

Choosing a Finish

Appearance is just one consideration

by Chris A. Minick

Ask ten woodworkers what they like best about woodworking. I'll bet a truck-load of walnut that finishing isn't at the top of the list. Most woodworkers hate finishing—and with good reason. Finishing requires you to work with stinky chemicals rather than shaping wood. Because finishing is the last step in a long process, a mistake could ruin the whole project. Or the error could mean spending hours stripping off the finish with more smelly chemicals. Furthermore, there are so many types and brands of finish to choose from (see the photo below). It's no wonder why many woodworkers get accustomed to applying only one kind of finish to every project. While that approach may be efficient, it could lead to a visual sameness to your work. More importantly, your old standby finish may not be the most suitable treatment for your project's intended use.

I consider three things when choosing a finish: the application equipment I have, the appearance I want and the protection I need for a project (such as film hardness and moisture resistance).

To sort out the most common finishing-product options, it helps to know about their properties. I use the comparison chart on pp. 86-87 to weigh the strengths and weaknesses of each finish.

Penetration and application

The most important factor affecting how a finish performs is whether it penetrates the surface. Based on where the finish resides, woodworking finishes can be divided into three general classes: "in the wood," "in and on the wood" and "on the wood."

In-the-wood finishes—Penetrating finishes like tung, linseed and Danish oils are easy to use. Just wipe them on, and wipe off the excess. Because easy repairability is their biggest advantage, I often use oil finishes on projects that take abuse. A periodic reapplication of oil hides any scratches. The lack of a surface film allows oil finishes to be re-coated anytime without fear of adhesion loss.

Oil finishes darken wood but leave it natural-looking. That



Picking finishes and applicators—Along with the most common wood finishes, author Chris Minick displays the applicators he prefers for each. From left: paste wax, linseed oil, Danish oil and mineral oil—all applied with a rag; semi-gloss interior paint-

applied with a polyester brush; shellacs—applied with an ox-hair brush; polyurethane varnish—applied with a foam applicator; water-based acrylic—applied with a nylon/polyester brush; and nitrocellulose lacquer—applied with a spray gun.

chocolate-brown color of the walnut box on the left in the photo below was achieved with three coats of linseed oil. I like the appearance of an oil finish on dark woods, but I find the yellow color of tung oil objectionable on light-colored woods like birch. In addition, tung oil tends to obscure subtle figure.

Not all so-called oil finishes are purely oil. Danish oils, for example, which add a rich, satin luster to certain hardwoods (see the photo on the facing page), are usually dilute varnish solutions to which oils have been added for increased penetration.

In-and-on-the-wood finishes—Oil-based varnishes and lacquers have the unique ability both to penetrate the wood and to form a protective coating on the surface. This class of finish produces that wonderful illusion of depth associated with fine furniture. Some woodworkers steer away from polyurethane varnishes, fearing they will give projects a plastic-coated look, but I've found an easy way to avoid the plastic look. Because I don't have a good touch at spraying on an oil-based varnish, I usually brush on three or four coats of thinned varnish to a piece. Then I burnish the final coat (after it has dried) with a soft cloth to kill the plastic look. The key to getting a nice finish with oil-based varnish is to apply thin coats and then rub out the last. The walnut box on the right in the photo below has a brushed-on varnish finish.

Nitrocellulose lacquer is an in-and-on-the-wood finish that exhibits marvelous depth, high luster and is quick-drying. These attributes make it the preferred finish of professional furniture-makers. Brush-on formulations of nitrocellulose lacquer are available, but I've found them difficult to apply. Spraying is the most practical way to apply nitrocellulose lacquers. Unfortunately, I don't have a spray booth or the other explosion-proof equipment needed to safely apply highly flammable finishes. As a consequence, I only use solvent-based lacquers on small projects.

On-the-wood finishes—As the name implies, on-the-wood finishes lay on the surface and do little to accentuate the grain or color of wood. The shellac finish on the center walnut box (see the

photo below left) has the typical satiny look of this class of finish. Wax is an obvious on-the-wood finish, too. And aside from its easy repairability, one of the best things about wax is its nontoxic nature (see the story on p. 88).

It may surprise you to learn that the new water-based finishes also lay on the surface of the wood. The chemical composition of a typical water-based finish prevents the resin from penetrating the wood. This accounts for the no-depth look that these finishes impart to bare wood. However, I've found water-based finishes look great when applied over sealed surfaces (see the photo at right on p. 89) rather than directly to the wood. A fair amount of practice is needed to acquaint oneself with the idiosyncrasies of applying water-based finishes. But because water-based finishes are non-flammable, have little odor and are easy to clean up, I find the benefits are worth the application effort.

Surface preparation—Of course the final finish you achieve is only as good as the surface you prepared. In some instances, sanding to 600-grit is all you need. In other cases, you may want a scraped surface. If you do sand, it's best to work your way up through the grades of grit, as described in *FWW*#99, p. 40. I often use my random-orbit sander to smooth a surface (see the photo on the facing page) because I can sand cross-grain without scratches or swirls. Smoothing between coats and after the topcoat will further improve the look and feel of your finish.

Appearance: color and luster

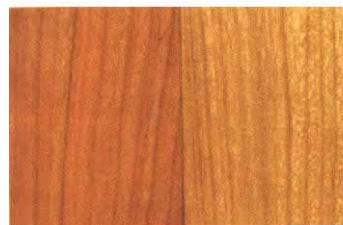
Clear finishes are far from colorless. While the color of a finish is not usually my primary consideration when selecting a finish, color can have a profound effect on the final appearance of the project. The samples shown in the photos above the chart are all cherry with three coats of finish. Paints were not included in the chart because of their wide variety.

Solvent-based acrylic lacquers (commonly found in auto supply stores) are clear and make good coatings for light-colored wood or as a clear coat over whitewashed, stained or painted pieces. Wa-



Same wood, different lusters—These three boxes were made from a single piece of walnut (a strip is shown at bottom), but finished differently: The left box was coated with linseed oil to give a dull look; the center box was wiped with shellac and waxed to a satin sheen; the right box (with the reveal on the lid) was brushed with polyurethane varnish and burnished to a low gloss. The finishes also bring out variations in color and grain contrast.

Comparison of translucent finishes



Finish type	Tung, linseed oils	Danish oil
Finish description		
Surface penetration	In	In
Stain resistance	Poor	Poor
Moisture resistance	Poor	Poor
Relative color ♦	Dark amber	Amber
Relative luster	Dull	Satin
Best applicator *	Wipe on	Wipe on
Repairability	Excellent	Excellent
Dry time (hours)	18-24	6-12

Notes:

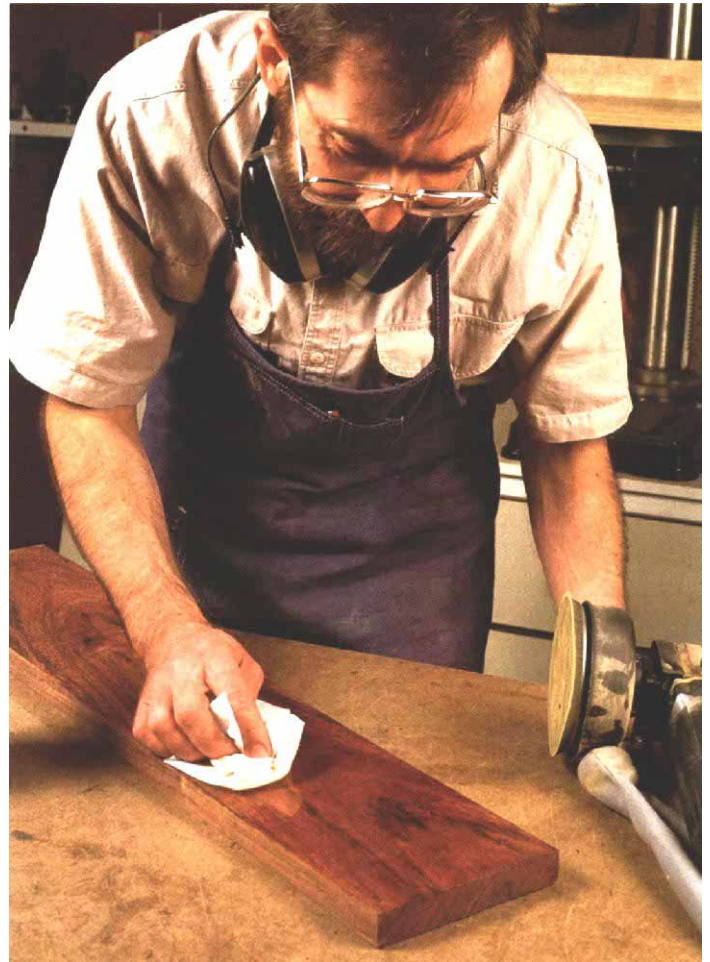
- ♦ 3 coats of finish were used to achieve these colors on cherry.

ter-based acrylic finishes are just as colorless as their solvent-based kin, but they look hazy over dark stains. Oil finishes are on the other end of the color spectrum. These deep-colored finishes drastically alter the hues of wood. But because oils don't form a surface film, the dark yellow tint is only noticeable on light-colored wood. Standard alkyd varnishes, polyurethane varnishes and nitrocellulose lacquers impart an amber glow, often called "warmth," as displayed by the lacquered Queen-Anne highboy in the top photo on p. 88. By contrast, the bluish tint of a water-based polyurethane coating gives stained wood a cold cast, an effect that is even more pronounced on walnut. I prefer warmer finishes, so I rarely use water-based polyurethane in my shop.

Aside from color, there's another quality of finishes that affects appearance—luster. A finish's formulation, thickness and method of application cause a surface to be either dull, satin or glossy. It's usually the style of a furniture piece that dictates which looks best. For instance, we're accustomed to seeing a hand-rubbed finish on an 18th-century, French period piece. Yet we prefer a more rustic look on a Shaker-style bench. A hard and glossy polyurethane varnish looks out of place on either piece.

Layering different finishes on the same piece—Finishes can also be layered for special effects. The spruce guitar soundboard in the photo at right on p. 89 has a double-layer finish along the top. First I brushed on fresh, super-blond shellac to enhance the grain and chatoyance of the stock and to add an amber color to the finish. Next I applied the vertical bands of water-based finish, so I could compare each against the look of acrylic and nitrocellulose lacquers. When undercoated with shellac, the color and depth of the water-based finishes closely matched the lacquers.

My favorite finish for black walnut is a three-layer finish. I apply linseed oil to deepen the brown color; two coats of shellac seal in the oil and enhance the wood's highlights. Finally I apply a top-coat of water-based lacquer to add depth. Layered finishes can produce unusual effects, so always test a layered finish on scrap-wood before committing it to your project. Keep in mind, too, that



Good surface preparation and Danish oil do wonders for this piece of macacauba (a relative of rosewood). The rich colors of the dense tropical wood also come alive when the surface is sanded to 600-grit and waxed, as the back part of the board shows.



Oil-based (alkyd) varnish +	Polyurethane (uralkyd) varnish +	Nitrocellulose lacquer +	Acrylic lacquer +	Shellac (orange)	Bees, carnauba waxes	Water-based acrylic +	Water-based polyurethane +
In & on	In & on	In & on	In & on	On*	On	On	On
Good	Excellent	Very good	Very good	Very good	Poor	Fair	Fair
Very good	Excellent	Good	Very good	Good	Poor	Fair	Fair
Amber	Amber	Light amber	Clear	Amber	Clear	Clear	Bluish
High gloss	High gloss	High gloss	High gloss	High gloss	Satin	Medium gloss	High gloss
Brush	Brush	Spray	Spray	Brush	Wipe on, buff	Spray/brush	Spray/brush
Poor	Poor	Good	Fair	Very good	Excellent	Poor	Poor
2-6	2-6	¼-½	½	½	¼	2	2

* Shellac can be considered "in and on" for dilute solutions.

+ Most manufacturers add flattening agents to create a "satin" option.

* Many finishes can be applied (less effectively) by other methods.



Highboy gets a high-end finish. Andrew Davis of Santa Fe, N.M., hand-rubbed layers of lacquer to finish this mahogany Queen Anne highboy. Aniline dye and japan colors were used to add tint.

not all finish combinations are compatible. Generally, I've had good luck layering water-based finishes over solvent-based ones if I seal in between them with shellac.

Protection

Durability is an important consideration when I'm choosing a finish. Along with film hardness and adhesion, a finish often has to resist abrasion, distortion, heat and solvents. Generally, the higher the molecular weight of a finish, the more protection it offers. Oil finishes, although easy to repair, offer little protection from water or food stains. The varnish component of Danish oil increases the protection level of the finish only marginally. Likewise, paste wax performs rather poorly at resisting stains or moisture. By contrast, the superior protection of polyurethane varnish makes it my first choice for kitchen tabletops and other pieces that must stand hard use. Oil-based varnish, shellac and both acrylic and nitrocellulose lacquers protect wood against stains and water, but not quite as well as polyurethane. Water-based finishes are slightly less protective than a nitrocellulose lacquer.

So while certain finishes provide excellent stain and water protection without repairability, others repair easily but don't provide much protection (see the chart). Do you settle for protection or repairability? You may not have to make that choice. Combining different finishes on the same project provides a way to take advantage of the strong points of each.

Applying separate finishes on the same piece—I often use different finishes on the same project. Vertical and horizontal surfaces in a piece will wear differently, so you may want to finish them differently. And because of the effects of dust and gravity, you may want to apply the finishes differently as well. The top of my dining room table is finished with a polyurethane varnish, which is practically bulletproof—protecting against food stains, water and abrasion. Because the table's legs are subject to chair bangs and kicking feet (three teenagers live in my house), I oiled the legs with linseed. By occasionally re-coating them, I hide the scratches. The stool in the photo at left on the facing page was al-

Nontoxic finishes

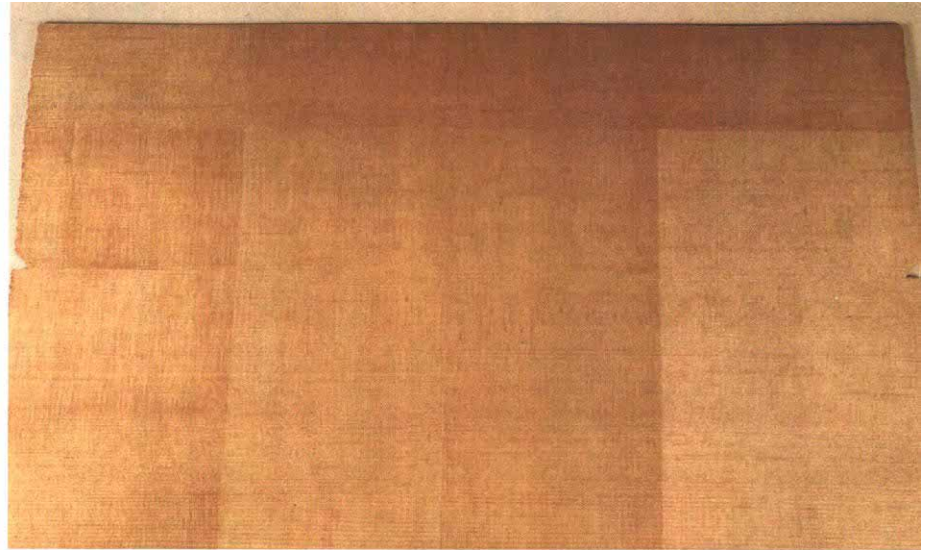


Safe to apply—To add a nontoxic finish to his maple cheese board, the author rubs on mineral oil (above), also known as paraffin oil, which is prescribed as a laxative.

While browsing through my hardware store, I picked up a can of interior oil-based varnish. Plainly printed on the label was "nontoxic when dry." This statement surprised me because I knew the finish must contain metallic driers to function properly. Although lead compounds are no longer used as driers in varnish, manganese, zirconium and cobalt are used, and their low-level toxicity effects have not been fully explored. So why risk putting heavy metals on your salad bowl or breadboard?

Current research about food-preparation surfaces indicates that wooden cutting boards are better than synthetic ones (see *FWW* #101, p. 104). And the study suggests that if you finish the wood, you may actually impede some of the wood's beneficial effects (the tannins may deter bacteria). However, if you decide to finish the wood, there are several superior nontoxic finishes.

Mineral and linseed oil: My first choice for finishing wooden kitchen items is mineral oil, which is a petroleum-derived hydrocarbon. Sold as a laxative in my pharmacy, the bottle of mineral oil I use recommends "one to three tablespoons at bedtime." I feel pretty safe using this finish on a cheese board (see the photo at left). A few coats of mineral oil help protect against food stains and dishwasher, and an occasional re-coating keeps the board looking new. Another laxative, raw linseed oil (not the boiled kind which may contain metal driers), imparts a yellow color to wood and also makes a fine nontoxic finish.



A layered finish adds depth. This spruce soundboard stock (above) shows what effect an under layer of super-blond shellac (the top horizontal band) has. From the left, the vertical finish strips are nitrocellulose lacquer, acrylic lacquer, water-based acrylic and water-based polyurethane.

Separate treatments—Minick chose five finishes for this stool (left). The seat was coated with water-based acrylic; the legs were shellacked, painted and waxed; and the rungs were Danish oiled. Similarly, a guitar's body and neck may be finished differently.

so treated with a combination of finishes. With a multi-finish approach, I like to finish the components separately. Before finishing, I mask off the surfaces that will be glued. Once the finish is dry, I assemble and glue up the components.

One last test of a finish comes when I stand back to admire a project. The finish should enhance the wood. If all I see is the finish, then I chose the wrong one. A close friend summed it up best, "You never see a perfect finish, you only see the bad ones." □

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Further reading

To learn more about:

Brushing on a finish, see *FWW*#98, p. 54 and *FWW*#95, p. 46.

Finish durability, see *FWW*#82, p. 62.

Finishing hazards, see *FWW*#92, p. 80 and *FWW*#80, p. 58.

Spraying a finish, see *FWW*#82, p. 56.

Water-based finishes, see *FWW*#89, p. 52 and *The Woodfinishing Book*, by Michael Dresdner, The Taunton Press, 1992.

Tung and walnut oils: Pure tung and pure walnut oil dry without metallic driers. As long as their container says "pure," both walnut and tung oil are considered nontoxic. Products labeled tung-oil finish or tung-oil varnish may contain resins or metallic driers. One source for drier-free oils is Wood Finishing Enterprises (1729 N. 68th St., Wauwatosa, Wis. 53213; 414-774-1724).

Waxes and shellac: Carnauba wax (made from Brazilian palm trees) or paste furniture waxes that contain beeswax (secreted by honey bees) give a nice shine to a smooth piece of hardwood. Both waxes are approved by the Food and Drug Administration (FDA) as nontoxic food additives. I apply paste furniture wax to cutting boards fairly often because its protection against water is low.

Shellac, a nontoxic resin made from insect secretions, is also recognized by the FDA as a food additive. Used as a candy glaze (hence the name confectioners' glaze) and as a timed-release coating on oral medications, shellac makes an excellent choice for baby cribs and other pieces requiring a film-forming finish. Shellac has a short shelf life once dissolved in alcohol. So it's best to prepare your own solutions from fresh, dry shellac flakes. I've found the pre-mixed variety is often too old to dry properly.

Watch paints and water-based finishes: Most children's toys look best when painted. Don't use common house paint—oil-based or latex! These paints often contain pigments, biocides and

fungicides that maybe harmful if ingested. Instead, use one of the specially developed nontoxic paints, which are available at most arts and crafts stores. Look for the seal of The Arts and Crafts Materials Institute or the words "conforms to ASTM D-4236" on the label. Either designation indicates the product meets government and industry standards for a nontoxic paint.

Similarly, don't assume water-based finishes are nontoxic just because they contain water. A clear, water-based finish can contain up to 15 separate additives, some of which are harmful if ingested. Also, be careful if you apply a clear finish over stain. It's best to read the can and call the manufacturer if you're unsure.

Material Safety Data Sheets: No discussion of finish toxicity is complete without mentioning Material Safety Data Sheets (MSDS). These sheets include information for the safe handling and disposal of a product, and they list most of the hazardous ingredients it contains. But except for special cases (carcinogenic and certain highly toxic materials), hazardous ingredients at concentrations of less than 1% of the formulation do not have to be listed on the MSDS. Just because a material doesn't appear on the MSDS does not mean it isn't in the finish. Metallic driers, for instance, typically fall below the 1% rule and do not have to be listed. If you have concerns about a particular finish, call the manufacturer. You'll be provided with the product's MSDS and other safety information. —C.M.