Metal Leaf and Chemical Patination on Wood

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1. The Basic Process

Metal leaf and chemical patination provide two separate but complementary ways to alter the surface of a woodturned piece.

A typical process is:

1. Prepare and seal the wood.
2. Apply gilding size.
3. Add selective resists or masks where desired.
4. Apply metal leaf.
5. Allow the size to cure appropriately.
6. Apply chemical patination, coloring, or other surface treatments.
7. Allow the surface to dry and stabilize.
8. Apply an appropriate protective finish.

The process is not limited to a single recipe. Different metals, sizes, chemicals, application methods, and finishes can be combined to produce very different results.

2. Metal Leaf: What Are We Working With?

Metal leaf is extremely thin metal produced in sheets for decorative finishing.

Common types include:

- Genuine gold
- Genuine silver
- Copper
- Aluminum
- Dutch metal, also called imitation gold
- Other imitation or alloy leaves

The metal itself matters. Copper, Dutch metal, aluminum, silver, and gold do not respond identically to chemicals or finishes.

Genuine Gold

Gold is highly resistant to oxidation and does not normally require chemical patination. It is primarily used when the desired appearance is the natural color and reflectivity of gold.

Genuine Silver

Silver can tarnish and can be chemically colored, although it is generally more expensive than the imitation metals used for experimental surface work.

Copper

Copper is particularly useful for chemical patination. It can produce greens, blues, browns, blacks, and other colors depending on the chemistry and application method.

Dutch Metal

Dutch metal (sometimes called composition metal) is an imitation gold, generally an alloy containing copper and zinc. It is essentially brass. It is inexpensive and responds readily to many patination chemicals. Its color and patination behavior make it particularly useful for experimentation.

Aluminum

Aluminum is commonly sold as imitation silver. It is inexpensive and easy to handle, but it does not respond to many of the traditional copper/brass patination chemicals. Alcohol inks, commercial aluminum blackening products, and other non-reactive coloring methods can be more useful with aluminum.

3. Leaf Sizes, Books, and Transfer Leaf

Leaf is available in several common sheet sizes.

Traditional genuine gold and silver leaf is commonly approximately 3⅜" × 3⅜".

Imitation gold, copper, and aluminum leaf are commonly larger, often approximately 5½" × 5½".

These dimensions are useful clues when identifying leaf, but sheet size is not an authentication

standard. Manufacturers and suppliers may use different dimensions.

Book Leaf

Traditional leaf is commonly sold in books. Individual sheets are separated by thin sheets of interleaving paper. The metal leaf itself is loose and must be transferred carefully to the prepared surface.

Patent or Transfer Leaf

Transfer leaf is attached to a carrier sheet.

Advantages include:

- Easier handling
- Less leaf blown away by air movement
- Easier positioning on flat or gently curved surfaces
- Particularly useful for beginners

Transfer leaf can be less convenient on highly irregular or deeply curved surfaces.

4. Preparing the Wood

The surface underneath the leaf has a major effect on the final result.

For most applications:

1. Sand the surface thoroughly.
2. Remove all dust.
3. Seal porous wood.
4. Allow the sealer to dry.
5. Sand or smooth the sealed surface as necessary.
6. Apply the gilding size.

A final sanding in approximately the 320–400 grit range, or higher, is often appropriate, although the required surface depends on the desired appearance.

Sealing the Wood

Possible sealers include:

- Shellac

- Lacquer
- Varnish
- Acrylic finishes
- Other compatible clear finishes

The purpose is to provide a stable, relatively smooth, non-porous surface for the size.

The color underneath the leaf can also be used intentionally. For example:

- Warm red or brown underneath can make gold tones appear richer.
- Black or dark colors can deepen the appearance of metallic surfaces.
- White or light colors can produce a brighter appearance.

5. Other Materials That Can Be Leafed

Metal leaf is not limited to solid wood. With suitable surface preparation, leaf can be applied to:

- Plywood
- MDF
- Gesso
- Plaster
- Ceramic
- Glass
- Stone
- Metal
- Paper
- Canvas
- Some plastics and resins
- Painted surfaces

The basic requirements are that the surface be clean, stable, and compatible with the gilding size. Porous surfaces generally require sealing before applying size.

6. Gilding Size

Gilding size is the adhesive specifically intended for attaching metal leaf.

Two broad categories are commonly encountered:

Oil-Based Size

Advantages: Long working time, strong bond, good durability, well suited to larger projects, generally preferred when the leaf will subsequently be chemically patinated.
Disadvantages: Slower drying, solvent cleanup, more odor and VOC exposure.

Water-Based Size

Advantages: Faster working time, water cleanup, lower odor.
Disadvantages: Shorter working time, can be softened or disturbed by subsequent applications of water-based chemicals, requires more attention to timing when aqueous patination follows gilding.

The issue is not that water-based size cannot be used with copper or Dutch metal. It can. The concern is that subsequent aqueous patination can soften or disturb some water-based sizes.

Size Comparison Table

Metal	Oil-Based Size	Water-Based Size	Considerations
Copper	Excellent	Usable	Oil generally preferable when subsequent aqueous patination is planned.
Dutch Metal	Excellent	Usable	Oil generally preferable when subsequent aqueous patination is planned.
Aluminum	Excellent	Usable	Chemical patination is limited; coloring methods are often more useful.

Commercial water-based sizes include products such as Rolco Aquasize and Mona Lisa Brush-On Adhesive. Rolco Aquasize, for example, develops tack relatively quickly and generally

remains tacky for an extended period under normal conditions. Actual timing varies with temperature, humidity, application thickness, and substrate.

Commercial oil-based sizes include products such as Dux Quick Dry and Dux Slow Dry Gold Size. Dux Quick Dry Size, for example, reaches a gilding tack in about 1 to 3 hours and offers a working window of roughly 1 to 2 hours under normal conditions. Dux Slow Dry Size takes 10 to 12 hours to reach tack, but provides an extended gilding window of up to 12 hours for larger projects. Actual timing varies with temperature, humidity, application thickness, and substrate porosity. Other oil-based sizes can have drying times up to 24 hours.

7. Other Adhesives: What Works Isn't Necessarily What Is Best

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A variety of products can make metal leaf stick to a surface. That does not necessarily make them good gilding sizes.

Mod Podge

Mod Podge can adhere metal leaf, but it is not formulated specifically as a gilding size. Its tack characteristics, film thickness, drying behavior, film hardness, and water sensitivity are not optimized for predictable gilding and subsequent chemical patination. It can work, but it is not the preferred choice for controlled results.

Contact Cement

Contact cement can also make leaf stick. The problem is that contact cement is a structural adhesive rather than a gilding size. A particularly important issue is the thickness and softness of the adhesive film. Metal leaf is extremely thin. A thick, relatively soft or rubbery adhesive layer underneath it can deform when the leaf is brushed, rubbed, burnished, handled, or patinated. This can result in wrinkles, impressions, stretching, tearing, or other surface defects. Solvent exposure and compatibility with subsequent chemicals are additional considerations.

The fact that an adhesive will make metal leaf stick does not make it a good gilding size.

8. Traditional Water Gilding

Traditional water gilding is a very different process from simply using a modern water-based

adhesive.

A traditional sequence is:

Wood → Rabbit-skin glue → Gesso → Sanding → Bole → Gold leaf → Burnishing

- **Rabbit-Skin Glue:** A traditional protein-based adhesive used in preparing the surface.
- **Gesso:** Used to fill and smooth the surface.
- **Bole:** A finely prepared clay-like layer placed beneath the gold. Red or yellow bole can influence the appearance of the gold and provides a suitable surface for burnishing.
- **Gold Leaf:** The leaf is applied to the prepared surface.
- **Burnishing:** An agate burnisher can be used to compress and polish genuine gold leaf, producing the extremely bright surface associated with traditional water gilding.

Traditional water gilding is an important technique to understand, even when using modern sizes and processes.

9. Tools

Useful tools for gilding and patination include:

- Size brushes
- Soft leafing brushes
- Gilder's mop or soft brush
- Tweezers
- Sharp scissors
- Cotton gloves
- Nitrile gloves
- Soft cloth or tissue
- Small chemical-resistant containers
- Pipettes or droppers
- Small spray bottles
- Cotton swabs
- Makeup-style soft brushes
- Cheesecloth
- Gilder's tip
- Gilder's cushion and knife for traditional techniques
- Paper towels

Chemical Preparation Tools

Accurate chemical measurement is important. Typically, measuring spoons and cups are used to measure chemicals; however, given the highly variable texture of different dry chemicals, using a weight-based measurement system can give more predictable results.

Useful equipment includes:

- Small digital scale
- Stainless-steel mortar and pestle
- Measuring containers
- Pipettes or graduated droppers
- Labels and permanent marker
- Distilled water
- Chemical-resistant mixing containers

Dry chemical crystals can be broken up with a dedicated stainless-steel mortar and pestle before weighing. A small digital scale is preferable to measuring spoons for dry chemicals because spoon measurements can vary substantially depending on crystal size, packing, and material density.

Never use equipment that has been used for chemicals for food preparation.

10. Measuring and Preparing Patination Chemicals

Patination chemicals are often used in relatively small quantities.

For reproducible results:

1. Identify the chemical.
2. Read the manufacturer's instructions and SDS.
3. Weigh the dry chemical when practical.
4. Use warm distilled water.
5. Dissolve the chemical thoroughly.
6. Label the solution with its contents and concentration.
7. Store and dispose of it appropriately.

Why Distilled Water?

Distilled water minimizes the effect of dissolved minerals and other impurities. This becomes increasingly important when working with small quantities of chemicals where small changes in

water chemistry can affect the result.

11. Patination Chemistry

Patination is essentially controlled alteration of a metal surface. Different chemical families produce different effects.

Copper Salts

Examples include cupric nitrate, cupric acetate, copper sulfate, and cupric chloride. These can produce a wide range of green, blue, turquoise, brown, and other colors depending on concentration and application.

Chlorides

Examples include ammonium chloride and cupric chloride. Chloride chemistry is particularly important in producing certain green and blue-green effects.

Sulfur Compounds

Examples include liver of sulfur, sulfurated potash, and sodium sulfide. These can produce dark brown, black, gray, and other effects on reactive metals. Sulfur compounds require particular care. **Never acidify sulfide solutions because toxic hydrogen sulfide gas can be produced.**

Iron Compounds

Examples include ferric nitrate and ferric chloride. These can create rust-like, brown, yellow, orange, and darker effects on appropriate metals.

Mild Household Chemicals

Some effects can be produced with relatively mild materials such as vinegar, salt, water, and ammonia-containing products where appropriate. Even common household chemicals should be treated as chemicals and used with appropriate ventilation and protective equipment.

12. Chemical Ratios and Effects Reference

The following table provides specific baseline ratios, volume-to-weight conversions, and

expected color effects for common patination chemicals on various metal leaves.

Chemical	Ratio (tsp per ¼ cup water)	Ratio (g per ¼ cup water)	Effect on Copper	Effect on Silver	Effect on Dutch Metal
Sodium Sulfide	1/8 tsp	~0.4 g	Orange to magenta to blue	Iridescent orange, brown, green, blue	Orange to light red to blue-green or gold-green
Sulfurated Potash (Liver of Sulfur)	1/8 tsp (pea-sized chunk, crushed)	~0.5 g	Purplish black; rainbow colors with heat	Blue-black to steel gray; interference colors (yellow, red-brown, purple, blue)	Grays and blacks; antique toning
Cupric Nitrate	1/8 tsp	~0.6 g	Greens, olives, browns, blacks; turquoise or reddish-brown	Greens, yellowish-green, turquoise, olives, blacks	Green, chalky-bronze
Ammonium Chloride	1/8 tsp	~0.5 g	Greens, blues, olive green (via fuming or solution)	Light blue stains	Green-blue (similar to mix; limited data)
Cupric	1/16 tsp	~0.3 g	Green-blue	Green,	Green-blue,

Chemical	Ratio (tsp per ¼ cup water)	Ratio (g per ¼ cup water)	Effect on Copper	Effect on Silver	Effect on Dutch Metal
Nitrate-Ammonium Chloride Mix	Cupric Nitrate + 1/8 tsp Ammonium Chloride	Cupric Nitrate + ~0.5 g Ammonium Chloride	patina	turquoise	chalky-bronze

Reference Notes & Guidelines

- **Ratios:** All measurements are scaled to ¼ cup (60 ml) warm water for consistency across sources. Gram weights are approximate based on bulk densities (e.g., ~4–5 g/tsp for flakes or powders). Always test on scrap pieces first, as density varies depending on chemical form (flakes vs. powder vs. chunks).
- **Application:** Dissolve dry chemicals thoroughly in warm distilled water. Apply via brush or sponge, and rinse with clean water to freeze/control color development. Always wear chemical-resistant gloves and work in a well-ventilated area. Seal with clear lacquer or varnish once dried.
- **Chemical Progression:** Effects progress over exposure time. For Ammonium Chloride used alone, data is sparser—it is most commonly utilized in mixes or fuming setups for vibrant blues and greens. Dilute solutions further if milder tonal shifts are desired.

13. Patination Is a System, Not a Recipe

A published recipe is a starting point, not a guarantee of a particular color. The final appearance can be affected by:

- Metal composition
- Leaf thickness
- Surface preparation
- Size
- Chemical concentration
- Water chemistry
- Temperature

- Humidity
- Application method
- Number of applications
- Drying time
- Previous chemical treatments
- Protective coating

The same recipe can produce noticeably different results on different pieces. This is one reason sample boards are valuable. Experiment with your process before applying to a final product.

14. Applying Patinas

Patination chemicals can be applied in many ways.

- **Brushing:** Provides direct control over where the chemical is applied.
- **Spraying:** Produces softer transitions and can cover larger areas.
- **Dropping:** Drops or small amounts of solution can produce localized effects and interesting boundaries.
- **Layering:** Different chemicals can be applied sequentially. The first layer can be allowed to react and dry before another chemical is added.
- **Wiping:** A chemical can be applied and then partially removed to create variation.
- **Selective Application:** Patina does not have to cover the entire surface. Leaving portions of the original metal exposed can create contrast.

Controlling Patina Application with Absorbent Materials

Using absorbent materials—such as tissue paper or cheesecloth—provides significantly greater control over chemical patination, especially when working with lower concentration or weaker solutions.

Application Method: Lay the dry tissue paper or cheesecloth directly onto the prepared gilding or metal surface. Using a pipette, carefully drip the liquid patina onto the material, allowing the fibers to wick and hold the chemical in direct contact with the surface.

Benefits & Control: This technique prevents harsh pooling, reduces run marks, and slows the chemical reaction, allowing for subtle, gradual tone development across the piece.

Surface Effects: Beyond control, the weave of cheesecloth or the delicate wrinkles of tissue paper leave distinct, organic texture patterns and mottled tonal variations that are difficult to

achieve with a standard brush application.

15. Resists and Masks

A resist prevents or changes the contact between the patination solution and the metal. A resist does not have to be a chemical coating. Physical materials can be used as masks.

Examples include painter's tape, low-tack masking film, paper, tissue, wax paper, produce mesh, rubber bands, and cheesecloth.

Produce Mesh

Plastic mesh bags used for some fruits and vegetables can be placed over the surface to create repeating patterns.

Rubber Bands

Rubber bands placed across the surface create lines and areas that receive less patination. The pattern can be simple or deliberately irregular.

Wax and Grease-Based Resists

Wax, paraffin, beeswax, wax crayons, and petroleum jelly can act as water-repellent experimental resists. They can be applied where aqueous patination is to be reduced or blocked. However, these materials can interfere with subsequent adhesion of finishes, adhesives, or other coatings. For that reason, they should be treated as experimental techniques and used with caution.

16. Aluminum: A Different Approach

Aluminum does not respond to many of the traditional copper and brass patination chemicals. Rather than trying to force a chemical reaction, aluminum can be colored by other methods.

One practical approach is: **Clear seal → Alcohol ink → Protective clear coat**

Alcohol inks can produce translucent colors that resemble anodized metal. Commercial aluminum blackening products are another option. The important concept is that not every metal needs to be chemically reacted with in order to change its appearance.

17. Jewelry and Metalsmithing

Much of the vocabulary and chemistry associated with metal patination comes from jewelry and metalsmithing. Metalworkers routinely work with copper, brass, bronze, silver, steel, and aluminum.

Common techniques include surface preparation, oxidation, chemical coloration, immersion, brushing, spraying, fuming, layering, selective removal, resists, and protective coatings. These techniques can provide useful ideas for woodturners.

However, there is an important difference: **metal leaf is extremely thin and is attached to a wood substrate.** A technique that works on a solid piece of metal may not transfer directly to metal leaf.

Particular caution is required with heat, prolonged immersion, aggressive scrubbing, mechanical abrasion, prolonged wetting, and chemicals that attack the adhesive or wood substrate.

18. David J. Marks

David J. Marks is an important early practitioner of combining gilding and chemical patination with woodturning and other woodworking. His instructional material demonstrates the use of metal leaf, gilding, chemical patination, resists, layering, and surface experimentation.

His DVD, *Gilding & Chemical Patinations*, is particularly relevant to this subject. The DVD is from an earlier period of woodworking instruction and predates the modern explosion of YouTube instructional content. Its production style is dated, but the techniques and demonstrations remain useful:
https://djmarks.com/store/how-to/gilding-patinations-dvd-by-grace-baggot-and-david-marks/

David Marks' work is worth studying because it demonstrates that chemical patination can be treated as a surface-design process rather than simply as a method of producing one particular color.

19. Matthew Runfola — Patina

Matthew Runfola's book *Patina: 300+ Coloration Effects for Jewelers & Metalsmiths* is an excellent reference for expanding beyond the handful of patinas demonstrated in this class. It

includes numerous recipes and examples covering different metals and application techniques.

Techniques discussed include immersion, brushing, spraying, fuming, layering, resists, hot patination, and cold patination. The book is particularly useful because it demonstrates how changes in chemistry and application method can produce substantially different results.

https://www.goodreads.com/book/show/18147301-patina

20. Commercial Patination Products

Commercial patination systems can provide more predictable and repeatable results than mixing individual chemicals. Sculpt Nouveau is one of the major suppliers of products for metal coloring and finishing.

Product categories include traditional patinas, concentrated patinas, Birchwood patinas, patina stains, Smart Stains, Dye-Oxide patinas, Universal patinas, solvent dyes, protective coatings, waxes and oils, and metal cleaners and surface-preparation products.

Commercial products can be especially useful when a particular color needs to be reproduced consistently. Always follow the manufacturer's instructions for dilution, application, ventilation, personal protective equipment, and disposal.

21. Sealing and Protecting the Finished Surface

The final protective finish is an important part of the process. Sealing can slow further chemical reaction, reduce tarnishing, protect the surface from handling, reduce abrasion, stabilize a patina, and control the final sheen.

Possible protective finishes include shellac, lacquer, varnish, acrylic clear coats, polyurethane, and wax. The appropriate finish depends on the metal, patina, substrate, and desired appearance.

Sheen Matters

The clear coat itself can change the appearance substantially. A gloss finish generally increases apparent depth and saturation. Satin or matte finishes can soften reflections and reduce the visual intensity of the metallic surface.

Timing

Allow the chemical reaction and surface to dry adequately before applying the final finish. The finish should be compatible with the underlying materials. Always test the complete system on a sample before applying it to an important piece.

22. Troubleshooting

Leaf Will Not Stick

Possible causes: Size is not tacky enough, size has dried too far, surface is contaminated, surface is too porous, leaf is being applied incorrectly, size was applied unevenly.

Leaf Tears or Wrinkles

Possible causes: Excessive brushing, too much pressure, soft or excessively thick adhesive, leaf being moved after contact, surface is not sufficiently smooth.

Patina Does Not Develop

Possible causes: Chemical concentration is too low, metal composition is unsuitable, surface is contaminated, chemical has deteriorated, application is too light, reaction requires more time.

Patina Is Too Dark or Too Strong

Possible solutions: Reduce concentration, shorten exposure time, dilute the solution, apply more selectively, remove some of the patina mechanically, apply a contrasting layer.

Patina Is Uneven

Unevenness is not necessarily a defect. It can result from surface texture, leaf overlap, chemical concentration, application method, drying rate, temperature, or humidity. Variation can often be incorporated into the design.

23. Basic Safety

Chemical patination should be treated as chemical work, even when individual ingredients are relatively common.

Basic Practices

- Wear appropriate eye protection.
- Wear chemical-resistant gloves.
- Provide adequate ventilation.
- Clearly label all solutions.
- Keep chemicals away from food and drink.
- Never use food-preparation equipment for chemicals.
- Follow the SDS for each chemical.
- Use compatible containers.
- Keep incompatible chemicals separated.
- Do not mix chemicals unless the procedure specifically calls for it.
- Dispose of solutions according to local requirements.

Particularly Important

Sulfide compounds must never be acidified because toxic hydrogen sulfide gas can be produced. When in doubt, consult the chemical manufacturer's SDS before using an unfamiliar chemical.

24. A Practical Workflow

A reliable workflow for experimental pieces is:

1. **Step 1 — Prepare the Surface:** Sand, clean, seal, and smooth the wood.
2. **Step 2 — Apply Size:** Apply an even coat of appropriate gilding size.
3. **Step 3 — Apply Leaf:** Apply the selected metal leaf carefully.
4. **Step 4 — Inspect:** Look for missed areas and repair them as necessary.
5. **Step 5 — Allow the Size to Cure:** Give the adhesive appropriate time before beginning patination.
6. **Step 6 — Plan the Patina:** Decide whether the entire surface will be treated or whether selected areas will remain unchanged.
7. **Step 7 — Apply Resists:** Use mesh, rubber bands, masking materials, or other techniques where appropriate.
8. **Step 8 — Apply Patina:** Brush, spray, drip, wipe, or layer the chemical.
9. **Step 9 — Observe:** Patination is a reaction. Allow time for the chemistry to develop.
10. **Step 10 — Adjust:** Additional applications, removal, layering, or selective treatment can modify the result.
11. **Step 11 — Dry and Stabilize:** Allow the surface to dry completely.

12. **Step 12 — Protect:** Apply an appropriate clear finish or wax when the surface is ready.

25. Sources and References

Metal Leaf and Gilding

- **SeppLeaf Gilding:** Supplies, metal leaf, sizes, adhesives, and technical information.
- **Gilded Planet:** Metal leaf and gilding supplies.
- **Speedball / Mona Lisa:** Mona Lisa gilding products and art materials.

Patination Chemistry

- **The Science Company:** Patination chemicals and published formulas.
- **Copper Development Association / Copper.org:** Technical information concerning copper and patination.

Woodturning and Chemical Patination

- **David J. Marks — Gilding & Chemical Patinations:** DVD and instructional material concerning gilding and chemical patination on woodworking.
- **Fine Woodworking — David Marks:** Articles and demonstrations concerning patina finishes.

Jewelry and Metalsmithing

- **Matthew Runfola — Patina: 300+ Coloration Effects for Jewelers & Metalsmiths:** A broad reference containing hundreds of patination examples and techniques.

Commercial Patination

- **Sculpt Nouveau:** A major supplier of commercial patinas, metal-coloring products, protective finishes, and related supplies.

26. The Big Idea

Metal leaf and chemical patination are most useful when treated as surface-design tools rather than fixed recipes.

The same metal can produce very different results depending on preparation, size, leaf type,

chemical, concentration, application method, resists, layering, drying, and final finish.

The goal is not simply to reproduce a particular color. The goal is to understand enough of the process to control, modify, and deliberately exploit the variables.

Experiment on sample material first. Record what was used and how it was applied. Unexpected results are often useful information.

Useful Online References

- SeppLeaf
- SeppLeaf Rolco Aquasize Technical Data
- Gilded Planet
- Speedball Art — Mona Lisa products
- The Science Company — Patina Chemicals
- The Science Company — Patina Formulas
- David Marks Woodworking
- David Marks Videos
- Matthew Runfola — Patina
- Sculpt Nouveau