Fuming with Ammonia

How to get an authentic Arts-and-Crafts finish safely and effectively

by Kevin Rodel

Photo this page: Dennis Griggs

***Fuming with ammonia** gives white oak that classic golden-brown color. Before it's been fumed (inset), white oak is a pale, almost cool, tan.*

Photos except where noted: Vincent Laurence

Anyone who's spent time mucking out stables, or just walking through a working barn, knows how pungent ammonia fumes are. Those fumes have darkened the beams of many a barn over the centuries. I wouldn't doubt that many farmers put two and two together when they noticed how quickly oak acquired an aged patina.

Around the turn of the century, fuming became popular with many of the furnituremakers and manufacturers working in the Arts-and-Crafts style. So much so that when most people think of Stickley, Limbert or Roycroft furniture, fumed white oak is what they see in their mind's eye. Other woods can be fumed, but white oak responds best and most predictably to fuming (see the bottom photos on p. 48). For a look at the effects of fuming on other woods, see the box on p. 49.

Regardless of species, boards that will be fumed should all come from one tree. Different trees within a species will vary in their tannin content because of growing conditions. This will affect how they react to the ammonia. Because it's difficult to get boards all from one tree at a regular lumberyard, I buy most of my lumber from specialty dealers who saw their own.

I began fuming furniture because I'd become increasingly interested in the Arts-and-Crafts movement. I had been making more furniture in that tradition, and I wanted it to convey the look and feel of the originals. The finish seemed like an important element in the whole equation. Fuming is not the perfect colorant for every situation and wood species, but where it does work, it works very well and can give a superior finish to stains or dyes.

Stains obscure the surface of the wood somewhat. Worse yet, on ring-porous woods like oak, pigments collect in large open pores, making the rings very dark and overly pronounced. The effect is quite unnatural and looks to me like thousands of dark specks sprinkled across the surface. Also, stains are time-consuming to apply, and I have a strong aversion to exposing myself to the volatile fumes of the petroleum-based products found in most commercial stains.

Aniline dyes do a better job than stains, but they're also rather labor-intensive and can be very tricky to apply well. Dyes also fade over time, especially in direct sunlight. Fumed wood is colorfast.

The thing I like best about fuming is that what you see after the process is still only the wood, just as clearly as before. It's just darker. That's because the ammonia reacts with tannins that are naturally present in the wood, actually changing the color of the wood, not merely adding a superficial layer of color. Samples of fumed wood that I've cut open show a ragged line of darker wood between 1/16 in. and 1/8 in. deep.

Another thing I like about fuming is that it's virtually foolproof. The first piece you fume will look great. Unlike stains or dyes, fuming won't make a piece look blotchy or cause drips. And there's one other benefit to fuming. While the piece of furniture is being fumed, you can get back to work. The ammonia keeps working while you're taking care of other business.

Handle ammonia with care

The first and most important consideration when fuming is safety. Before you even buy the ammonia, make sure you have a properly fitted face-mask respirator with ammonia-filtering cartridges. Other types of cartridges, such as those used for spraying lacquer or other finishes, are not designed to filter ammonia fumes and will not offer protection. Ammonia cartridges are inexpensive and available at any fire or safety equipment store. Look in the yellow pages for the one nearest you.

Eye protection is essential. I use swimming goggles, which fit tightly around the eyes. The purpose of the goggles is to protect the eyes from fumes, not just accidental splashes. Rubber or plastic gloves are also necessary. Read the precautions on the side of the ammonia bottle, too.

Finally, if you're trying this for the first time and you work in a basement shop, wait until the weather is nice and do the fuming outside. After you become comfortable with the procedure, you can consider doing it indoors.

The reason for all the precautions when fuming is that ammonia used for fuming wood is not common household ammonia. It is a strong aqueous solution that has between 26% and 30% ammonium hydroxide. Household ammonia has less than 5%.

You'll want to buy the ammonia locally and pick it up yourself. Because it is considered a hazardous substance, shipping charges are high (more than the cost of the ammonia). This industrial-strength ammonia is used in machines that reproduce blueprints and surveys, so you can usually find it at business-supply, blueprint-supply or surveyor-supply stores (look in the yellow pages for a supplier). It's sold by the

Aqueous ammonia is poured into a glass container placed *at the bottom of the fuming chamber (above). Then the top of the chamber is lowered quickly onto its base (right). Protective gear is essential.*

gallon. Here in Maine, it costs between $6 and $10. And 1 gal. fumes a lot of furniture.

Bringing ammonia and wood together

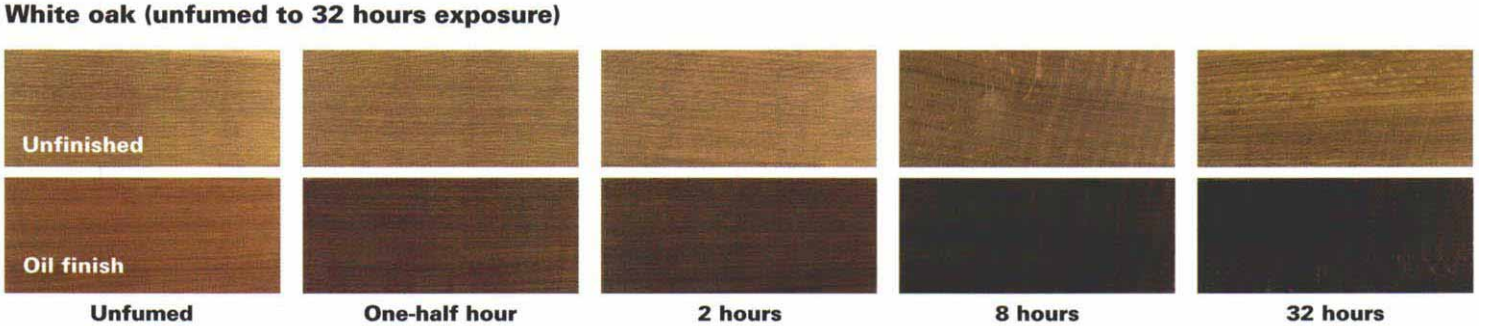
With safety equipment and ammonia in hand, you're almost ready to fume. All you need now is some kind of fuming chamber—the more airtight the better. The most versatile and efficient chamber construction seems to be a heavy-gauge (3 mil or greater) plastic wrap stapled to a simple softwood frame that's held together with drywall screws (see the photo at right).

This type of chamber is lightweight, can be made to just about any size and can be broken down into flat panels for storage. If a fairly large chamber is needed, one side panel can be used as a detachable doorway. Use spring clamps or hand screws to attach the door panel and felt weather stripping as a gasket to seal the chamber. Small chambers can be placed over the items being fumed, as in the photo at right above. If you're fuming outdoors, be sure to weight or tie down this kind of chamber. They're very light and blow over easily.

I've used many other types of fuming chambers as well—everything from large plastic trash cans (perfect for small items) to a rented moving van. The van allowed me to fume an entire bedroom set at one time for a reasonable cost. The ammonia did no harm to the van, and by the time I returned it the morning after fuming, there was little if any residual smell. And because every piece was exposed to the ammonia for the same amount of time, I was able to achieve a precise color match.

Prepare a piece of furniture to be fumed the same way you would for staining or finishing. Scrape or sand until the surface is smooth, and remove any hardware. Place the piece of furniture in the chamber so that no part that will be visible is touching anything. If the ammonia vapors can't circulate, they won't be able to react with the tannins in the wood. As a result, that spot will not darken like the rest of the piece.

Never let the furniture come into direct contact with the aqueous ammonia because it is very corrosive. I use glass pie plates to hold the ammonia. They're relatively inexpensive, clean up completely and can be used over and over again. They



Wood sample photos: Scott Phillips

also present a large surface area to the air so the ammonia evaporates readily.

I fill a plate about half full and place it on the floor of the chamber (see the photo at left on the facing page). The plate should be filled quickly but carefully. If you're fuming a particularly large piece or more than one piece, you may want to use two or three pie plates. Attach the door to the chamber, or lower the chamber onto its base. With the fumes confined to the chamber, you can remove your mask and goggles. Note the time so you can keep track of the exposure.

Test pieces determine color

The length of time a given piece will need to be fumed depends on the volume of the chamber, the amount of ammonia used, the species of wood being fumed and the depth of color you're looking for. Knowing when to remove a piece is largely a matter of personal experience. You can hedge your bets, though.

The best way to know when you have achieved the desired amount of fuming is to use test pieces. I always place three or four pieces of scrap, preferably cutoffs from the same project, on the floor of the chamber. When I think enough time has gone by, I don mask and goggles, quickly open the chamber, remove one of the scrap pieces and reseal the chamber.

When it first comes out of the chamber, the wood will have a gray, almost weathered, look. Don't be alarmed; this is normal. To see an approximation of what the finished piece will look like, I apply a coat of finish. As soon as the finish goes on, the real color imparted by the fuming appears instantly, almost magically. If I want the piece darker, I'll continue checking the color of the scrap boards at regular intervals until I'm happy with the result.

If, after eight hours in the chamber, a piece is still lighter than you'd like, you should replace the ammonia. I put on my mask, goggles and gloves, open the chamber and dump the old ammonia into a bucket of water. I add fresh ammonia to the pie plate, reseal the chamber and leave the bucket of diluted ammonia outside for a day. Then I pour it around the trees in our orchard or on the compost heap.

Once you've decided the wood is dark enough, remove it from the chamber, and let the piece of furniture off-gas for eight to 12 hours. I try to plan my fuming sessions so that the piece comes out of the chamber at the end of the work day, By morning, there's little residual smell.

At this point, you can apply your finish. Oil, varnish, shellac—any finish will work. There's no problem with compatibility between a piece of furniture that's been fumed and the topcoat. At the same time, fuming doesn't protect the surface of a piece in any way, so build up your finish as you would normally.

My preferred finish has always been boiled linseed oil (I use Tried and True brand because it builds quickly and contains no metal driers). Three or four coats over fumed oak impart a subtle amber overtone that's in keeping with the look of Arts-and-Crafts furniture. □

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Fuming common furniture woods

The practice of fuming wood to enhance its color is most often associated with white oak. The oaks in general are high in tannin and fume well, though red oak tends to turn greenish rather than deep brown like white oak. Other species contain varying amounts of tannins and can be fumed, but the effects are generally not as pronounced as with white oak. I was curious about the effects of fuming on other furniture woods, so I fumed a number of them for four hours.

I'd heard that nontannic woods could be fumed if a solution of tannic acid was applied to the surface of the wood first, so I tried that as well. (Tannic acid is available from Olde Mill Cabinet Shoppe; 717-755-8884.) Tannic acid is sold as a powder that you add to water. I added tannic acid to a pint of water until the solution was saturated, applied the solution with a foam brush and then let the samples dry overnight before fuming. Here are the results. —*K.R.*