"Handouts" provided by Ed Pretty after Zoom Demo to Montgomery County Woodturners 7/9/20

Colouring Wood

presented by Ed Pretty

Colouring wood:

- creates a unique piece
- match décor
- highlights figured grain
- creates contrast within a piece
- create illusions within a piece
- a vehicle for your personal expression

Methods of colouring

1. Stain – blocks light – topical only
2. Dye – penetrates – doesn't block light – penetrates – highlights figure
3. Chemical reaction – topical – very topical
4. Liming – highlights grain shape and direction
5. Bleaching – lightens wood – somewhat topical
6. Faux finish – less colouring than it is altering

Stain

OK to use but I'm not a fan. Colours but subdues grain and figure significantly. Large pigment particles don't allow penetration and block light.

Dye

- Dye accentuates figure by penetrating at different rates (grain direction within the figure)
- Dissolves completely so penetrates further and doesn't block light
- Anilines are organic petroleum oxides
    - Notorious for poor light fastness
    - Probably are no longer made. Manufacturers use the name because that's what people recognize (i.e. Kleenex). You have no idea what dye base is being used when you use anilines.

- Dichlortriazine dyes (Procion MX)
    - most colour fast
    - compatible with cellulose fibers like cotton, linen, bamboo and rayon (actually derived from plant fiber), silk and … wood.
    - no fixing required as when used with fabric (not being washed)

- Metal Oxide dyes (Procion, Trans Tint)
    - Are compatible with synthetic fibers and wool
    - Not compatible with wood fibers

- General fabric dyes (i.e. Rit)
    - Unsure of colour fastness
    - May not be compatible with cellulose

- Enhance with finishes
    - Penetrating finish required to "pop" figure (chatoyance)
    - Topical finishes (lacquer, acrylic, shellac) provide less drama
- Can be applied in multiple layers for varied effects
- "Sanding back" produces varied effects

Chemical reaction

- Reaction between chemicals in the wood and an applied chemical alter the colour
- "Ebonizing" – fancy term for making wood black ☺ or "pickling"
- Tannin in wood reacts chemically to darken wood surface
- Oak, black walnut, acacia have high tannin content however most woods will react to some degree
- The effect can range from turning wood almost black to a soft, weathered grey depending on tannin content
- Fuming – ammonia (industrial strength – not household strength)
    - Fuming darkens wood
    - Fuming can darken wood after a stain or dye has been applied (George Frank – Adventures in Wood Finishing)

- Iron sulfate (in water) or iron and vinegar (forms iron acetate) both react with tannin in the wood
- Note that iron (steel wool) and vinegar forms iron acetate and hydrogen while reacting (caution: ignition hazard). Make sure you have adequate ventilation so that fumes do not accumulate.

Liming

- Accentuates grain pattern by following grain lines
- A grain filling technique
- Liming traditionally uses a white filler (pigment, not lime)
- I now use Golden Open acrylics. Allows limitless range of colours. You must use the "Open" line of colours because regular acrylic dries too fast.
- Requires ring-porous or semi ring porous woods for best results
    - Oak, Ash, Chestnut, Hickory, even acacia
- Diffuse-porous woods only look messy
- Order of business: Colour or stain if desired (prior grain raising may be required), finish with desired finish to seal colour, apply coloured grain fill.
- Accentuates flaws exponentially!

Bleaching

- Wood bleach required.
    - Wood Kote's "Lighten Up" from any place that sells Mohawk products
    - See USDA handout
    - Google "bleaching wood" for homemade bleaching formulas. Most chemicals are readily available at pool supply stores.
- Process:
    - Raise grain first. Too much post-sanding goes through bleach layer.
    - Apply bleach – reaction not complete until wood is dry
    - Apply additional coats if lighter colour desired

- Use prior to application of lighter dyes: yellow in particular.

Faux finishes

- Not really colouring the wood but adds interest
- Includes:
  - Patination of applied metal paints (copper and iron)
  - Crackle finishes
  - Gilding
  - Any faux technique used when applying painted finishes.

Chemical applications
Please read: A word of warning below.

Long before there were man-made stains found on our hardware shelves of today woodworkers discovered that chemicals could change the color of wood. These chemical stains react with those present in the wood to form compounds that add color or ...here's the part you all should like.... an aged appearance.

Two of these three chemicals can be purchased as powders with the exception of iron buff and dim water. A good starting point is 1 oz. powder (by weight equals roughly 2 tablespoons) to 1 qt. water. Allow the solution to cool to room temperature and strain the mixture to remove any residue. Apply the same way as a water based stain flood the surface liberally with a bristle or foam brush. NEVER SPRAY A CHEMICAL STAIN. Wait at least 4 hours for the color to develop if another coat isn't needed rinse the wood with clean water to remove any residue. if desired you can smooth the raised wood with 220 grit sand paper.

Ferrous sulfate also known as iron sulfate or copperas turns most woods a light weathered gray, it can be purchased as dry granules at Earthguild.com or 1-800-327-8448 it will react with the tannins in the wood to form iron compounds similar to gray/black stains visible on wood that been in contact with iron. It works well producing grays on most species, a color difficult to obtain with dyes and pigments.

Iron buff produces grays and blacks, the simplest way to make Iron buff is to shred 1 oz steel wool (one pad) into 1 pt. white vinegar. Mix the solution with an open container allowing the hydrogen-gas to escape. I the strain the liquid through a coffee filter to remove all steel particles. Leaving the steel in the vinegar for 1 day creates light grays on tannin rich woods such as oak, cherry, and walnut. Leaving the steel in the vinegar for a week produces color ranging from dark gray to a deep blue or black. You can experiment yourself as you go along.

Sodium carbonate is not as strong as lye, but it's much safer. It works well duplicating the yellowish brown patina caused by photo-oxidation from sun and air exposure. Again start with a mix of 1 oz washing soda to 1 qt. water and increase or decrease the amounts to get the desired effect.

I have used these stains on Mahogany, white oak, ash, maple, cherry, and pine countless times with wonderful results. They are easy to make and again the type stains our fore fathers made and used, and the aged factor will surprise all of you that haven't tried it.

A word of Warning! The chemical ingredients in some of the products listed above can be hazardous and must be used with caution! Wear rubber gloves, a face shield, and a mask if required. Open the window and put on the fan. Follow the manufacturer's instructions to the letter. Make sure you keep these agents in a well secured, safe lockable cabinet. Keep away from pregnant women, kids and pets. Accidental overdose of products containing iron is a leading cause of fatal poisoning in children under the age of 6. Keep this product out of the reach of children. In case of an accidental overdose, call your doctor or a poison control center immediately. In other words, use your common sense! I'm not trying to scare you, but just use a little precaution when using and or mixing certain chemicals agents.

Sources

1. Procion MX: Opus and Maiwa (Granville Island and on line)
2. Wood Essence: Colour FX. On line (Saskatoon)
3. "Aniline" dye: Lee Valley

4. Trans Tint dyes (metal oxide) : Craft supplies
5. Iron sulfate: nurseries – separately or major constituent in moss killer
6. Ammonia: chemical suppliers or blue printers
7. Lime wax: Woodchuckers and Craft Supply (both on line)
8. Golden Open. Most art stores. Opus, Michaels
9. Wood Bleach: “Lighten Up”. Any Mohawk supplier. Some hardware/builder supply stores also supply other brands
10. Various faux finishes
    - Crackle glaze: Benjamin Moore or Windsor Plywood (Titebond Liquid Hide Glue)
    - “Faux Metal” paints and patination applications: Opus, other art stores
    - Gilding foil, size and glue: Opus and other art stores (this foil is not true metal)

<u>Dye procedure options</u>

1. **One colour** – *Use on figured grain for highlights or colour change for regular grain*
2. **Two colours, no sanding of first colour** – *Use on regular or figured grain. Yields a third colour (i.e. blue + yellow = green) or highlight areas of flat and end grain with shades of tertiary colour (usually on turnings more than flat work because turnings have flat and end grain unless turned end grain).*
3. **Two colours, sanding back the first** – *Use on figured grain. Yields tertiary colour with blends between darker and lighter shades.*
4. **Black plus one colour, sanding back the black** – *Use on figured grain. Yields black or very dark colour highlights plus second colour.*
5. **Black plus two colours, sanding back black and first colour** – *Use on figured grain. Yields black or very dark tertiary highlights with blends of darker and lighter tertiary colours.*
6. **Three colours –** *Use on figured grain or regular grain. Darker colour first, mid second and lightest last. Use sanding techniques for black/two colour. Yields tertiary colour of dark and combination of last two primaries (i.e., blue + red + yellow = shades of brown in figured wood, [same as blue + orange= brown]). When used on regular grain, yields one tertiary colour.*
7. **Note when applying black and first colour** – *wipe down with damp cloth after application to remove excess dye. Saves a lot of sanding.*
8. **Note that primary colours (Blue, Red, Yellow) are the only colours required.**
9. **Use a colour wheel (art stores) if not familiar with combining colours**
10. **Sanding procedures.**
    - **Two colour:** *Sand back first colour to various degrees (aggressive or light) depending on desired effect. Use 150 or 180 then 220*
    - **Black and one colour:** *Sand the black aggressively (150/180/220 or even 120/180/220) then apply second colour. No need to sand tertiary colour but can for lighter highlights.*
    - **Black and two colours:** *Sand the black aggressively (150/180/220 or even 120/180/220) then sand first colour back (180/220). No need to sand second* **colour but can for lighter highlights.**
    - **Do all sanding by hand with a view to highlighting areas of interest.**
    - **Sanding after application of finish will bring out lighter highlights so attention must be paid to that.**

From yahoo answers; How does a fiber reactive dye work?

Fiber reactive dyes form permanent covalent bonds with the cellulose fiber in cotton or with the protein molecule in silk. I will use Procion MX (dichlorotriazine) dyes with cotton as an example.

First, the high pH of the soda ash (or other base) activates the cellulose, removing a hydrogen ion and creating a cellulosate anion. Following that, the cellulosate anion attacks the carbon adjacent to one of the chlorines in the dichlorotriazine molecule. Finally, the chlorine is lost and the covalent bond is formed. See the drawings in the links below.

Compare to the much looser bonds that are formed between the direct dye in an all-purpose dye, such as Rit. The looser bonds cause Rit dye to bleed in the laundry and to fade quickly. The covalent bonds that fiber reactive dyes form enable them to stay bright for years.

Why can't fiber reactive dyes be made more than a couple of days in advance?

I think it has something to do with the fact that the fiber reactive dyes are an organic compound.

- 3 years ago
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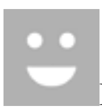Paula B

Best Answer - Chosen by Asker

It has nothing to do with the fact that they are organic compounds. Anything that contains carbon is an organic compound! What it all has to do with is the reactivity of the dyes. They are not only capable of reacting with cellulose; they can also react with water (hydrolyze). Once they have reacted, they cannot react again, so they become useless for dyeing cotton.

It's not entirely true that you can't dissolve the dyes more than a couple of days in advance, though. That's just a good rule to follow so that you don't mix the dyes up weeks in advance and then find that they don't work. The fastest-to-react dyes are the dichlorotriazine dyes, which are known as Procion MX dyes. If you dissolve them in pH-balanced water, they will stay good for at least a week or two at room temperature, and weeks longer than that if they are stored in the refrigerator (since cooler temperatures reduce the reaction rate).

However, if the dyes have soda ash already mixed in with the dye, then you should use them within half an hour or so of mixing the dyes with water, because the high pH of the sodium carbonate encourages the dyes to hydrolyze quickly. Once even a drop of soda ash gets into the dye solutions, they will not last even half a day. Some tie-dye kits contain the soda ash in a separate bag to be used as a presoak, but others contain it already mixed in with the dye.

The soda ash (sodium carbonate) is required to activate the cellulose in the cotton so that it can attack the dye. See the drawings of the reactions in the links below.

Other types of fiber reactive dye are less quick to react than the dichlorotriazines, so they can be stored for months after dissolving them in water. Some can even be purchased already dissolved in water, but many of these require such high heat to react that they are usually steamed to set them in the fabric. These include the vinyl sulfones (Remazol dyes), monchlorotriazines (Procion H dyes), and monofluorotriazines (Cibacron F dyes).

The dyes are actually made a year or more before they are used. They are made in the dye factory. What you should not do more than a week or two before use is dissolve the dyes in water. Even if the dyes are not dissolved in water, though, they will still go bad a year or two after purchase, due to gradually hydrolyzing in the jars. They will go bad very quickly if stored in a hot place. If you leave the tie-dye kit in your car with the windows rolled up in the sun, they will hydrolyze ("go bad") in just one day.

Source(s):

About Fiber Reactive Dyes:
http://www.pburch.net/dyeing/fiberreacti…

Chemical reaction for a dichlorotriazine (fiber reactive) dye with cellulose:
http://www.pburch.net/dyeing/dyelog/B106…

I'm wondering if you could explain the chemistry behind why cotton can't be dyed at an acidic pH:
http://www.pburch.net/dyeing/dyelog/B106…

Refrigerating dyes?:
http://www.pburch.net/drupal/?q=node/198