounces of cold distilled water and mix thoroughly. Strain the solution into a new container and wait for it to cool to room temperature before applying it to your wood. Wipe off the excess with a rag.

While you are waiting for the ferrous sulfate to dry on the wood, make the potassium dichromate solution. If you have applied tannic acid to the wood before applying the ferrous sulfate, you do not need to apply another solution of tannic acid before applying the potassium dichromate. When you are certain that the wood is completely dry, apply the potassium dichromate solution:

1 tsp of potassium dichromate
3 oz. of hot distilled water
3 oz. of cold distilled water

Slowly stir one teaspoon of potassium dichromate into three ounces of hot distilled water. Mix until thoroughly dissolved and then add three ounces of cold distilled water. Mix thoroughly. Strain this solution into a clean container and apply when it has come to room temperature. Wipe the surface of the wood with a rag before the solution dries. Do not sand until after you have applied your first coat of finish.

Alder

Cherry

Mahogany

Maple


Oak


Walnut

10

Iron Acetate (Liquid Nightmare)

How can you not be intrigued by a chemical compound called “liquid nightmare?” Especially when a more appropriate nickname would be “liquid dream?” You don’t have to buy it. In fact, it is made out of inexpensive, readily accessible materials: cider vinegar and #0000 steel wool. And, liquid nightmare darkens most wood a few degrees shy of ebonizing—a dye-and-chemical process in which wood attains the deep, dark color of ebony but with the grain pattern still evident. In fact, liquid nightmare almost could be called Ebonizing Light. However, a more accurate chemical description of it is iron acetate.

George Frank, a legendary wood finisher—did not invent the process of liquid nightmare but he did stamp it with its memorable name. Mr. Frank was a renowned wood finisher in Paris whose work appears in museums worldwide. He is credited with elevating the practice of fine finishing into a respected profession. When he was first learning the craft, Mr. Frank watched his boss’s wife make a brew of old rusty nails and scrap iron covered with vinegar, which she let sit undisturbed for weeks until the mixture turned into a dark liquid that was strained and then used to color wood. Mr. Frank decided to recreate the recipe but he forgot a critical step in the process. His mistake was that he covered the jar tightly, and one night a few weeks later—during a dinner party no less—the jar exploded, spraying its contents everywhere. Hence the nickname Liquid Nightmare.

Recipe for Iron Acetate

2 pads of #0000 steel wool
1½ quarts of apple cider vinegar

It cannot be white vinegar because it needs the acid boost of the cider.

Loosely put the steel wool pads in a non-reactive container like glass or plastic and then pour the vinegar over them. Loosely cover the top and poke a few holes in it. As the acetic acid in the vinegar breaks down the steel wool, it creates an off-gas that will lead to an explosion if it is not able to escape.

After four or five days, strain the solution through a paper cone strainer. Test the color on your sample and adjust accordingly. Of course, if it’s too weak, you’ll have to start all over again—which is why it is better to make a strong first batch.

Apply the solution with a synthetic brush. Wipe the excess from the surface with a rag before the solution dries. Do not sand until after you have applied your first coat of finish.

Acclaimed furniture designer Gustav Stickley had his own rather loose recipe for making what he referred to as “Iron Rust. “He too threw iron filings, rusty nails or whatever small iron scrap he came across into a solution of vinegar or acetic acid. Woodworkers who make reproductions of Stickley furniture may not obtain the same coloration as the originals if they neglect to finish it with “Iron Rust” or a similar dye color.

Iron acetate is a “plan-ahead” technique for coloring wood because it takes four to five days for the solution to “cook.” It is better to make the solution really strong and then dilute it with distilled water if the color turns out too dark for your taste.

It should be stored in amber bottles in a dark place. Iron acetate loses its potency after a few months.

> “You have three ways of succeeding in your field. You can either be cheaper than your competitors, you can be better than your competitors, or else you can be so specialized that you don’t have much competition. To this day, I have always tried to be the best in my specialized field.”
> —Brian Miller

Alder


Cherry


Mahogany


Maple


Oak


Walnut

11
Nitric Acid

First we'll scare you: nitric acid is used in explosives and rocket propellants—although in much more concentrated forms. This explains why nitric acid is also known as "Aqua fortis" which in Latin means strong water. For the purpose of coloring wood, however, a 35 percent concentration is fine. Nonetheless, you still want to handle this odorless, colorless liquid with great care because it is unstable.

Besides being explosive or flammable in the right concentrations or if handled negligently, nitric acid can also be corrosive. For this reason it is used to etch copper or brass.

Now that we've raised your eyebrows, let us attempt to lower them. The main chemical produced from nitric acid is ammonium nitrate, which is used in fertilizers—and that is what its primary use is.

So why did we include nitric acid in this book if it comes with so many warnings? Some chemicals amplify the colors within certain species to spectacular effect (look at lye on cherry!) while these same chemicals have merely pleasing effects on other species (look at lye on alder!). Nitric acid—while tricky to work with—hands-down produces the most consistently warm enhancements of tones across all species. An additional benefit of nitric acid is that it does not rely on tannins in the wood for its magic to occur. Look at the sample of maple (a species containing little to no tannins) for proof. Nitric acid is an equal-opportunity coloring agent!

You can buy nitric acid at a chemical supply house. It is sold as a liquid and should always be stored in a dark glass bottle in a very cool place where it won't be jostled or disturbed—and should most definitely be placed out of the direct sun. Under these conditions it has a shelf life of roughly three years before it begins to lose its potency.

If nitric acid splashes onto your skin while you are mixing it, you should "irrigate" your skin for 15 minutes, that is, run cool water over the area where the spill occurred.

Step One: Applying the Nitric Acid

1½ oz. of nitric acid
8 oz. **cold** distilled water

Slowly pour the nitric acid into the cold distilled water while stirring.

Unlike the application of other chemicals, nitric acid is applied to the edges and end grain first—using the side of the brush. If you are concerned about the end grain becoming too dark, pre-treat it with distilled water immediately before applying the nitric acid. Then brush the nitric acid solution onto the surface of the wood.

It is not necessary to wipe off the solution with a rag as you do when applying other chemicals, because nitric acid "evens out" on its own and doesn't leave lap marks.

Step Two: The Heat Gun

Nitric acid tends to dry more quickly than other chemicals. After you are sure that the nitric acid solution is completely air dry, it is time to use the heat gun. The heat gun develops the color change. It would take days or weeks for the color to develop on its own if you did not use a heat gun.

Slowly wave the heat gun over the wood, holding it about 2 inches above the surface and constantly moving it along the wood. If you hover over one spot for too long, you'll burn the wood. You will see the rich color develop as you wave the heat gun over it, and you'll know you're finished when the color doesn't darken any further.

You have to use a legitimate heat gun because a hair dryer simply doesn't produce enough heat.

Step Three: Neutralizing the Nitric Acid

1 tbs of baking soda
3 oz. of hot distilled water
3 oz. of cold distilled water
A clean brush

Slowly add one tablespoon of baking soda into 3 ounces of hot distilled water and stir until dissolved. Then add 3 ounces of cold distilled water and mix thoroughly. Strain into a clean container. Using a clean brush, apply the solution to the wood.

Before You Begin

1. Always mark the container holding the nitric acid solution with a piece of blue tape. It is astonishingly easy to mix up containers—thinking that one is filled with water (for the neutralizing process) when in reality it contains the nitric acid solution!
2. Always use cold distilled water for the nitric acid solution because this chemical is too volatile for hot water.
3. Always add the nitric acid to the water and not the other way around. You don't want to experience any splashing!
4. Always wear a mask, eye protection and gloves.

Alder

Cherry

Mahogany


Maple


Oak

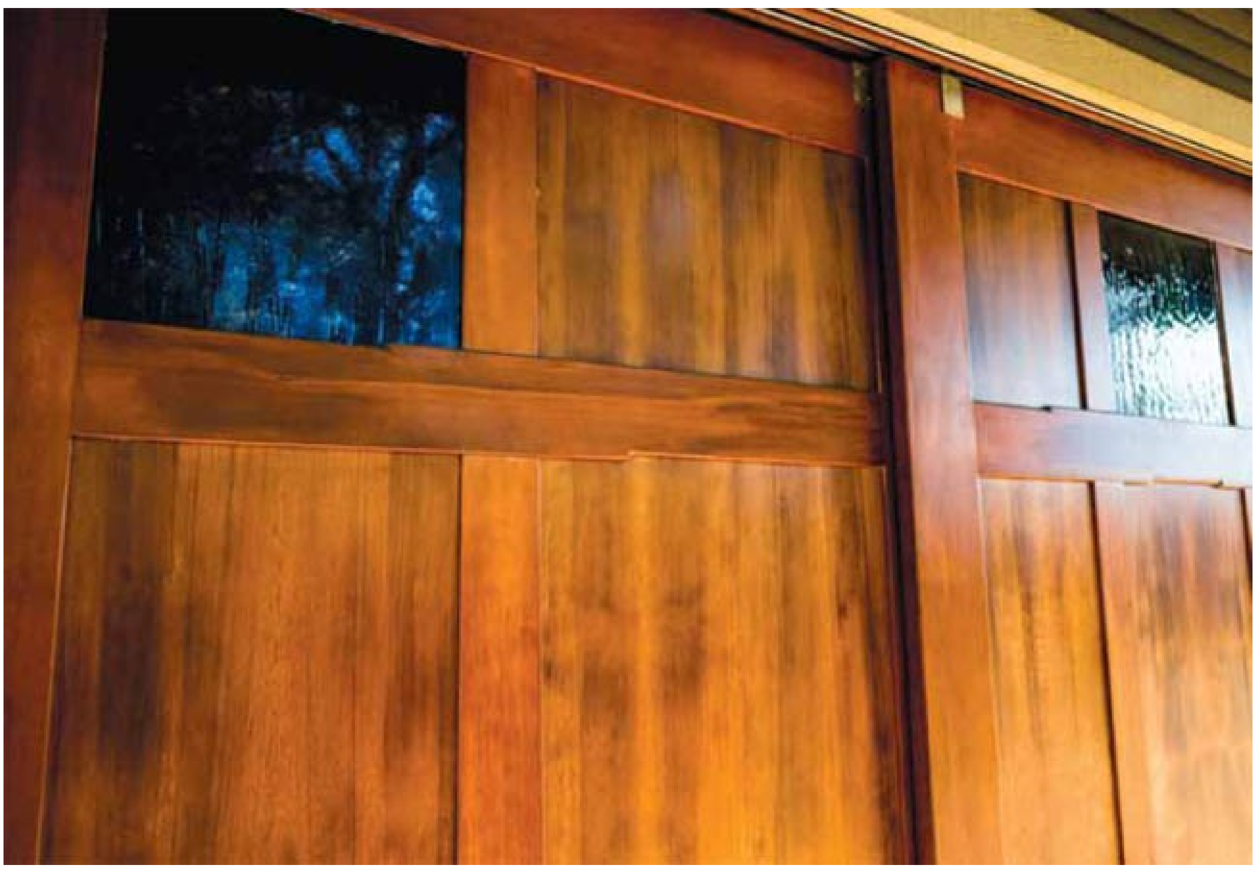
Walnut

12

Potassium Dichromate

Sounding like a mystery ingredient in a junk food snack, potassium dichromate has been used for hundreds of years to color wood furniture. In particular, it is frequently associated with its use on French Empire furniture during the early 1800s when Napoleon was determined to bring a magisterial grandeur to French architecture and decorative arts. Consequently the costliest woods—particularly Cuban mahogany—were treated with potassium dichromate to enhance the wood's lustrous colors.

On a lighter note, potassium dichromate is also a frequent ingredient in fireworks—not for its color but for its ability to lower the ignition temperature of other chemicals in the mix. This does not mean that potassium dichromate is explosive.



Also known as bichromate of potash, the chemical is often referred to by those within the wood finishing profession by its nicknames of "PD" or simply "dichromate. "It is readily available through chemical supply houses and it arrives in the form of bright orange/red crystals. It is very carcinogenic so be sure to wear gloves, eye protection and a mask while working with it. If you store potassium dichromate in a non-reactive container and keep it in a cool dark place, it has an almost infinite shelf life.

Despite its carcinogenic nature, potassium dichromate still remains one of the most popular chemicals for coloring walnut and mahogany. It typically deepens and enriches the inherent warm tones on these two woods as it reacts to the tannic acid within them. On maple however, which is void of tannic acid, it merely deposits its own color, leading to a rather weathered look. The effect is similar to the gray tones of ferrous sulfate, but with more pronounced background tones of yellow. Applying a wash of tannic acid to maple before applying the dichromate significantly changes the color effect to a mellowed brown color with blond undertones. This was shown on page 22.

Recipe for Potassium Dichromate

½ tsp of potassium dichromate
4 oz. hot distilled water
4 oz. cold distilled water

Slowly add ½ teaspoon of potassium dichromate to four ounces of hot distilled water while stirring continuously. When the crystals are dissolved, add four ounces of cold distilled water to the solution. Stir until the solution is thoroughly mixed, then strain through a cone into a clean container and apply the solution when it has come to room temperature. Wipe the surface with a rag before the solution dries.

Are you old enough to remember when the powdered drink Tang first came out and it was considered space-age? Well, potassium dichromate may look like Tang when you see it inside a container, but trust me, you definitely don’t want to drink this stuff! Or even touch it without wearing gloves!

Alder

Cherry


Mahogany


Maple

Oak

Walnut

13

Sodium Carbonate

You can call sodium carbonate by its nicknames: soda ash or washing soda or soda crystals or sal soda or even super washing soda! But don't call sodium carbonate by its cousin's name of sodium bicarbonate—aka baking soda. They are different compounds and the correct one for coloring wood is sodium carbonate.

Pardon the bad joke here, but besides being used as a clothes detergent, sodium carbonate has a laundry list of other seemingly unrelated uses. You might ask someone, "What do glass manufacturing, photo developing, pool cleaning and taxidermy all have in common?" and as they are walking away from you to find a more interesting person to talk to, you can yell at their back, "They all need sodium carbonate to get the job done!"

While you can find sodium carbonate as an ingredient in some laundry products, you'll want to buy it in its purest form from a wood finishing supply company.

It is a white granular powder that is hygroscopic, which means it absorbs moisture from the air so you need to reseal the container immediately after you've extracted the amount you'll need for your solution. The container must be airtight for the powder to maintain its potency. It is non-toxic and imparts more of a brown than a golden color.

Granted, sodium carbonate does not result in a particularly dramatic color change on wood. You may have to up the strength or simply use a different chemical if you want more visual "oomph!" So why would you want to use it? Why wouldn't you just go straight to your clear coat finish? Well, sodium carbonate offers all the advantages of chemicals that aren't achievable with just a plain, clear coat finish. Sodium carbonate patinates the wood and accentuates the grain pattern to a much more pronounced degree—look at that ripple on the maple sample!—and enables you to see deeper into the wood. And because sodium carbonate is non-toxic, you can worry a little less if the idea of working with chemicals makes you nervous. Best of all, you can dispose of the solution by dumping it right down the drain!

Recipe for Sodium Carbonate

1 tsp of sodium carbonate
3 oz. hot distilled water
3 oz. cold distilled water

Slowly stir one teaspoon of sodium carbonate into 3 ounces of hot distilled water. Mix until thoroughly dissolved and then add 3 ounces of cold distilled water. Mix thoroughly. Strain this solution into a clean container and apply when it has come to room temperature. Wipe the surface with a rag before the solution dries. Do not sand until after you have applied your first seal coat.

Alder

Cherry

Mahogany

Maple

Oak

Walnut

14

Sodium Hydroxide (Lye)

Of all the chemicals presented in this book, sodium hydroxide has perhaps the most lurid associations! More commonly known as lye and sometimes referred to as caustic soda, pure sodium hydroxide is not as widely available as it once was. This is because it is a necessary component in the creation of crystal meth. However, it is available through various online sources.

Another less than savory use of sodium hydroxide is to speed up the decomposition of dead bodies—a practice favored by a handful of notorious serial killers and drug cartel assassins because it erases features and reduces the corpse to a gelatinous sludge.

Sodium hydroxide is probably most well known, however, by its common name of lye and for its use as a drain cleaner. In fact, it is one of the oldest and cheapest cleaners around. In considerably lower strengths, it is used to make soap.

By now you are probably wondering why anyone would want to color their wood with this nasty substance! The reason is that sodium hydroxide produces a magical transformation in the color of wood—particularly on cherry and mahogany whereby their inherent reddish cast is magnificently enhanced.

Remember, though, that this chemical is also called caustic soda! Its deceptively innocuous-looking white crystals will burn your skin if you don't wear gloves, particularly when the crystals are wet. Like sodium carbonate, it is hygroscopic, which means it has a strange ability to attract and extract moisture from the air.

Here's a simple science experiment for you to perform: Place about a teaspoon of sodium hydroxide crystals on a piece of scrap wood and time how long it takes before water droplets appear. When done, use another piece of scrap wood to sweep them into the trash.

If you don't neutralize the lye, it will eat through your finish, leading to blistering or pimpling.

Recipe for Sodium Hydroxide

Bear in mind that because you will neutralize the lye after applying it, you will need two complete sets of supplies: mixing containers, brushes, stir sticks, measuring spoons and cups, distilled water, rags, gloves and strainers.

It is best if you have all of these supplies ready on the work table before you begin mixing the sodium hydroxide solution. Be sure to wear eye protection as well as gloves and a mask.

Also, it is important to label your mixing containers beforehand because when the sodium hydroxide is dissolved in the water, it can look a lot like plain water, and you don't want to mistake the lye solution for plain water when you start making the neutralizing solution. It has happened!

Sodium Hydroxide Solution:

1 tsp. of sodium hydroxide
3 oz. hot distilled water
3 oz. cold distilled water

Add one teaspoon of sodium hydroxide **very slowly** to the container of hot water because it can be unstable when it hits hot water and you don't want it splashing out of the container onto you or other surfaces. Mix until thoroughly dissolved and then add 3 ounces of cold distilled water. Mix thoroughly. Strain this solution into a clean container and apply when it has come to room temperature. Wipe the surface with a rag before the solution dries.

Neutralizing Solution:

4 oz. white vinegar
4 oz. distilled water

When the sodium hydroxide solution has completely dried on the wood, it is time to apply the neutralizing solution. Be sure to use a different brush for this!

Slowly stir the vinegar into four ounces of distilled water and mix thoroughly. Brush the solution onto your project.

Always put the lid back on immediately and tightly seal the glass or plastic container that holds the crystals. This will prevent clumping, which makes the crystals much more difficult to dissolve and a tight seal will also maintain their almost infinite shelf life.

Now the main thing to know about lye if you are going to use it to color wood is that it is an alkali so you need to neutralize it with an acid after it dries, which in this case will be a solution of one part white vinegar to one part distilled water.

The color will lighten slightly after you neutralize it so you have to account for this. The finish color (the color of the wood after a clear coat finish has been applied) will match the color of the wood after the sodium hydroxide solution has dried. (You'll recall that typically the finish color matches the color of the wood while it's wet.)

Alder

Cherry

Mahogany

Maple

Oak

Walnut

15

Introduction to Natural Dyes

No doubt woodworkers were inspired centuries ago to try coloring their wood with natural dyes after observing the range of hues they imparted on fabrics. We tend to think of natural dyes as coming from plants, but of the four most popular dyes used to color wood nowadays, two of them, brazilwood extract and logwood extract, are derived from the heartwood of trees, one is derived from the husk of a nut or from peat (walnut crystals) and the fourth, cochineal, is actually a bug.

Like chemicals, natural dyes get a color boost from tannic acid. Unlike chemicals, however, they will still deposit a more colorful shading (as opposed to the weathered effect of chemicals) on wood that does not contain tannins.

The main advantage that natural dyes have over synthetic dyes is that they are more light fast when used in conjunction with a mordant. So before you get too excited about the prospect of coloring your wood in a more natural way than using chemicals, let us explain the concept of mordants.

The word “mordant” comes from the Middle French word “morder” which means “to bite.” A mordant is the fixer that helps the natural dye’s color bite more firmly into the wood’s fibers . . . or you could say, the mordant binds the color to the fibers. Chemicals are the mordants for natural dyes. The most common chemicals used as mordants are potassium dichromate, ferrous sulfate and alum. If you want to use a less toxic chemical as a mordant, try sodium carbonate and see if you like the results. Mordants are not essential for all natural dyes, as you will see in two of the following recipes (brazilwood and walnut crystals).

When chemicals are used as a mordant with natural dyes, tannins are not essential. Chemicals will still bind the natural dye to the wood even if the wood does not contain tannins.

If tannins are indeed present, though, the chemical mordant will do more than interact with the dye color and help bind the color of the natural dye to the wood fibers. Now the chemical will add an additional twist to the final color because of the chemical’s reaction to the tannins.

So the irony is that chemicals require an organic substance (tannins) to be present in the wood in order to be their most effective, and natural dyes require a chemical (as a mordant) in order to produce their most dramatic color change.

The traditional method of application is dye first, followed by a chemical mordant. If, however, you are adding tannic acid to the wood (yet another variable on species like alder and maple that contain little to no tannins), you would begin with the application of the tannic acid solution and—after the wood is completely dry—proceed to applying the dye. However, there is no need to re-apply the tannic acid solution before adding the chemical.

Because you dissolve natural dyes in water, use a synthetic brush to apply them. They are typically non-toxic but they will stain your skin, so wearing gloves is a good idea.

You can see that the intersection of chemicals and dyes vastly widens your choices for coloring wood. The combinations presented here are some of our favorites but feel free to experiment, and even design your own signature combination!

Always keep track of the number of passes you made when coloring with a natural dye so that the color intensity remains consistent.

Tea as a Natural Dye

From time to time you hear about the potential of tea to color your wood, and indeed it will—but not dramatically. Compressed tea is best because it produces a more concentrated color. In our experiment with it, we steeped twenty-four ounces of compressed pu-erh (black) tea, the amount intended per the instructions to fill forty-eight teapots, in a mere three cups of water for eleven hours. The results produced a decidedly minor blond effect.

Tea is loaded with tannins, however, so it will serve as a booster if used in conjunction with other natural dyes or chemicals.

16

Brazilwood

Yes, your suspicions are correct: there is a close relationship between brazilwood and the country of Brazil. The country's name was derived from the name of the tree, which grew primarily along the coast and slightly inland. Brazilwood is a very close relative to sappanwood found in southeast Asia, which was long a source of red dye for textiles in Europe but its availability was spotty.

After Portugal claimed the territory as its colony and named it Brazil in 1500, Portuguese merchants followed when they learned that the brazilwood tree was an excellent and abundant resource for red dye. At that time, a vibrant colorfast red was extremely difficult to achieve in textiles so the color red was reserved for the attire of royalty or the very rich. A steady trade in brazilwood began, proving so lucrative that France and Spain dared to transgress Portugal's territorial authority so that they too could bring the profitable wood back to Europe. Because the dye is made from wood chips or sawdust, whole trees had to be felled and transported. It was not an easy wood to harvest because of its density, requiring back-breaking labor to move the rough-milled trees to the ships.

Both high demand and greed nearly wiped out the species in the eighteenth century. In the late nineteenth century, however, brazilwood was perhaps saved from extirpation (extinction in its native range but not total extinction off the face of the earth)by the introduction of synthetic dyes that were capable of producing similarly vivid shades of red for textile dying. This led to a decreased demand for the trees. However, recovery of the species is still in progress.

Even though brazilwood produces vivid reds on textiles, it results in more yellow tones on wood where it is not fixed with a mordant. When ferrous sulfate is added as a mordant, there is a notable color shift to a more profoundly dark brown color with red undertones.

It arrives as a fluffy reddish brown powder. Bear in mind that brazilwood extract is significantly more concentrated than brazilwood powder. Both have an indefinite shelf life. These two recipes call for the extract.

Because of its unrivaled acoustic qualities, brazilwood remains the preferred species in the making of bows for string instruments.

Recipe for Brazilwood

1 tsp of Brazilwood extract
2 oz. of hot distilled water
2 oz. of cold distilled water

Slowly stir one teaspoon of brazilwood extract into two ounces of hot distilled water. Add two ounces of cold water and stir thoroughly. Strain into a clean container. When the solution comes to room temperature, apply to the wood, maintaining a fifty percent overlap. Wipe off any excess solution. When the wood is completely dry, apply one coat of finish before lightly sanding off any nibs.

Alder

Cherry

Mahogany

Maple

Oak

Walnut

Recipe for Brazilwood + Ferrous Sulfate

Follow the above recipe for mixing the brazilwood solution. After you have applied this solution to your wood and it is completely dry, apply the ferrous sulfate. Do not sand until after the ferrous sulfate and a first coat of finish have been applied.

Ferrous Sulfate:

⅛ tsp of ferrous sulfate
3 oz. of hot distilled water
3 oz. of cold distilled water

Slowly stir the ferrous sulfate into 3 ounces of hot distilled water. Mix until thoroughly dissolved and then add 3 ounces of cold distilled water. Mix thoroughly. Strain this solution into a clean container and apply when it has come to room temperature. Wipe the surface with a rag before the solution dries.

Oak

Walnut

17

Cochineal

Just like people, natural dyes have histories and some are much more fascinating than others. Cochineal has a complicated, compelling history and perhaps its most direct relationship to our own history is that it was used to dye the distinctively colored jackets of the “Redcoats”—the British soldiers we fought in the Revolutionary War.

But let’s back up a bit. Cochineal used for dying fabric and wood is actually the dried body of the female cochineal bug. This dried body looks like a dark silver peppercorn which, when finely ground and dissolved in hot water, produces a brilliant scarlet dye sometimes referred to as carmine. The female cochineal bug spends her entire life with her head burrowed into a nopal (opuntia) cactus, which we commonly refer to as a prickly pear cactus. It is incredibly labor-intensive to hand-harvest the cochineal bugs, and it takes roughly 70,000 bugs to make one pound.

Both cochineal and the nopal cacti are native to central and south America where the bug was used extensively for dying textiles a striking red color, especially within the Aztec culture. When Spanish merchants arrived in Mexico in the sixteenth century, they realized the value of the extraordinary red dye, influenced no doubt by the financial success that Portugal and France were having in exporting brazilwood from Brazil which produced a far less stunning red dye, and thus cochineal became a prized export, second to silver.

Consequently, the demand for cochineal exploded across Europe, inspiring pirates to loot ships that were ferrying the dried bugs back to Spain. Europeans fervently tried to figure out exactly what cochineal was, and they mistakenly assumed it was a dried berry. The French, English and Dutch were particularly zealous about discovering the “plant” that produced this berry, but the Spanish did not allow any foreigners into Mexico so the mystery remained for over two centuries! When it was finally discovered that cochineal was a bug that lived on the nopal cactus, there was a determined effort to bring both back to Europe. However, the cochineal bug is very fragile and the nopal cactus requires a highly specific climate in order to grow, so all attempts to transplant it to Europe failed.

> If you want to keep the cochineal color exactly as you see it on your wood, you need to cover it with an acrylic finish because they dry very clear.

The demise of the cochineal trade in the late 1800s was due to the invention of synthetic dyes which dealt a severe financial blow to the farmers and trade merchants. However, demand for cochineal was revived after the United States’ Food and Drug Administration banned Red Dye No. 2 in 1976. Now cochineal is used as a coloring agent in cosmetics such as rouge and lipstick, food (jams, candy, beverages, juice, cookies, icings) and medicine (pills and cough drops).

It is far cheaper to buy the dried cochineal bug and grind it yourself than to buy it in powder form. An electric spice grinder or coffee grinder works fine for this. After you've ground the cochineal, store it in an airtight container out of the sun and it will retain its potency indefinitely.

Remember to wear gloves, a mask and eye protection when working with potassium dichromate.

Recipe for Cochineal with Potassium Dichromate

1 tsp of finely ground cochineal
4 oz of hot distilled water

Slowly add one teaspoon of the cochineal powder to four ounces of hot distilled water while stirring continuously. Mix until the powder is dissolved. Strain it through a cone filter. There will probably be leftover sediment in the bottom of the cone, and this can be discarded. When the solution comes to room temperature, brush it onto the wood with a fifty percent overlap. Wipe off all excess. Let it dry thoroughly. Do not sand.

Recipe for Potassium Dichromate

½ tsp of potassium dichromate
4 oz. of hot distilled water

Slowly add ½ teaspoon of potassium dichromate to four ounces of hot distilled water while stirring continuously. Mix until the crystals are dissolved and then strain the solution through a cone filter. When the solution comes to room temperature, apply it to the wood with a fifty percent overlap. When thoroughly dry, apply a coat of finish before lightly sanding off the nibs.

Alder

Cherry

Mahogany

Maple (plain cochineal without potassium dichromate as a mordant)

Maple

Oak

Walnut

18

Logwood

For an immediate visual understanding of the effects of mordants on natural dyes, look at the difference in the wood samples here. After applying a solution of logwood extract to all the samples, potassium dichromate was applied to one set as a mordant and ferrous sulfate was applied to the other set. The dichromate produced a distinctive reddish coloration on walnut, oak, cherry and mahogany and a pinkish cast reminiscent of aromatic cedar on alder and maple, both of which do not contain tannic acid. Ferrous sulfate, on the other hand, turned all the samples a rich complex black color.

Now in reverse, to see the effects of dyes on wood, look at the samples that have only been treated with ferrous sulfate (Chapter 8, pages 34–36) or only treated with potassium dichromate (Chapter 12, pages 53–55) without being dyed with logwood first. You will notice that the dichromate by itself deepens the existing color of the wood (with no additional reddish cast) and the ferrous sulfate by itself adds a gray tone to the wood.

Logwood is also known as campeche or bloodwood, and it is derived from the heartwood of the logwood tree, which is found in central America—primarily Guatemala, Belize and Mexico where it was used in herbal medicine. Like brazilwood and cochineal, logwood was exploited by European traders as a quite profitable export until the advent of synthetic dyes. The old adage of "You can't judge a book by its cover" is especially applicable to logwood because it looks red, akin to Hungarian paprika powder, in the container, then appears yellow on the wood until you add the mordant.

When combined with ferrous sulfate, logwood is used to achieve an effect on wood called ebonizing. This is a centuries-old technique that is currently in vogue again. True black ebony comes from the heartwood of Gaboon ebony, which has very little to no visible grain pattern but is known instead for its extraordinary luster after polishing. Due to over harvesting, Gaboon ebony is now a critically endangered species, and it is illegal to import it into the United States. The technique of ebonizing wood with a logwood/ferrous sulfate solution offers that same jet-black color but still allows you to see a faint grain pattern of the species to which the solution has been applied. Some finishers think this background hint of grain pattern gives ebonized wood greater depth and interest than real ebony.

This is a substantially different effect than you would get from painting the wood black or dying it with India ink because those substances mask the grain characteristics, resulting in a flattened black effect. Similarly, logwood's advantage in ebonizing wood compared to using a synthetic black dye is that logwood produces a more mature, complex, black because of its subtle hints of reddish brown undertones.

It is better to use logwood extract, as opposed to logwood chips. The extract is more expensive but it is also more concentrated. It is readily available online and has an indefinite shelf life.

Recipe for Logwood Extract + Ferrous Sulfate (Ebonizing)

You want to apply both solutions hot for better penetration, which will heighten the reaction on the wood.

Logwood Extract:

1 tsp of logwood extract
6 oz. of hot distilled water

Slowly stir one teaspoon of logwood extract into six ounces of hot distilled water and mix thoroughly. Strain the solution into a clean container and then apply it to the wood while hot. Wipe off the excess solution with a rag. When the wood is completely dry, apply the ferrous sulfate.

Alder

Cherry

Ferrous Sulfate:

1 tsp of ferrous sulfate
6 oz. of hot distilled water

Slowly stir one teaspoon of ferrous sulfate into hot distilled water and mix thoroughly. Strain into a clean container and apply to the wood while still hot. Wipe the surface with a rag before the solution dries. Do not sand until after you have applied your first coat of finish.

Mahogany

Maple

Oak

Walnut

Applying the solutions while hot makes them more effective because they penetrate deeper. However, it is important to keep the solution at the same hot temperature throughout the process to ensure an even color.

Recipe for Logwood Extract + Potassium Dichromate

Logwood Extract:

2 tsp of logwood extract
6 oz. of hot distilled water

Slowly stir two teaspoons of logwood extract into hot distilled water and mix thoroughly. Strain into a clean container and then apply to the wood. Wipe the solution off with a rag.

Potassium Dichromate:

½ tsp of potassium dichromate
4 oz. of hot distilled water
4 oz. of cold distilled water

Slowly add ½ teaspoon of potassium dichromate to four ounces of hot distilled water while stirring continuously. When the crystals are dissolved, add four ounces of cold distilled water to the solution. Stir until the solution is thoroughly mixed, then strain through a cone into a clean container and apply the solution when it has come to room temperature. Wipe the surface with a rag before the solution dries.

Alder

Cherry

Mahogany


Maple


Oak

Walnut

19

Walnut Crystals

Trying to untangle the name and source material of what is commonly known as "walnut crystals" is a daunting task. The term "walnut crystals" is sometimes used interchangeably in the woodfinishing profession with Vandyck crystals or Van Dyke crystals (Van Dyke is the anglicized version of Vandyck.) While the majority of walnut crystals sold come from ground walnut hulls, there are some suppliers who sell peat moss under that name. Most likely they are guided by the final color outcome rather than the actual source material.

Genuine walnut crystals are made from the blackened hulls (also popularly referred to as husks) of walnuts. As a walnut grows on the tree, the nut is covered by a shell and the shell in turn is covered by a soft hull (think of a thin orange peel). When ripe, the hull will turn black when it is removed and air dried—or sometimes the hull falls to the ground and blackens naturally. Either way, the blackened hull is then boiled.

Walnut crystals look like shiny black pepper and are the concentrated dried solution. It is also available as a fine powder or you can even purchase the entire hull for soaking. This is in stark contrast to other dyes that originate from trees in which it is the bark or the sawdust or the chips from the tree that are the source of the colorations.

Historically, walnut crystals have been a mainstay of the world of art rather than the furniture finishing profession. For centuries, the sepia tones produced by the crystals were employed as a popular ink for sketches and drawings. Also the crystals still continue to be used as a textile dye to achieve a mild brown shading on fabrics. However, nowadays they are predominantly associated with the art of calligraphy. Not only is their ink used for decorative handwriting, but it is also applied sometimes as a wash on certain papers to achieve an aged effect.

Natural walnut dye will color your hands quite deeply and will last beyond days, so be sure to always wear gloves when you are working with it. Popular folklore has it that centuries ago, certain cultures stained their prisoners' hands with walnut ink to readily identify the criminals.

Like brazilwood, walnut crystals are rich in tannins and deposit enough of their own color that they do not necessarily require a mordant, although a mordant would undoubtedly boost or swivel the coloration in a new direction. They are primarily used to deepen the brown tones in wood.

Recipe for Walnut Crystals

2 tsp of walnut crystals
5 oz. hot distilled water

Slowly stir two teaspoons of walnut crystals into five ounces of hot distilled water. Stir thoroughly until dissolved. Strain into a clean container. When the solution comes to room temperature, apply with a synthetic brush. Wipe off the excess solution with a rag.

Alder

Cherry

Mahogany

Maple


Oak


Walnut

20

Introduction to Synthetic Dyes

Back in 1856, Sir William Henry Perkins was trying to find a synthetic form of quinine to cure malaria, and instead he accidentally discovered aniline dyes. While he was hoping to have a profound effect on the treatment of malaria, he instead radically changed the way fabric, and eventually wood, was colored. His discovery opened up a world of colors that were previously either unstable or sporadically unavailable across the world.

The one trait that synthetic dyes have in common with chemicals and natural dyes is that they don't obscure the grain pattern because they do not deposit a pigment residue. While the advantages of chemicals and natural dyes have already been discussed, here are reasons to choose synthetic dyes instead.

Advantages of Synthetic Dyes Over Other Coloring Agents

- Unlike chemicals, they are nontoxic! This also means that, unlike chemicals, synthetic dyes can be sprayed.

- Because they are not dependent upon tannins or mordants to achieve their color effect, they produce a more consistent color outcome. What you see on your sample is what you know you will get on your wood. The effect is more monochromatic, which some people prefer.

- If the dye is water-based and the effect is too dark for your taste, you can easily "reawaken" the color by applying clear, distilled, water and wiping it off. This will dilute the intensity of the color by "putting it back into solution." If you want to eliminate the color, you can wipe the surface with diluted unscented household bleach.
- Conversely, if you reapply a second coat of synthetic dye to your wood, the wood will darken. This is not possible with stains because the binder component in stains (typically boiled linseed oil) is a finish and will inhibit further absorption of the pigment in the stain.
- There is a quite a range of non-wood colors. You can make your own playful colors by mixing the dye colors.
- Depending on the manufacturer, synthetic dyes are soluble in a greater variety of mediums, including water, acetone, alcohol, shellac and lacquer thinner. It is possible to find oil-soluble dyes, but they will not dry as fast as other solutions.

You should always wear gloves when working with synthetic dyes because it's hard to remove the dye from your skin—although scrubbing your hands with 36-grit sandpaper works well. It removes the dye and your skin!

Make sure you level off your measuring spoon if you plan on repeating the formula so that the color will be consistent with each solution.

Disadvantages of Synthetic Dyes Over Other Coloring Agents

- They are not as light-fast as natural dyes and chemicals, although their manufacturers are improving them in this regard. For the most part, however, you can't use synthetic dyes outdoors because the color will quickly fade.
- Each manufacturer's color palette will vary considerably despite sharing similar names. For example, there will be a tremendous variety in colors named "walnut." You need to become familiar with the color palettes of different brands.

Synthetic Non-Grain-Raising (NGR) Dyes

As you know by now, there is an ongoing issue of the grain being slightly raised after the application of water-based materials—even if you tried to ward off this possibility by raising it intentionally in advance (always a good idea).

However, synthetic dyes that are soluble in mediums other than water have the distinct advantage of sidestepping this problem. They are called NGR (non-grain-raising) dyes and the carrier for these dyes is acetone and denatured alcohol. Consequently they must be spray applied because the solvent "goes off" (evaporates) too quickly for brushing. This rapid evaporation causes lap marks when using a brush.

NGR dyes are especially effective on large projects where the hand application procedure (brushing the dye on and then wiping off the excess to prevent pooling) would add significantly to the labor. NGR dyes can be applied quickly and at reduced cost because of lower labor costs. The other advantage of NGR dyes is that they are effective at controlling blotch on woods that are notoriously prone to it, such as maple and cherry, or softer woods like pine, fir and alder. This is because you can control the absorption of the dye into the wood through proper spray application.

Learning how to spray NGR dyes takes practice! You have to learn how to control the amount of material that hits the surface of the wood. This entails finding the most effective setting on your spray gun to control the amount of dye coming out of gun, and determining how high your hand should be above the wood surface as you make passes with the sprayer.

You will still need to keep a wet edge. If it is a particularly dry day and the dye is evaporating too quickly, you could add a small percentage of glycol ether (lacquer retarder) to slow down the evaporation rate.

Please note there are additional recipes with synthetic dyes that can be found in the chapters on wire brushing, grain filling and glazing.

Clear Coat Finish Considerations with NGR Dyes

Something to consider before you choose to use an NGR dye on your project is the clear coat finish. You need to make sure that the solvent in the finish will not put the dye back into solution.

For example, NGR dyes have a percentage of alcohol in them. So does shellac. Therefore, if you brush shellac over wood that has been colored with an NGR dye, the alcohol in the shellac will put the dye back into solution and you will end up with streaked color as the brush drags the shellac across the surface. This does not mean that you can’t use shellac as a finish. You would need to spray apply the shellac rather than brush it on because spraying the shellac does not put the dye back into solution.

Recipe for Taking the Pink Out of Mahogany

Synthetic dyes can be used to discreetly shift the color tone of a wood. For example, the pink tones of mahogany have been neutralized here with a green dye.

A pinch (1⁄16 of a teaspoon) of Arti Dye #124 Green
6 oz. hot distilled water
6 oz. cold distilled water

Slowly stir a pinch of Arti Dye #124 Green into six ounces of hot distilled water. Mix thoroughly and then add six ounces of cold distilled water, stirring continuously. Strain into a clean container. When the solution comes to room temperature, spray or apply with a synthetic brush and then wipe off the excess with a clean rag.

Mahogany

Recipe for Alder Twice-Dyed

The purpose of this sample is to show you how repeated applications of dye will deepen the color, until it reaches its inherent saturation point.

A smidgen (1⁄32 of a teaspoon)
of Arti Dye Black #134
1 tsp of Arti Dye #128 orange
4 oz. hot distilled water

Slowly add the smidgen of Arti Dye Black #134 and one teaspoon of Arti Dye #128 Orange into four ounces of hot distilled water. Mix until thoroughly dissolved and then strain into a clean container. When the solution comes to room temperature, spray or apply with a synthetic brush and then wipe off the excess with a clean rag.

Alder Twice-Dyed

Recipe for NGR Dye on Maple

Note the even coloration—no blotching—on this maple sample that has been sprayed with an NGR dye.

4 oz. acetone
4 oz. denatured alcohol
⅛ tsp Transtint Dye Honey Amber
1 pinch (1⁄16 tsp) of Transtint Golden Brown

First mix four ounces of acetone and four ounces of denatured alcohol together in a container. Then slowly stir in ⅛ teaspoon of Transtint Honey Amber and a pinch of Transtint Golden Brown and mix thoroughly. Pour the solution into a spray container and spray apply to the wood.

Maple with NGR Dye

21

Grain Filling

Yes, that is the question. As you can deduce from its name, grain filling is a technique performed on open-grained wood. The open-grained woods presented in this book are oak, mahogany and walnut, with oak having the deepest valleys and walnut having finer yet still visible ones across its surface. Mahogany falls in the middle of these two.

Grain filling is undeniably tedious work. The most basic description of the technique is that you apply colored filler material to the surface of the wood and then scrape it off, leaving a residue in the open valleys.

So why would you want to do this?

One reason people do it is to completely eliminate the open pores. When a finish coat is applied to open-grained wood, the light reflects off the valleys and highlights their existence. If you are not a fan of this effect, despite loving every other characteristic of the open-grained wood you have, you can completely fill the valleys and achieve a smooth, glass-like look and feel when clear finish is applied. Depending on how deep the open grain is, this will most likely require several applications of material to bring the valleys up to the same level as the overall surface of the wood. People who completely fill up the open grain valleys usually do so with a color that matches the existing surface color of the wood—although of course a contrasting color could also be used. Or, they fill the open grain with multiple coats of clear finish.

> "To fill or not to fill, that is the question."

More adventurous types look upon open grain as an opportunity to introduce color highlights by using a contrasting or complementary—but not identical—color. You can obtain this effect through a single application of grain filling material, which is what we did on the samples in this chapter. Your goal here is to merely deposit color into the open grain valleys, not to "level up" and change the surface texture of the wood. Technically this process could probably be called open-grain highlighting rather than filling.

Venturing further into the realm of coloring possibilities, you can dye the wood first before filling it, as we have done on many of these samples.

Grain filler material is marketed as such. It is not to be confused with wood filler or wood putty that is used to fill cracks, voids, scratches and nail holes in wood. There are products that are made to do both, in which case it will say "Wood Filler and Grain Filler" on the can.

As is the case with paint these days, grain filler is available in both water-based and oil-based solutions. The oil-based medium is generally preferred because it dries much more slowly, which gives you more open time—vital for scraping off the material. Even with oil-based grain filler, you have to work quickly. However, improvements in the open time of water-based mediums are advancing steadily.

Silica is typically the main ingredient in oil-based grain filler, with boiled linseed oil as the binder and paint thinner as the solvent. Like paint, the solids in grain fillers tend to settle at the bottom of the can, so you need to stir, stir, stir to achieve a smooth, spreadable consistency. Thin it out with pure gum turpentine or paint thinner if it is too thick in order to reach that heavy cream-like consistency.

Both water and oil-based fillers tend to come only in neutral colors. Oil-based fillers can be colored with pigments or metallic powders. Water-based grain fillers can be colored with artist's acrylics, available at any art supply store, or metallic powders can be used for a quite different look.

Additional Supplies You Will Need for Grain Filling

- A plastic scraper, like the yellow plastic card scrapers that are used in auto-body shops for removing Bondo body filler.
- White Scotch-Brite pads or burlap (Burlap is the traditional material used for this process.)
- Lint-free rags.

How to Apply Grain Filler

1. Remove all dust from the wood.
2. Lightly spray the wood with one or two coats of sanding sealer. Your goal is to seal the surface of the wood without having too much sealer in the open grain. If you didn't lightly spray your wood with sealer, you would end up coloring the whole surface of the wood with the color of the filler.

> Grain filler should be applied in small sections on a large project, roughly 24 in. square with oil-based filler and 12 in. square with water based, so that it doesn't dry before you start wiping it off. It is especially important to practice this technique on scrap wood first!

On the other hand, if you have too much sanding sealer on the wood, you no longer have the v-shape in the open valley. Consequently, you are left with a more rounded bottom, which makes the open pores more slippery or slick, making it quite possible that you will also drag or pull the filler out from the valleys as you are wiping the excess slurry off the surface of the wood.

All the samples in this chapter were sprayed with one light coat of lacquer sanding sealer, followed by a light coat of satin lacquer.

3. Mix your grain filling recipe until it has arrived at the consistency of a creamy, spreadable paste. This may require quite a bit of patience while stirring because sometimes the solids in the can have already separated from the oil or water and are

almost like lumps of soft clay. You don't want the material running off the surface of the wood, nor do you want small clumps or for the material to be so thick that it will dry too quickly before you can begin wiping it off.

Bear in mind that even though a grain filling product may be "ready-made for immediate use" you might still have to thin it to a workable consistency.

4. Using a natural bristle brush(or a synthetic bristle brush if you are using a water-based filler) apply it liberally (almost heavily) in the direction of the grain pattern, working quickly and spreading it evenly. It is not necessary to use a high-quality brush for this process. An old brush or even a chip brush will be fine.
5. Don't let the slurry dry on the wood surface! Holding your plastic card scraper at a 45-degree angle, run it across the wood in a diagonal direction to the grain pattern to wipe the excess slurry off the surface of the wood. You don't want to wipe in the direction of the grain pattern because you could more easily pull the filler out of the valleys. Working quickly, wipe the excess slurry onto rags as you go.
6. The filler becomes harder to remove as it dries. If it starts to thicken as you're working with it, you can re-temp it in the mixing container (industry shorthand for the word "re-temper" which means to reconstitute it) with paint thinner, or boiled linseed oil or turpentine if the filler is oil-based.
7. After you have removed most of the filler from the surface of the wood, let the remaining filler dry to a haze, which, depending on the weather, typically takes about ten to fifteen minutes.
8. Once you see the haze, buff it off with a white Scotch-Brite pad or burlap. First wipe on the diagonal to the grain direction. After removing most of the material, run the pad in the direction of the grain.
9. If there is still a slight residue that you are not happy with after you've buffed the surface with a Scotch-Brite pad or burlap, you can slightly dampen a rag with paint thinner (if the filler is oil-based) and gently wipe the whole surface. This will remove the haze from the surface but not from the valleys.
10. Clean your brush according to the directions in the "Supplies" chapter.
11. Let the leftover material in the mixing cup dry thoroughly before disposing it according to the guidelines of your local environmental or waste management agency. Lay out the unfolded rags and Scotch-Brite pads and/or burlap to dry **completely** before disposing of them. *Failure to do so could result in a fire*.
12. Apply your clear coat finish of choice.

Coloring Your Wood Before Applying Grain Filler

If you are going to color your wood before adding grain-filler, the order of operations is:

1. Prep the wood, including your sample, through the sanding process described in Chapter 3, including raising the grain and lightly sanding off the nibs. Remove the

sanding dust.

2. Following the appropriate directions, color the wood with a chemical or water-based dye (or a stain, if you prefer).
3. Apply a light coat of clear membrane or film finish such as lacquer, polyurethane, varnish or shellac. In other words, not an oil finish. Let that dry completely. If the wood is particularly porous, apply two coats.
4. Lightly de-whisker the nibs with worn out 400 grit sandpaper.
5. Proceed with the grain filling.

"I would say let the remaining filler dry to a haze before you begin buffing it—just like when you wax your car—but no one waxes their own car anymore!"
—Brian

Recipe for Black Grain Filler on Oak, Mahogany and Walnut

A sophisticated high-end look is obtained by adding black filler to open-grained wood. The walnut sample here has two coats of grain filler to amplify the grain-filling effect, which is more difficult to notice on an already dark wood like walnut. Note, too, how the medullary rays on the oak are not obscured by the grain filler. This is because the medullary rays are not open-grained. Mohawk Finishing Products makes a ready-mixed oil-based black grain filler.

2 oz. Mohawk M608-4216 Black Paste Wood Filler
1 oz. paint thinner or pure gum turpentine if necessary to thin the material.

Follow the application directions on pages 93–94.

Mahogany

Oak

Walnut

Recipe for Black Grain Filler Over Red Dye

In the right home interior or with a suitable project design, this combination of color processes can lend an Asian flavor to wood.

Red Dye

1 tsp of Arti Dye #129 Red
A smidgen ($\frac{1}{32}$ tsp) Arti Dye #134 Deep Black
3 oz. hot distilled water

Stirring continuously, add one teaspoon of Arti Dye #129 Red and a smidgeon of Arti Dye #134 to three ounces of hot distilled water. Mix thoroughly, strain the solution into a clean container and allow it to come to room temperature before applying with a synthetic brush. Wipe off excess solution with a rag and let dry completely.

Oak

Don't forget to apply a few light coats of membrane or film finish before applying the grain filler!

Grain Filler

2 oz. of Mohawk M608-4216 Black Grain Filler
1 oz. paint thinner or pure gum turpentine if necessary to thin the material.

Follow the application directions on pages 93–94.

Using Metallic Powders in Grain Fillers

For a contemporary look that offers the barest hint of a metallic luster try adding metallic powders to natural colored grain filler products. Their color and sheen will change depending on the lighting and the angle from which you are looking at the wood.

The downside to using metallic powders is that you have to be very careful in handling them. It is imperative that you wear a mask when working with the flake powder. Perhaps you have seen those television commercials illustrating how thousands of germs explode out into the atmosphere when a person sneezes. Well, that effect is similar to how easily the lightweight metallic flakes can go airborne when you are transferring them from the can to the container of grain filler. It's almost shocking. If the powdery flakes blow into direct sunlight, it will look like the air is sparkling. Consequently, it is always a good idea to work outdoors when you are handling metallic flakes, because it makes clean up so much easier: a good breeze will blow away the excess.

Similarly, it is critical to thoroughly clean your workspace when you are finished with the grain filling process because the random leftover metallic flecks can accidentally infect your clear coat finish later. They are readily available off the Internet if you can not find them locally.

Recipe for Aluminum Powder Grain Filler Over Dark Blue Dye

Aluminum powder grain filler has a pearlish coloration in the open pores. This color can be considerably deepened by applying two coats of the dark blue dye. You must wait for the first coat to thoroughly dry before applying the second coat.

Dark Blue Dye:

2 tsp Arti Dye #138 Dark Blue
4 oz. hot distilled water

Stirring continuously, add two teaspoons of Arti Dye #138 Dark Blue into four ounces of hot distilled water. Mix thoroughly, strain the solution into a clean container and allow to come to room temperature before applying with a synthetic brush. Wipe off excess solution and let dry completely.

Don’t forget to apply a few light coats of membrane or film finish before applying the grain filler!

Aluminum Grain Filler

2 oz. Mohawk M608-4206 Natural Grain Filler
1 tsp of Cres-Lite Extra-Brilliant Aluminum Powder #242

Stir the grain filler in its own can until you arrive at a creamy consistency. When it is ready, measure out two ounces of the filler into a mixing container, then add one teaspoon of the aluminum powder. You may have to add an ounce of paint thinner to achieve the desired consistency. Mix the powder thoroughly until you are satisfied that it is evenly distributed within the filler material. Follow the application directions on pages 93–94 for the rest of the process.

Oak

Recipe for Aluminum Powder Grain Filler Over Light Blue Dye

These two samples definitively illustrate how influential the background color of the wood is in determining the color outcome of a dye. Both the oak and the mahogany were dyed with one coat of a light blue synthetic dye. The oak has a medley of light hues, while the mahogany turned a significantly darker shade, eliminating the species' natural reddish cast.

Light Blue Dye

1 tsp Arti Dye #138 Dark Blue
4 oz. hot distilled water

Stirring continuously, add one teaspoon of Arti Dye #138 Dark Blue into four ounces of hot distilled water. Mix thoroughly, strain the solution into a clean container and allow to come to room temperature before applying with a synthetic brush. Wipe off excess solution and let dry completely.

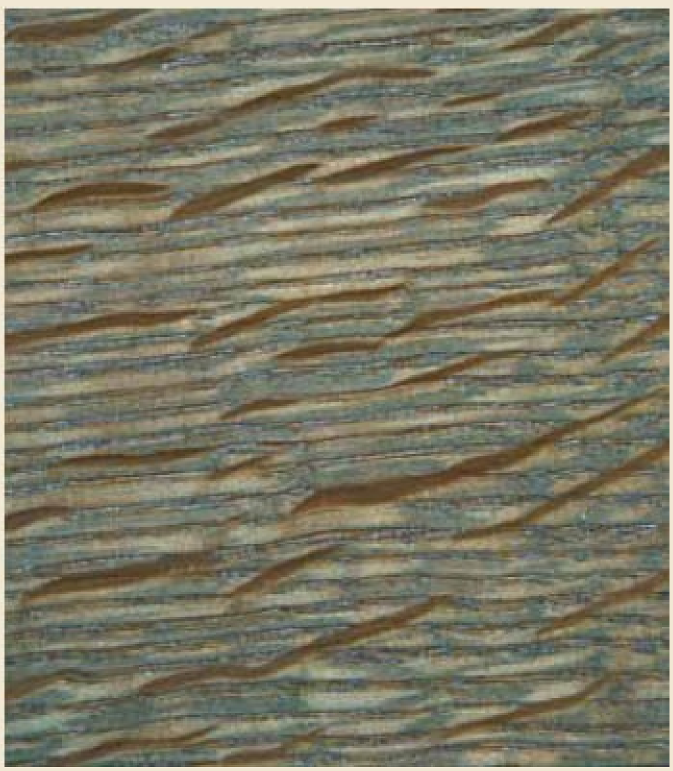
Don't forget to apply a few light coats of membrane or film finish before applying the grain filler!

Aluminum Grain Filler

2 oz. Mohawk M608-4206 Natural Grain Filler
1 tsp of Cres-Lite Extra-Brilliant Aluminum Powder #242
1 oz. of paint thinner if necessary to achieve spreadable consistency

Follow the grain-filling mixing and application directions on page 97.

Mahogany



Oak

Recipe for Gold Powder Grain Filler Over Deep Black Dye

Deep Black Dye

1 tsp Articidol powdered dye #134 Deep Black

4 oz. hot distilled water

Slowly stir one teaspoon of the dye into four ounces of hot distilled water and mix thoroughly. Strain into a clean container. When the solution comes to room temperature, apply to the wood using a synthetic brush. Wipe off the excess solution with a rag.

Don't forget to apply a few light coats of membrane or film finish before applying the grain filler!

Gold Powder Grain Filler

4 oz. Mohawk M608-4206 Natural Grain Filler

1 tsp of Cres-Lite Rich Pale Gold Powder #11

1 oz. paint thinner if necessary to thin to spreadable consistency

Follow the grain-filling mixing and application directions on page 97.

Walnut

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Glazes

Glazes are intermediate colors that are meant to be sandwiched between layers of finish. They are not meant to be applied directly to bare wood! The effect is not transparent like varnish or lacquer, nor is it opaque like paint. Instead, glazes cast a translucent veil of coloring that hovers above the wood.

After applying a few layers of clear finish to your wood, you apply a colored glaze and then quickly brush or rag off as much or as little as you prefer before it dries. The effect of glazes is determined by the person applying it. Every person has their own deftness in wiping the glaze. The amount of color left on the wood can be very dramatic and vibrant, or it can be subtle. After the glaze dries, a final clear coat finish is applied.

Advantages of Glazes in Coloring Wood

- Glazes enable you to successfully color woods, like maple and cherry, that are typically problematic in accepting color because they have soft spots that often lead to blotching when other coloring methods are used.
- You can develop a personal style in applying glazes. Some finishers, for example, prefer to leave a heavier amount of glaze in crevices and corners for a darkened effect there.
- If your project has a somewhat commonplace design—such as a basic box bookshelf—or if the wood you have chosen for the project seems lifeless, you can apply a glaze to give it some personality.
- Once you have developed your brushing technique, glazes are rather easy to apply, and not as intimidating as other coloring processes may seem to you.
- When you apply a glaze to open-grained wood that has not been previously filled, you have two options. You can either leave the glaze over the entire surface, wiping it off to the degree you prefer, and highlighting the open grain with the glaze deposits. Or you can wipe it completely off the surface and just leave it in the open grain as a grain highlighter.
- If you don't like the effect of the glaze, you can easily remove it with a rag that has been soaked with the appropriate solvent and just wipe it off. If you want to remove the glaze from the open grain, you can dip a toothbrush into the solvent and gently brush it out.

Back in the 1970s—and some of you may remember that decade more clearly than others—glazes became part of a do-it-yourself trend called "antiquing." Crafty homeowners updated their furniture with the latest stylish colors by applying glazes. You could buy "antiquing kits" which involved painting the wood first and then applying the glaze.

That effect of applying a glaze over a painted surface will always be somewhat in style, and the only thing that dates it will be the colors you choose. To do this, you first sand the wood and then prime it. Sand lightly after the primer coat and remove the sanding dust. Apply two coats of satin finish enamel paint in the base color of your choice. Don't use flat enamel because it's too porous and the glaze will penetrate into it. Then apply the glaze and remove it to the degree and in the manner that pleases you.

Oil-based glazes tend to be heavier than water-based glazes so you may want to thin them out beforehand with paint thinner or pure gum turpentine.

Dark and gray glazes have long been popular with movie set decorators as a way of creating the look of grime and dirt around the handles on cabinets and doors.

Traditionally, glazes were oil-based. Today, due to environmental concerns, there is a shift toward water-based glazes. While oil-based glazes offer a notably longer open time, there have been necessary improvements in the open time of water-based glazes by certain manufacturers. Whether oil or water-based, though, most glazes come in neutral colors and need to have colorants added to them. Both look like variations of thinned-down white glue.

You must make sure to choose colorants that are compatible with the type of glaze you are using. Water-based glazes need water soluble colorants, and oil-based glazes require colorants that are expressly designed for tinting solvents. Always use liquid colorants because they mix into the glazes more easily and effectively than powdered colorants.

How to Apply a Glaze

1. Your wood should have several coats of clear finish, and the final coat should be cured before proceeding.
2. Prepare your supplies in advance. Additional supplies include:
   – A brush for applying the glaze.
   – A very high-quality brush for removing the glaze because it makes the job easier and minimizes brush marks. For oil-based glazes, an ox hair or Chinese bristle brush is preferred. For water-based glazes, a top-of-the-line synthetic brush is favored because it will hold more material and release it more evenly.
   – Rags
3. Mix your glaze recipe. *Put the glaze into the mixing container first and then add the colorants*.
4. Apply the glaze with a brush as quickly as possible to a small (24 inches by 24 inches) area in a dust-free environment and out of the sun.
5. Switch to a clean high-quality brush and begin quickly dry brushing the glaze off the wood, wiping the brush on a clean lint free rag to remove the material from the brush.
6. Evaluate the effect as you go along—deciding whether to remove more material with this dry-brush technique—until you achieve a look that pleases you.
7. You can also gently wipe even more glaze off the surface with a clean rag.

8. Before the glaze in this small section dries completely, use your original brush to apply glaze to the next section of the wood. You have to keep a wet edge going to maintain a smooth coloration. You want to get the glaze on and off the wood as quickly as possible. The warmer the weather, the quicker the glaze is going to dry.

Softer woods, such as alder for example, require a few extra coats of sealer and clear finish before applying the glaze because otherwise the glaze might penetrate too easily through the finish and stain the wood.

9. If you don't like the color at all, just wipe it all off while it's still wet and reformulate your recipe!
10. When the glaze is completely dry, apply a clear coat finish.

The colorants used here were all water soluble.

Recipe for Blue Glaze on Maple

Before the glaze was applied, this maple sample was finished with one coat of lacquer sanding sealer and two coats of gloss lacquer with no sanding between coats. The glaze is what imparts the color to the plain wood.

2 oz. Saman Water-Based Glaze
½ oz. Paint Solutions Thalo Blue PL-11
½ oz. Paint Solutions Green Oxide PL-15
¾ oz. Paint Solutions Titanium White PL-50

Follow mixing and application instructions for glazes on pages 101–102.

Maple

Recipe for Gray Glaze on Oak

Before the glaze was applied, this oak sample was finished with one coat of lacquer sanding sealer and one coat of gloss lacquer spray. Compare this to the grain filled oak sample on page 95 and note how the glaze changes the overall color of the surface as well as making it look as if the oak had one application of gray grain filler.

2 oz. Saman Water-Based Glaze
1½ oz. Paint Solutions Lamp Black PL-16
½ oz. Paint Solutions Raw Umber PL-3
½ oz. Paint Solutions Titanium White #PL-50

Follow mixing and application instructions for glazes on pages 101–102.

Oak with gray glaze

Recipe for Dyed and Glazed Oak

This oak sample was first dyed and then sprayed with lacquer sanding sealer and a coat of gloss lacquer. A glaze was applied, followed by two coats of satin lacquer.

Dye

3 oz. hot distilled water
⅛ tsp Transfast Lemon Yellow Dye
1 smidgen ($\frac{1}{32}$ tsp) Arti Dye #118 Gray

Slowly add ⅛th of a teaspoon of Transfast Lemon Yellow Dye into three ounces of hot distilled water. Slowly mix 1⁄32nd of a teaspoon of Arti Dye #118 Gray into the solution and mix until thoroughly dissolved. Strain into a new container and apply when the solution has come to room temperature.

When the dye has dried, seal the wood with a few coats of clear finish. (You can de-whisker the wood after the first coat of finish.)

Glaze

2 oz. Saman Water-Based Glaze
1 tsp. Paint Solutions Medium Yellow PL-33A
¼ tsp. Paint Solutions Bulletin Red PL-14
¼ tsp. Paint Solutions Raw Umber PL-3
½ tsp. Paint Solutions Lamp Black PL-16

Follow mixing and application instructions for glazes on pages 101–102.

Oak with dye and glaze

Recipe for Dyed and Glazed Mahogany

This mahogany sample was first dyed and then sprayed with lacquer sanding sealer and a coat of gloss lacquer. A glaze was applied, followed by two coats of satin lacquer.

Dye

2 oz. hot distilled water
½ tsp. Transfast Lemon Yellow

Slowly stir a half teaspoon of Transfast Lemon Yellow dye into two ounces of hot distilled water. Mix thoroughly, strain into a new container, and apply to wood when the solution has come to room temperature.

When the dye has dried, seal the wood with a few coats of clear finish, depending on how soft the wood is. You can de-whisker the wood after the first coat of finish.

Glaze

2 oz. Saman water-based glaze
¾ oz. Paint Solutions Burnt Umber PL-4

Follow mixing and application instructions for glazes on pages 101–102.

Mahogany

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Wire Brushing

While technically this is not a method for coloring wood, the effects of this unusual technique are made much more evident through the application of color.

As you can imagine from seeing this sample, it can be quite a laborious process. The goal of wire brushing is to exaggerate the valleys in wood. It works best on soft wood like redwood or cedar. The bigger the cathedrals (the arched shape in the grain-pattern) on the face of the wood, the more exciting the results are, which is why the results are not as dramatic on pine. This is a great technique for the center panel in a door, beams in a ceiling, wainscoting or picture frames.

> The good news is that you don't have to raise the grain first because the final effect is a rough-hewn look.

Supplies You Will Need

- A shoe-handle wire brush that is used to strip flaking paint from wood. This can be found in paint stores or home-improvement stores. Another option is to use a hand-held drill with a coarse nylon wheel attachment. Wire wheels would be too aggressive, unless of course you want a severely jagged look.
- A small tank of MAPP gas. The 14-ounce size is typical.

The Process

1. Vigorously brush the wood in the direction of the grain pattern to create deep valleys.
2. When you are satisfied with the depth (or if you are tired of brushing!) hold the tank about four inches above the wood and wave it over the surface in a steady back-and-forth manner for a few minutes. You don't want the wood to catch fire, nor do you want the wood to be totally black/burnt.
3. Wire brush the surface again to achieve a more uniform look where areas need more brushing.
4. Gas it again. It won't go as dark as it did the first time.
5. Wire brush again.

Recipe for this Redwood Sample

Perhaps the colors on this sample are a little wild for your taste, but they are intended to show you how the effects of multiple coloring techniques are dramatically amplified on wire brushed wood. After the redwood was wire brushed, a dye was applied, followed by a coat of finish, and then a glaze. The final finish coat was spray lacquer.

Dye

½ tsp Arti Dye #1605 Light Oak
1 smidgen (1⁄32 of a teaspoon) Arti Dye #118 Gray
1 smidgen Arti Dye #138 Dark Blue
3 oz. hot distilled water

Stirring continuously, slowly add ½ teaspoon of Arti Dye #1605, a smidgen of Arti Dye #118 and a smidgen of Arti Dye #138 to three ounces of hot distilled water until thoroughly dissolved. Strain into a clean container and apply after it comes to room temperature.

Glaze

½ tsp Paint Solutions Medium Yellow
¼ tsp Paint Solutions Yellow Oxide
2 oz. of Saman Water-Based Glaze

Mix, apply and wipe off per the recipe instructions in the chapter on glazes.

Redwood

Charles and Henry Greene frequently featured wire-brushed wood in the homes they designed, but they did not torch it.

When applying dye and glaze to wire brushed wood, be sure to look at it from many directions because it’s easy to miss seeing one “wall” of the valley.

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Stains

There is a significant difference between the way stains color wood compared to how chemicals and dyes do the job. Stains color wood with pigments, which are particles that do not completely dissolve as dyes do.

Dyes dissolve in water the same way that salt does. If you add salt (a dye) to boiling water, it dissolves into the water and becomes an integrated part of the solution—and remains that way even after the solution returns to room temperature.

Pigments, on the other hand, are somewhat like chopped herbs in an oil and vinegar dressing. When stirred or shaken vigorously, they are suspended in the solution, but when left alone, the ingredients eventually separate and the herbs (like the pigments) settle to the bottom of the solution.

So because chemicals and dyes do completely dissolve in their carrier (typically water) they are able to color the fibers of the wood without leaving a residue of particles. Consequently, light is still able to penetrate into the pores of the wood and reflect back, enabling you to see the grain pattern with a much greater degree of clarity.

Stains, on the other hand, deposit a residue of pigment that lodges in the pores of the wood, in effect clogging the pores with color. Because this residue is opaque, and not transparent like dyes, the light is unable to penetrate through the pores and reflect back and thus the grain pattern is obscured.

The advantage of this opacity, however, is that stains are a much more appropriate colorant for outdoor projects because light does not penetrate through them as directly as it does through chemicals and dyes. Their opacity acts like sunblock on the wood, making the color more lightfast.

If given a choice, Brian usually prefers to use chemicals and dyes over stains because of the richer resolution they provide. His primary reason for using stains is if he is doing repair work on a piece that has already been stained, or if he needs to match one piece of furniture to another that has already been stained.

But let's be honest: Many people who want to color their wood feel more comfortable using a stain because chemicals and dyes can be intimidating until—like anything else in life—you get the hang of them. And because stains dry more slowly due to their oil base, they are easier to apply because you have a longer open time and don't have to worry as much about lap marks.

Stains are pleasant looking but there is no depth of character. The wood looks the same from any angle. There's no chatoyance or shimmer like you get with chemicals and dyes.

Stains are comprised of three basic ingredients: pigment, a carrier and a binder.

1. Pigments

Like natural dyes, pigments were derived from organic materials (iron oxides in this case) and were used as colorants for centuries. Iron oxide deposits were discovered in Sienna, Italy (raw sienna, burnt sienna!) Umbria, Italy (umber!) and in France (ochre!)Cavemen learned that raw earth pigments outlasted coloring agents from animal and vegetable sources and began using the pigments to paint the walls of their caves. Appalachia is also currently a source of natural earth pigments.

Following the trajectory of natural dyes, however, pigments were also eventually made in a laboratory as well.

Because the pigments used in stains are similar to those found in house paints, you are in a sense “painting” your wood when you stain it. Unlike paint however,which typically dries to a darker shade compared to the color you see when it is wet, stains tend to dry to a lighter shade.

Another type of coloring medium you may have heard of is “Japan colors.” They are similar to artist oils in that they are very finely ground pigments added to an oil medium (boiled linseed oil) that has metallic driers, such as the conveniently named Japan Driers, added to it because otherwise the Japan colors would take much longer to dry. There are various manufacturers of Japan colors.

2. Carriers

In oil-based stains,the carrier is typically paint thinner, which is a petroleum derivative solvent. Paint thinner has two advantages over pure gum turpentine, which could also be used as a carrier. First, paint thinner is less expensive because pure gum turpentine is extracted from the pitch of pine trees, which makes it more labor intensive to produce. Second, paint thinner is slower to evaporate so it gives you a longer open time in working with the stain, which is helpful on larger projects.

Pre-Sealing the Wood

To help the wood accept the stain more evenly, you might want to pre-seal your wood with a thinned-down finish coat. This is especially important on woods that are prone to blotch because of a soft or uneven pore structure, such as maple and cherry. Even with a pre-seal coat, stain can still look blotchy on these woods, but it will most likely look dreadful on maple without it. Truth be told, Brian never stains maple or cherry.

Whereas you will still have blotch on these woods with chemicals and dyes, the blotch disappears depending on the angle from which you are looking at the wood. With stains, however, the blotch registers from any angle.

There are many effective pre-sealers or wood conditioners on the market. Any final finish coat that you thin down to a certain degree becomes a pre-stain wood conditioner, also known as a wash coat.

3. Binders

Boiled linseed oil, popularly referred to as BLO, is the preferred medium and it has driers in it to help speed up the drying process. White lead was used as a drier until the toxic health effects associated with it became known. Driers nowadays tend to be cobalt and manganese.

Two Additional Ingredients to Consider

1. Acetone

Pigment can be mixed into a small amount of acetone first to break it down somewhat before further mixing it with paint thinner, which is the true carrier.

2. Driers

Even though BLO by definition has driers in it, you may want to add a touch more to speed up the stain's drying time so that you can begin putting a coat of finish on the wood. Nonetheless, you should still let the stained wood dry overnight before applying a finish coat.

The Final Color

Unlike chemicals or dyes where the color of the wood while wet reveals what the final color will look like with a coat of finish, it works differently with stains. Stains dry lighter than they appear when wet, so in order to determine the final color, you need to actually apply a coat of finish to your sample in order to determine if your stain solution is the right color intensity for your project.

However, if you have not added additional driers to your stain solution, you will have to wait longer because BLO is slow-drying and as it dries the color will continue to change. Only when the stain is completely dry can you apply a clear coat finish to see what the final color outcome will be.

To lighten a stain color, simply add more paint thinner. To darken a stain, add more pigment to the already-made solution, and this may require an additional proportion of binder (BLO). You can't simply re-stain the wood with the same color twice because the binder component in stains (BLO) is a finish coat by itself and prevents further pigment absorption after it has already been applied to the wood. However, bear in mind that the more pigment you add to darken your stain color, the less of the grain pattern you are going to see. In effect, you begin to visually lose more of the character of the wood.

> You don't have to raise the grain before applying oil-based stains because there's no water in them to kick up the grain.

There are water-based stains, but most people prefer oil-based because of their long open time.

How To Make and Apply a Stain:

1. Stir the pigment thoroughly into the acetone, and then add the paint thinner, stirring vigorously.
2. Add the boiled linseed oil and mix thoroughly.
3. Strain the solution through a cone strainer. You might end up with a lot of pigment remaining in the bottom of the filter. Push as much of these solids as you can through the filter and don't worry about the rest. There will always be some pigment that doesn't break down in the thinner.
4. Stir, stir, stir.
5. Immediately before applying the stain to your project, stir it well once again. Keep stirring it as you continue applying it.
6. Use a high-quality natural brush because it holds more material so that you don't have to make as many trips back to the bucket.
7. Never rest your brush inside the solution because it will absorb pigments that have settled to the bottom of the container, resulting in uneven color when you resume staining the wood.
8. Keep a wet edge as you apply the solution.

Recipe for Alder with Half Pre-Sealed

The bottom half of the sample was lightly pre-sealed before stain was applied to the whole sample. The pre-sealed bottom is a smidge lighter than the top half. For the wash coat (or preseal coat) we diluted Zinsser's Seal Coat Dewaxed Shellac, which comes in the can as a two-pound cut, with denatured alcohol to make it a one-pound cut. In other words, we added an extra ounce of denatured alcohol for each ounce of dewaxed shellac in order to thin it for use as a pre-sealer.

Stain:
2 oz. acetone
3 tsp. Red Oxide Dry Earth Pigment
1 tsp. Burnt Umber Dry Earth Pigment
1½ oz. BLO
2 oz. Paint Thinner (or pure gum turpentine)
¼ tsp. Japan Drier

Mix and apply according to directions above.

Alder, lightly pre-sealed bottom half.

Recipe for Alder with Half Dye and Half Stain

The stain and dye colors have been custom matched so that the bottom half of the sample is dyed and the top half is stained to show the difference between the grain pattern being obscured with stain and more visible with dye.

Dye

4 oz. hot distilled water
4 oz. cold distilled water
½ tsp Arti Dye #790 Brown
¼ tsp. Arti Dye #1605 Light Oak
A smidgen (1⁄32 tsp) of Transtint Red

Slowly stir ½ teaspoon of Arti Dye #790, ¼ teaspoon of #1605 and a smidgen of Transtint Red into four ounces of hot distilled water. Mix thoroughly until dissolved and then slowly stir in four ounces of cold distilled water. Strain the solution into a clean container. When it reaches room temperature, apply and then wipe the excess solution with a clean rag.

Stain

2 oz. acetone
3 tsp. Red Oxide Dry Earth Pigment
1 tsp. Burnt Umber Dry Earth Pigment
1½ oz. BLO
2 oz. Paint Thinner or pure gum turpentine
¼ tsp. Japan Drier

Mix and apply according to directions above.

Alder, top-half stained and bottom-half dyed.

Recipe for Oak with All Dye and Half Stain

This oak sample was dyed all over and then stain was applied to half of it to show you how you can further develop color outcomes by combining both processes. The wood is still porous after applying the dye color, so the overlay of stain creates a custom color. Also notice how the stain lodges in the open pores of the oak, similar to grain filler!

Dye

4 oz hot distilled water
1 tsp Arti Dye #128 Orange

Slowly add one teaspoon of Arti Dye #128 into four ounces of hot distilled water and mix thoroughly. Strain into a clean container. When the solution comes to room temperature, apply and then wipe off the excess solution with a clean rag.

Stain

2 tsp Burnt Umber into 2 oz. Acetone
2 oz. BLO
2 oz. Paint Thinner

Mix and apply according to directions above.

Oak, stained and dyed

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Bloopers

The way that things can go wrong in coloring your wood with chemicals and dyes usually have more to do with application and preparation than with the inherent properties of the chemicals or dyes themselves. Here are some classic (i. e., common) bloopers:

Fingerprints

Just as your mother told you frequently when you were a child: Wash your hands! But in wood coloring, it's for a different reason. The oil on your skin can leave a faint residue on the wood, which interferes with color absorption. This problem shows up markedly in the fuming process.

After you have sanded your wood to your final preferred grit, you should no longer touch the wood unless your hands are clean or you are wearing gloves.

Fingerprints

Lap Marks

You need to keep a wet edge when applying chemicals and dyes (except for nitric acid) because if you are interrupted or stalled for some reason and then pick up where you left off, you can end up with a lap mark.

Lap marks

Wicking and Pooling

Wicking can occur when you apply the solution to the end grain first and then apply it to the face of the wood. Pooling is a result of not wiping off the excess solution after you apply it.

Wicking and pooling

Uneven Color

It's never a good idea to apply any of these solutions while you are in the direct sun because some of them—such as this glaze for example—can dry so quickly that you don't have time to pull the solution across the wood.

Uneven color

Streaking

When you don't strain dyes or chemicals before applying them, you can end up with a color streak that is hard to wipe out with solution or water. Sometimes your attempts to fix the streak only exacerbate the problem.

Streaking

Blistering

If you leave your wood in the sun to dry after you have sprayed it with a clear finish, it can develop small white blisters or pimples. These are due to solvent entrapment, whereby the resins in the finish have "skinned over" while the solvent was trying to evaporate.

Blistering

You know how it goes: None of these bloopers will result when you're experimenting on scrap wood and aren't following the rules here . . . but the minute you start working on your actual project, these disastrous results will occur in spades if you break the rules. It's just how life works sometimes . . . right?

About the Authors

Brian Miller entered the finishing business in 1975 when he learned the intricacies of mixing colors while working at All West Paint in Reseda, California. Eventually, Brian started his own contracting company specializing in wood finishing and custom painting.

In the early 1990s, Brian taught himself all about chemicals and dyes after reading George Frank's fascinating landmark book, *Classic Wood Finishing*, on the topic. He bought dozens of additional older books (some from the 1800s) to learn more and also spent countless hours in his garage experimenting with recipes. A tour of the Gamble House in Pasadena—a national historic landmark designed in 1908 by Charles and Henry Greene and long considered a jewel of the American Arts and Crafts movement—inspired Brian to expand into historical preservation work.

Among the many architectural treasures he has restored are several Greene & Greene homes, including the interior and exterior of the famed Blacker House, as well as Charles Greene's personal home. For the Huntington Library and Museum in Pasadena, Brian did the finishing work for a permanent exhibit featuring a reproduction of the dining room designed by the Greene brothers for the Robinson House. He has also restored the woodwork on several of the Wright family's homes (both father Frank Lloyd and son Lloyd).

Currently, Brian's work entails both historical preservation and new projects. His unrivaled ability to match colors and patinas keeps him in demand as both a painter and wood finisher.

Since 2002, Brian has been an adjunct faculty member in the Woodworking Technology department at Cerritos College in Norwalk, California, where he teaches a wood finishing course he designed.

Both the California state legislature and the Pasadena Historical Society honored Brian in 2016 for his historic wood preservation work.

Marci Slade Crestani is a former lifestyle columnist for the *Los Angeles Times* and the *Los Angeles Daily News*. As a freelance journalist, she wrote for *Family Circle, Bride's*, and *Popular Woodworking*, among many others. She has served as executive editor of Flowers—a magazine for the floral trade industry—and as acquisitions editor for numerous medical trade magazines.

Her recent book, *Halfway to Dead: After 50, You Just Have to Laugh*, is a collection of thought-provoking and humorous essays on all aspects of aging.

In 2008, Marci enrolled in an Introduction to Woodworking class at Cerritos College to indulge her curiosity about making something out of wood. Intending to take just this one course, she is still a student there—admittedly a very slow one. She eventually took Brian Miller's wood finishing course and he gave her the knowledge (and more importantly, the courage!) to take her projects to the next level by coloring them.

Marci attributes her love of reading and writing to her mother, Carol Slade, and her love of woodworking and craftsmanship to her father, Gordon Slade.