Enhance Your Turnings with Copper

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Brazos Valley Woodturners

Metals Commonly Used in the Decorative Arts.

A. Gold-Silver-Pewter-Copper-Aluminum-Brass-Bronze-Iron
    a. In order of decreasing ductility (ease of shaping).
    b. Gold and silver have excellent ductility but are very expensive.
    c. Copper has a nice balance of good workability and low cost.
        i. Gold=$1500/oz VS Copper=$0.25/oz
    d. Copper is available in a wide assortment of shapes
        i. Leaf, foils, sheets (smooth and textured), wire (flat, round, ½ round, square), rods, tubes, mesh.
    e. Easily bent, twisted and hammered into complex shapes.
        i. Copper is said to be "work hardened" when repeatedly bent, hammered, twisted, etc. Work hardened copper is brittle and will eventually break.
        ii. To restore the original properties of copper, it must be heated to a dull red color and quenched in cool water. This process is termed ANNEALING.
        iii. A hard to remove scale is a result of annealing process and must be removed before further work on the copper piece. Fire scale can be removed by fine sandpaper or steel wool, but the best method is immersion in a hot "pickle bath". A good product is Rio pickle available from Rio Grande Inc. (see the appendex) A small slow cooker is ideal for the hot pickle and a pair of copper forceps must be used.

iv. Work hardened copper is termed DEAD HARD and annealed copper is termed DEAD SOFT.

B. Sources of copper metal.
    a. Found Copper
        i. Electrical copper wire stripped of its insulation and copper plumbing pipe.
        ii. Large diameter copper pipe (3-4") can be quite useful. They make great loop handles for shallow bowls.
        iii. Caution: these are hard drawn and must be annealed before working.
        iv. A cheap alternative, if scrap wire or fittings are used but available in limited sizes. 14, 12, 10 gage wire.
        v. Gage is a unit of measure for metal thickness. Unfortunately, a gage in non-ferrous metals and ferrous metals is not the same. I use the American Standard wire gage for non-ferrous metal; also termed B&S wire gage). Don't confuse this with the American Standard gage for iron and steel or any of the British Standard wire gage.
        vi. Preparation of found scrap copper can be labor intensive. If you are going to use copper frequently, purchasing from commercial sources that specialize in jewelry/decorative art supplies.
    b. Sources for copper used in jewelry and other decorative arts.
        i. Available in a wider range of shapes and sizes.
        ii. Can be purchased as dead soft.
        iii. Wire is available in long spools and sold by the pound.
            1. 10 gage – 28 gage (2.6mm-.5mm) .
            2. 4 and 6 gage wire is available from Lowe's or Home Depot stores.
            3. Round, ½ round, square, flat, patterned flats.

4. Twisted wire can be shop made using an ancient rope making jig. Three-element twisted wire is not readily available. It can be flattened by hammering on an anvil.

iv. Copper sheets are available in 6x12" or 12x12" sheets.
   1. Smooth or pre-textured.
   2. 16-34 gage
   3. Copper foil is usually sold in rolls and is available commonly in two thicknesses; 36 gage and 40 gage.
   4. Copper leaf is very thin and is applied to a surface that has been coated with a sticky sizing (partially dried varnish).

v. Copper mesh, nails, rivets, washers.

vi. Copper clay. I have only started to look into this technique

Metal Working Tools

A. Most all tools needed for working with copper are found in the shop
   a. Don't spend a lot of money. Harbor freight is ok.
      i. Metal shears and scissors
      ii. Mill Files. Flat, round, triangle (single cut bastard)
      iii. Mini needle files, assorted cross sections.
      iv. Electrician's diagonal cutters and needle nose pliers.
      v. If one intends to work with copper wire, a jeweler's flush wire cutter, round nose, flat nose, chain nose pliers are necessary.
      vi. Small anvil (10-15 lbs) or a flat piece of steel at least 3/8" thick.
      vii. Assorted hammers
         1. Small (4 oz) ball peen hammer, rawhide mallet, dead blow hammer with leather facing, auto body hammers.
      viii. Electric drill with fractional drill and numbered drill sets.
      ix. Center punch
      x. Hair dryer or hot air blower which delivers very hot air (800 degrees F)

xi. Propane torch. MEPPS is best or acetylene.
xii. Hammering blocks of varying hardness ie. Poplar, maple
xiii. American Standard Wire Gage (B$S) for non-ferrous metals.

Texturing and Patinas

A. Texturing.
   a. Mostly mechanical methods. Adds visual and tactile interest to copper.
   b. Ball peen hammer on a surface of varying hardness such as poplar wood block, hard maple block, iron block.
   c. Leather covered mallet on a rough surface such as a rock, a piece of concrete, rough tree bark.
   d. Using the edge of a flat faced hammer makes interesting textures
   e. Using shop-made texturing tools.
      i. Mild steel ½" and ¼" diameter rods with one end textured with files, burrs, etc.
      ii. Use paper punches and scissors used in scrape booking. Use 40 gag copper.
   f. Repousse and chasing techniques.

B. Patina techniques
   a. Copper has an especially strong affinity for sulfides and oxygen. When copper is exposed to the atmosphere, a blue-green surface film is slowly formed with the chemical combination of carbon dioxide, water and oxygen to form basic copper carbonate and basic copper chloride. This patina can be achieved in the shop using a variety of chemicals. This method will not be demonstrated here because the development of the blue-green color takes several hours to develop.

b. When copper is exposed to various sulfides the color changes from pink-blue-grey-black. These reactions and others can be duplicated in the studio greatly speeding up the process by using certain chemicals and controlled conditions. The various colored films are called PATINAS.
c. A simple patina can be achieved by gently playing a torch over the surface of the copper.
d. Three important points to keep in mind.
    i. The metal surface must be perfectly clean,
    ii. All chemicals must be protected from light, moisture and heat.
    iii. Must be protected to preserve the color using wax, lacquers, or other clear coating.

C. Patina supplies (most all available at a supermarket or DIY/hobby stores.
a. Latex, nitrile or vinyl gloves.
b. Plastic food storage containers
c. Large sprayer bottles for distilled water and alcohol.
d. Kitchen measuring cups and spoons
e. Mortar and pestle (not essential but very useful. See appendix for sources)
f. Good quality paste wax.
g. Spray can of lacquer or an acrylic clear product (gloss or satin)
h. Copper Cleaner
i. Green scrubbing pads.
j. Distilled water.
k. Alcohol (methyl, ethyl or isopropyl alcohols).
l. Liver of sulfur (Sulfurated potash, potassium sulfide) see appendix for sources.
m. Pair of stainless steel or chrome plated forceps (Hobby Lobby or Michalson's)

D. Preparation of the metal
a. Scrub the metal with a commercial copper clean using a green scrubbing pad. Wear latex or vinyl gloves when cleaning the surface. This prevents body oils from contaminating the copper surface. DO

NOT USE STEEL WOOL as it often contains oils of manufacture that may contaminate the metal surface.

b. Rinse with distilled water
c. Flood the copper surface with alcohol and allow the air dry or use a hair dryer.
d. Apply the patina solutions within 2 hours.

E. Developing a patina using liver of sulfur.
    a. Put 2 cups of distilled water into each of two containers. The container size depends on the size of the copper piece.
    b. Add 1/8 teaspoon of liver of sulfur to one of the two containers of water and stir until completely dissolved. This is where a mortar and pestle is handy to grind the large pieces of liver of sulfur and hasten the process. Don't get obsessive with measuring, an estimate (filling ¼ tsp measuring spool ½ full) is fine.
    c. Using stainless steel forceps, introduce the copper piece into the liver of sulfur solution and watch for color development.
    d. When the color starts to develop, quickly rinse in the distilled water container and put the piece back into the solution and allow the color to develop further. Repeat the process until you have the desired color.
    e. Rinse the piece with distilled water followed by an alcohol wash and allow to air dry. A hair drier will speed the process.
F. Final preparation of the copper piece.
    a. To preserve the color, wax the still warm (not hot) piece and buff with a soft cloth or alternatively spray with lacquer or acrylic spray.
    b. If the piece has been heavily textured, use 800 grit sandpaper or steel wool to highlight the piece by gently removing the patina from the high spots. Apply wax or spray the piece.
    c. As you might have guessed by now, the process of creating a patina is not an exacting technique, but rather an empirical one.
        i. Elements that influence the final desired result are;
            1. Composition of the metal
            2. Patina formula used (chemicals)

3. Purity of chemicals and water used
4. Surface preparation
5. Application temperature (solution, metal, rinse)

ii. Good notes on your efforts will help your to reproduce a particularly terrific patina.

Some Strategies for Fixing Metal onto Wood

A. Issues to consider when applying metal (in this case copper) to wood.
   a. The type of glue in question.
      i. Polyvinyl and Aliphatic (white and yellow) glues. These glues are not good for bonding metal to wood.
      ii. Cyanoacrylic (CA) glues are very useful because of their fast setting. Use medium thick to thick varieties. The jury is out concerning the longevity of these glues.
      iii. Epoxy glues are my glue of choice. I use the fast curing (5 min and 20 min) epoxy glue. You may have to employ some type of holding strategy until the epoxy sets ie. (Clamps, tape, etc.)
      iv. Polyurethane glues. They may well be superior to epoxies in some applications. They do have a long curing time however and will require some type of holding devices to hold the copper in place during that time.
      v. Silicone adhesives are excellent glues especially where a flexible bond is required.
      vi. I am just beginning to explore the utility of construction adhesives such as "Liquid Nails". No opinions on this glue at the moment.
   b. Are mechanical methods appropriate?
      i. Nails, screws, rivets are excellent to use if they can be hidden or disguised. Their use is also appropriate if they fit into the design of the piece.
   c. How stable is the wood in question when dry?

    i. Wood moves and some woods move more than others. Metal does not move for all practical purposes. Use furniture makers' strategies that allow movement without buckling the metal.

d. The resinous nature of the wood in question.
    i. Some woods, such as the rosewoods, have a lot of resins which weakens the bonds of most glues.
    ii. Wiping the wood bonding site with acetone helps to assure a good glue bond.

e. Grain orientation of the turning (ie. Turned end grain or long grain).
    i. Most end grain turnings (small boxes and vases) do not move much when dried and a good finish is applied. Copper embellishments will be little affected.
    ii. Long grain orientation (ie. Bowls) may affect copper metal additions especially if they are of large diameter (>12" diameter.

References and Sources

Books and Videos. There are no publications to my knowledge that specifically address the general application of decorative copper to wood turnings. However the following are helpful:

Videos

Gilding and Chemical Patinations by David Marks. www.djmarks.com

Patina Basics by Tim McCreight. www.brynmorgen.com

Books

Jewelry Making, Techniques for Metal by Tim McCreight. General metal working techniques.
www.doverpublications.com

Woodturning Jewelery by Hilary Bowen. Fox Chapel Publ. Available from Packard Woodworks. This book is a great source to show the method of inlaying of copper wire into a wood surface.
www.packardwoodworks.com.

Copper Metal

Rio Grande
7500 Bluewater Road NW
Albuquerque, NM 87121
800-545-6566
www.riogrande.com

Metalliferous
34 West 46th St.
New York, NY 10036
888-944-0909
www.metalifferous.com

Patina Chemicals, jewelry and metal working tools, mortar and pestle, scales, etc.

The Science Company
95 Lincoln St.
Denver, CO 80203
303-777-3777
www.sciencecompany.com

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7500 Bluewater Road NW
Albuquerque, NM 87121
800-545-6566
www.riogrande.com

Art Chemicals
510-637-8707
www.artchemicals.com

Shop around locally for useful tools and supplies

Harbor Freight

Hobby Lobby

Michelson's

Websites that offer additional information

http://www.artsandcraftsmetalwork.com/

http://www.artchemicals.com/

www.sciencecompany.com