

Woodworkers of Central New York, Inc.

Abrasives with Jim

Demonstration by Jim Yonkers at the September 13, 2022 Meeting



IMPORTANT ABRASIVES WEBSITES

[Largest Sandpaper Test EVER Done - Top 19 brands Tested using Robots for Unbiased Data - YouTube](#)

12"x 24" Black Hook Sheet, w/PSA Backing by Klingspor \$18.95 SKU: VC12040
www.woodworkingshop.com

Drill press sharpener, by woodcraft;
www.woodsmithplans.com/plan/drill-press-sharpening-station/

Multi sanding block plans;
<https://www.craftsmanspace.com/free-projects/sanding-block-plan.html>

Norton Abrasives, grinding stones
<https://www.nortonabrasives.com/en-us>

3M, Roloc
<https://multimedia.3m.com/mws/media/7941410/3m-roloc-application-guide.pdf>

Very small microabrasive products for the model makers
www.micromark.com

3m polishing sheets 1200 to 8000
www.texasknife.com

Diamond paste, wicked edge,
<https://www.sharpeningsupplies.com/>



ABRASIVES – abrasive paper (countable and uncountable, plural abrasive papers) An abrasive material made by gluing grains of a coarse abrasive to a cloth or paper surface.

But have you ever wondered how it is made? Sandpaper is made by gluing abrasive minerals such as aluminum oxide, garnet, and silicon oxide onto a paper backing and allowed to dry under some kind of pressure. These materials provide sharp edges for the sandpaper to act as a cutting/smoothing tool.

Although the most familiar types of coated abrasives are probably the individual sheets of sandpaper with which home woodworkers prepare furniture or crafts for painting, the trade term "coated abrasives" actually encompasses a much wider array of products for both individual and industrial use. While these products assume many forms, all are essentially a single layer of abrasive grit attached to a flexible backing. In addition to their best-known form, sandpapers are also available to consumers on belts, rolls, and disks. However, the biggest users of coated abrasives are manufacturers who employ large-scale abrasives in various phases of industrial production. For example, coated abrasives are critical in both the furniture and automotive industries.

It should be noted that abrasives were used on Egyptian buildings as shown on many hieroglyphs about 3400 yrs ago, as well as shark skins in early Chinese history.

Coated abrasives date as far back as the thirteenth century, when the Chinese used crushed shells and seeds glued with natural gum to parchment. By 1769 coated abrasive paper was being sold on the streets of Paris. An 1808 article describes a process for making coated abrasives, and in 1835 a United States patent was issued for a machine that produced coated abrasives.

Not always a highly versatile tool, coated abrasives were originally restricted to finishing applications such as polishing or preparing surfaces for painting or plating. Through improvements in the strength of backings and the properties of abrasive minerals, coated abrasives now can be used for heavy-duty applications. Today, industrial uses for coated abrasives range from hand polishing with sheets of coated abrasive to grinding steel with large machines that use 300-horse-power electric motors to drive belts several feet wide.

Currently, approximately forty companies manufacture or import jumbo rolls in the United States. The size of the industry is limited because it requires a substantial investment in equipment, raw materials, energy, and labor. A larger number of companies convert the jumbo rolls into useable products such as disks and belts.

Raw Materials

The name "sandpaper" is actually a misnomer, as most coated adhesive products contain neither sand nor paper. Generally, they consist of some type of abrasive mineral, which can be organic or synthetic; flexible backings; and adhesives. Other materials may be added for special applications. Most companies that manufacture jumbo rolls of coated abrasives purchase minerals and backing materials from independent companies that specialize in making these items. Natural minerals come from companies that mine and process the minerals, synthetic minerals come from companies that specialize in such refractory materials, and most backings come from fabric manufacturers.

The abrasive grain, the key part of coated abrasive products, may be either a natural or synthetic mineral. Due to their extreme hardness, natural minerals such as garnet or emery (corundum with iron

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impurities) find limited use in products for wood-related applications, while crocus mineral (natural iron oxide) is limited to use as a polishing agent because of its softness. However, such natural minerals comprise less than one percent of the abrasives market. Metalworking applications require synthetic minerals exclusively because such minerals offer consistent quality and can be specially manufactured with an elongated structure that bonds well to flexible backings.

The use of a particular coated abrasive product determines the mineral that will be used in that product. Aluminum oxide is the most common abrasive, followed by silicon carbide. Because silicon carbide is harder and sharper, it is used for applications involving glass and other nonmetal materials. Aluminum oxide, which is the tougher abrasive, is used for metalworking applications where high forces are common. Minerals containing zirconium alumina and alumina are typically used where extremely rugged abrasives are needed, such as in foundries. Expensive and extremely hard minerals such as diamond or cubic boron nitride are restricted to special polishing processes.

The sizes of abrasive grains range from fine particles that look like flour (2,000 grit) to large particles that look like granulated sugar (60 grit). Finer grains are used for surface finishing applications and larger grains for shaping and material removal applications. Recent developments in making uniform and extremely small grain abrasives with particles the size of air-borne particulate in smoke have created applications in fine polishing known as superfinishing. Other improvements include patented technology to cluster fine minerals into small hollow spheres or conglomerates the size of conventional grains. Such refinements have improved cutting ability and extended the useful life of coated abrasive products.

The backing is the flexible platform to which the abrasive mineral is attached. The development of coated abrasives as a versatile manufacturing tool can in part be attributed to improvements in backing materials. Without a strong and flexible backing, coated abrasives could not survive rough handling or the effects of liquids that are often used as grinding aids.

Backings come in four basic materials, each with unique attributes. Paper is the lightest of the backing materials and also the weakest. Although its lack of material strength limits paper's usefulness for hand applications, its flexibility makes it ideal for applications in which the coated abrasive must fit closely to the contour of a work piece. Graded on a scale that increases with the physical weight of a ream, paper backings come in weights rated A to F. Unless specially treated, paper cannot be used with water or other fluids.

Backings made from woven fibers come in progressively heavier weight designations of J, X, Y, M, and H and are typically made of cotton, polyester, or rayon. The pattern of weave in the backing varies from fibers woven at 90 degree angles to fibers overlaid at 90 degree angles and stitched together. A less-common mesh or screen pattern is used for backings in materials needed in wet, low-pressure applications. Fiber backings are made of multiple layers of resin-impregnated cloth fibers that are used in some dry, high-pressure applications. Film backings, a recent development, have improved the effectiveness of coated abrasives in precision finishing. Uniformly thick synthetic film can be used with special micron-sized minerals to produce highly reflective finishing and precision dimensions on parts.

The bond or adhesive is applied to the backing in two layers, each of which serves a different purpose. The first layer of adhesive, called the make coat, holds the abrasive mineral to the backing. After the first layer of adhesive and grain have been applied, a second adhesive, the size coat, is applied in varying thicknesses depending upon the kind of product being manufactured. A thin layer of size coat leaves more of the abrasive mineral exposed, yielding a product that cuts more aggressively. Thicker layers of



size coats, which cover more of the mineral, create a product that cuts less aggressively but creates finer finishes.

The Future

Coated abrasives will continue as reliable and useful tools for the consumer and the manufacturing industry, although changes in the use of some products are likely. For example, as nonwoven abrasive products are improved and become better recognized, they may replace some coated abrasive products. Continuing development of minerals and backings will improve the performance of existing coated abrasive products. New film backing and ultra-fine abrasive minerals will enable new approaches to highly reflective and precision finishes. Also, coated abrasives will be used more with automated equipment as designs are improved and better computer controls become available.

SANDPAPER Grades and Grits

EXTRA-COARSE (24-, 30- AND 36-GRIT): Use for preliminary hardwood floor sanding with a drum sander.

COARSE (40-, 50- AND 60-GRIT): Use to sand paint off wood or to sand out deep gouges with a belt for disk sander.

MEDIUM (80-GRIT): Use first to prepare wood for finishing, either by hand or with a belt or orbital sander.

FINE (100- AND 120-GRIT): Best utility sandpaper. Use to smooth scratches, rough up painted surfaces and sand drywall.

VERY-FINE (150-, 180- AND 220-GRIT): Use to scuff-sand lacquer, polyurethane and other finishes between coats.

EXTRA-FINE (320- AND 360-GRIT): Use to sand finishes prior to polishing.

SUPER-FINE (400-, 500- AND 600-GRIT): Use to polish finishes on wood and metal. Also use for wet-sanding.

ULTRA-FINE (800-, 1,000-GRIT AND BEYOND): Use for ultra-smooth polishing of wood and metal finishes and bare metal.

family handyman



APPLICATION OF VARIOUS COATED ABRASIVES

- 3m Roloc, Coated sanding disks, Scotch Brite disk, Bristle discs
- 5" and 3" hook and loop
- Hook and loop backed coated abrasives
- Hand sanding pads/blocks
- Creating shop made holders with hook and loop
- Shop made sanding disks for lathe
- Shop made sanding disks for bench

Scotch-Brite

Scotch-Brite Non-Woven technology explained – Our unique non-woven web is the secret to superior performance. It binds together synthetic fibers and abrasive particles to create a conformable, three-dimensional material. Its open structure reduces the risk of warping or discoloring the part, resists loading, improves finish and prolongs the product's life.

What makes Scotch-Brite the best you can buy? A tough, non-woven nylon web impregnated with resin and mineral throughout its structure Spring-like action produces a smooth, burr-free surface Uniform, consistent results with no undercutting Suitable for deburring, finishing, cleaning and small weld removal applications Easy to use, less rework, fewer rejects.

Scotch-Brite is a surfacing conditioning product and as such is not listed or associated with grit size. It is used to clean and prepare a surface for the finish and to be used between finishes for 2nd or 3rd coats. Some sales outlets have listed this product with a grit size, and other manufacturers have put grit size to their non-woven pads.

CREATING SHOP MADE SANDING STICKS,

3" paddles

Commercial sanding sticks

Available from Micro-Mark: www.micromark.com

3) 3M: 7 Mentions Overall

3M abrasive pads

3m's gold stikit

3M 255L discs





4) Mirka: 5 Mentions Overall

Mirka gold: 2



5) Hermes: 4 Mentions Overall

Hermes J-flex(the blue stuff on the yellow cloth) is best.



6) Rhynogrip: 3 Mentions Overall

7) SIA: 3 Mentions Overall

7 Honorable Mention Sandpapers

These are in the order that I found them more or less.

8) SandEze sanding materials.

9) EKAMANT

10) Prager KMCA

11) HCAB aluminium oxide paper.

12) Supergrit house brands (Zirconia and Red Resin papers)13) Abranet sand paper

14) the Gator brand from Lowes

But is an aggressive, durable disc a good value? That depends on the price of the disc. When purchased in a box of 50 at the time of our test, Klingspor Stearate costs about 25 cents for every gram of wood removed if you used the disc for 10 minutes, making it a terrific value compared to the similar-performing Craftsman Professional discs at \$1.10 per gram of wood removed. Bosch Standard, Mirka Gold, Gator Ultra Power, and Makita also provide above-average value at 43-58 cents per gram removed. (Discs sold in packages of 15 or fewer discs tend to have the highest cost-per-gram.)

Polishing Sheets, are not exactly coated abrasives but impregnated woven paper

They are generally in the range of 1200 to 8000 grit (15 micron to 2 micron)

This product is used in knife making but would work on any acrylic projects such as pen making. And epoxy composite wood items for final polishing.



3M polishing sheets Available:www.texasknife.com



3MPS9 Polishing Sheet by 3M 1200 Grit (Blue) \$1.95



3MPS30 Polishing Sheet by 3M 400 Grit (Green) \$1.95



3MPS3 Polishing Sheet by 3M 4000 Grit (Pink) \$1.95



3MPS15 Polishing Sheet by 3M 600 Grit (Gray) \$1.95



3MPS2 Polishing Sheet by 3M 6000 Grit (Sea Green) \$1.95



3MPS1 [Polishing Sheet by 3M 8000 Grit \(Pale Green\)](#) \$1.95

Grit = Micron = Mesh Conversion Chart

Grit	Mesh	Micron
100,000	0- 0.5	1/4
60,000	0-1	1/2
14,000	0-2	1
13,000	1-2	1.5
9,000	2-3	2.5
8,000	2-4	3
5,000	2-6	4
4,500	4-6	5
2,800	5-10	7
1,800	6-12	9
1,400	8-20	14
1,200	10-20	15
1,050	12-25	18
800	20-30	25
600	20-40	30
500	30-40	35
325	40-50	45
285	50-60	55
240	60-80	70
225	80-100	90
160	100-120	110
100	120-160	150

Abrasive Pastes

There are many abrasive pastes, with mostly silicon oxide, they are mixed with many different carriers such as mineral oil, and waxes. Metal sharpening pastes are used to put a final edge on tools and to polish to a high sheen hard epoxy or acrylic projects.

Aside from aluminium oxide, and silicon carbides, diamonds, volcanic pumice, and Rottenstone can be used. Rottenstone is pulverized and graded ore of ancient sea shells, limestone with silica. AKA as Tripoli

Diamond paste is avail from Norton and or Wicked Edge in micron size 2 to 1/2 micron

It is most commonly used on strops for final tool steel edge.



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Application of various coated abrasives, for discussion and examples

3m Roloc, sanding disks, Scotch Brite disk, bristle discs

5" and 3" hook and loop

Hook and loop backed coated abrasives

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Scotch-Brite Hand pads

White: non abrasive

Gray: Ultra Fine

Maroon: Fine

Green: FDA Fine

Brown: Course

STROP COMPOUNDS

BLACK : COURSE EMERY

WHITE: ALUMINIUM OXIDE 5 TO 6 MICRON

YELLOW ALUMINIUM OXIDE 3 TO 4 MICRONS

(FLEXCUT, BEST COMPOUNDS FOR KNIFE SHARPENING)

DIAMOND PASTE 1 1/2 MICRON

DIAMOND PASTE 1 MICRON

DIAMOND PASTE 1/2 MICRON



GRINDING & SHARPENING WHEELS &/OR PLATES

All shapes wheels, cups, bars and blocks

Cutoff wheels, grinding wheels hand stones and more.

vitrified, meaning cooked to convert into glass or a glassy substance by heat and fusion. , a process of mixing 3 key ingredients, hydraulically compressing and baking

1. Abrasives
2. Binder
3. Filler

An Abrasive Grain

- Aluminum oxide, silicon carbide, zirconia, ceramic alumina, cBN, or diamond are the most common
- Past use of garnet, sand, ash, fullers earth, crushed sea shells

A Bonding Agent

- Vitrified – glass-like bond
- Organic – resin or other agent
- Rubber, shellac or other

Air/Empty Space by a filler such as iron oxide, silicates, and chalk.

Voids or porosity (natural or induced)

Abrasives can be Aluminum Oxide, Silicon Carbides, Ceramic

Manmade Cubic Boron, Zirconia Oxide or Diamonds.

Binders are usually 2-part phenolic resins that are heat set.

Fillers are materials that space the components apart causing voids and will carry off fragments from the above, they also act as temperature monitors. They may be Talc, chalk silicates or stearates

All Vitrified wheels use an abrasive that is crushed to specific sizes or grits, and are or should be listed on the wheel as part of the identification, everyone should understand grit sizes such as 80 grit, 220, 1000.

These abrasives are designed to break down under use in order to expose newer sharper points for wood or metal removal.

The Binder is formulated to hold the abrasive particles together for as long as they work, when the face of abrasive particle no longer is sharp it heats up and fractures of leaving sharper material to continue to work, the binder is selected so that it fractures at the same time always maintaining sharp abrasive on the face,

The Filler dissipates the heat build up to keep and make the abrasive particle last as long as possible before helping to eject the broken particle and also aids in the rejection of clogged metals on the face of the wheel.

All vitrified wheels have a density, also marked on the wheel by letters such as L, K, M, T U and such. The higher the density the harder the wheel must work, wheel use is determined by RPM and down

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pressure, hard steel with a Rockwell of 100 plus will use the less density well that breaks down sooner presenting more fresh abrasive points to the work, heavy dense wheels are used for Rockwell 50 to 80rc (K hard, 3400 rpm tool steel)

White aluminum wheels are U hard, softer than Gray aluminum oxide wheels that are generally harder and are for carbon steels

Tool steel should use a K hard aluminum oxide wheel 3400 rpms

Carbide steel, inserts should use a silicon carbide wheel such as a Norton Mfr# 66252837194 120 or finer grit

Off brand wheels, bargain wheels and internet "same as" will not work, and are unsafe

To buy. use only best quality best brand and never from a big box store.

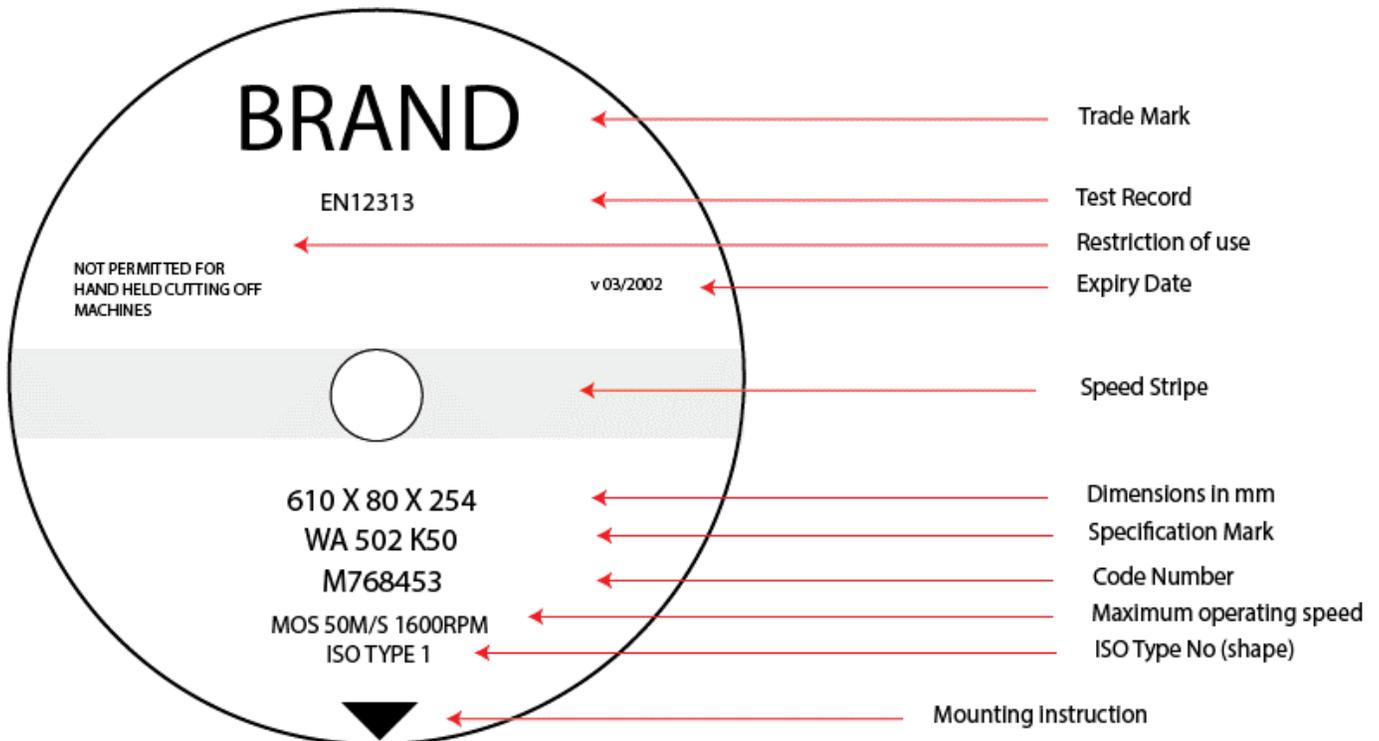
Vitrified wheel economy is determined by metal removal rates vs cost

Same as we will find out in the coated abrasives, paper, pads or discs,

Where wood removal rates vs cost is the measure of quality.

Always, always follow the MFG suggested RPM

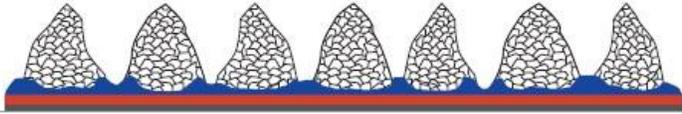
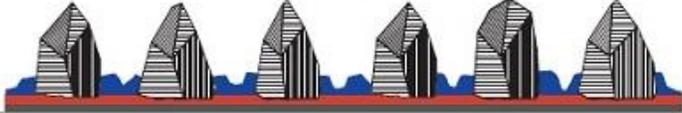
New wheels are being marketed such as a Boron or CBU wheel using a cubic boron ceramic abrasive bonded to a monolithic aluminum or steel wheel. Very expensive very long lasting, but require a 1700 rpm grinder to meet safety specs





What abrasives are available for grinding wheels?

There are 4 main types of abrasive grains available for grinding wheels, these are:

<p>Ceramic Aluminium Oxide Often referred to as just “Ceramic”, Norton Quantum’s patented ceramic form of aluminum oxide is harder and sharper than conventional abrasive grains. This ceramic grain has a unique microcrystalline structure that is self-sharpening. This ultimately reduces the regularity that the grinding wheel needs dressing as well and providing a significantly cooler cutting action when in use.</p>	
<p>Silicon Carbide Harder than standard aluminum oxide with a very sharp abrasive grain. It is a versatile material, recommended for grinding relatively soft metals such as aluminum or cast iron but can also be used on extremely hard materials such as cemented carbide.</p>	<p>Sharp-edged, pointed grit / micro wear, self sharpening</p>  <p>Sharp-edged, brittle, highly friable / micro wear</p> 
<p>Zirconia Alumina For use in rough grinding applications where high stock removal is required. This grain is associated with high tech resin bonds.</p>	<p>Wedge-shaped, block, drop formed grit / micro wear, self-sharpening</p> 
<p>Aluminum Oxide Generally recommended for grinding materials of high tensile strength, such as stainless steel and tool steels but it can also be used on some high tensile aluminum and bronze alloys. Aluminum Oxide is manufactured in varying qualities.</p>	



Items Displayed

2 sizes round sanding pads/blocks

All sizes 3m Roloc holders

3M polishing sheets

Shop made sanding disc 2

Shop made sharpening disc

3m pads, coated, Scotch Brite, bristle

3m disc various sizes with holders

Shop made sanding pads

Rottenstone, pumice

Beeswax raw, 6 oz tins

Various stropping sticks, pc of leather

Stropping paste sticks

Diamond paste

Hook and loop backing sheet

Norton axe round stone

Any flat stone

Flat stone flatten Plate

Beeswax, Carnuba wax block

Cans of Beeswax mix

Making Your Own Finish

There are many home-brewed finishes. But here we will only and quickly discuss wax and oil concoctions

The use of beeswax goes back hundreds if not thousands of years, mixing beeswax with various oils, penetrates and sometimes color results in a subtle, protective finish

Below is but one of the proportional mixes that are used

1/3 beeswax

1/3 mineral oil

1/3 linseed oil

You can substitute turpentine or mineral spirits for the mineral oil

The safest process is mix the ingredients in a mason jar and leave for several days perhaps weeks, shake well frequently.

You may use a double boiler with electric heat

Beeswax mineral oil and abrasives, such as pumice, rottenstone, volcanic stone ceramics etc

Beeswax Mineral Oil with diatomaceous earth

DE used in pool filters, tooth paste,

De same as Yorkshire paste, Triple E

Some Homemade/Shop-made Stains.

Finishing would not be anything without a stain, shop made stains are an interesting way to add depth and color to projects

1. Coffee stain

If you want a deeper, darker stain, coffee is your best bet. Simply brew coffee granules. Add water depending on how strong you want the stain. Allow the coffee mixture to cool off; then use rag or brush to apply it onto the wood. To achieve darker staining, allow the coffee to sit longer on the wood. After ten minutes, wipe away excess coffee or granules. You can apply several layers until you get the desired color.



2. Tea stain

Perfect for dark wood, tea stain gives off a light stain that highlights wood grains. To make one, boil two cups of water and add tea leaves into it. Continue boiling until you get a deep tea concentrate. Add tea leaves depending on the level of stain you want to achieve. Lightly brush the hot tea water onto your wood until it is completely coated and stained. You can try different tea leaves to find the shade you prefer.

3. Black raspberry

If you are looking for a reddish, dark stain, go for this mixture. Collect black raspberries and cleanse them. Completely crush the raspberry until the stain oozes out of its sac. Rub the berry pulp onto the wood and leave it there for a few hours. Once it has completely dried up, wipe away the dried out pulp. Take note that direct sunlight can cause the stain to fade away, so use this recipe only for indoor wood projects.

4. Walnut hulls

Black walnut hulls can produce dark wood stain. Soak walnut hulls for several days until the water changes color. You can also boil the hulls to make it easier to release its stain. Remove the hull and strain the mixture before using it. Use paintbrush to apply your homemade wood stain onto your furniture.

5. Vinegar plus pennies

Acid plus any metal object results in a chemical reaction that you can use as DIY wood stain. Prepare a glass of white vinegar or lemon juice. Add a metal object such as pennies in it, and let it sit for a week. This will produce a pale, bluish mixture perfect for your wood projects.

6. Apple cider vinegar plus steel wool pad

As with the previous recipe, place a steel wool pad in a glass of apple cider vinegar. Allow it to sit for about a day. This gives off a rich reddish stain that you can use to stain wood.

7. Vinegar, tea and metal

If you want a deep black stain, try trio: white vinegar, tea, and a metal object. Let the mixture stand for a couple of days and you'll see the chemical reaction. You can add salt to speed up the process and intensify the black color. It's perfect for adding stain on wood details and fixtures. It also gives of an almost permanent staining, so make sure you try it first before finally applying on any wood surface.

8. Vinegar plus rusty nail

This combination results in a reddish shade. To make this mixture, simply soak rusty nails in a glass of white vinegar. The acetic acid of the vinegar dissolves the iron compounds in rusty nail, hence, the color. Allow it to stand for a longer time to get the bright red shade.

9. Tobacco

Tobacco gives off a beautiful brown stain when soaked in water and ammonia mixture. In a glass container, prepare equal amounts of water and ammonia. Mix well and add tobacco sticks. Let the mixture sit for hours. Once the color bleeds out, strain off some of the liquid and brush it onto the wood.

10. Onion skins

Onion skin produces a nice yellow color. When applied to wood, it results in warm amber to pale yellow. Simply soak onion skins in warm water and let it stand for a few hours.