

When developing an incised pattern be sure to allow for stock loss. A good rule is to start with at least double the thickness of the final sheet or item. Stock loss from twist patterns and combinations of twist and stock removal patterns is difficult to predict but allow for at least a 20% loss.

**Annealing:** For a visual indicator use a dark room. A dull red is sufficient to soften the material after cold working. The color of the copper alloys is a more reliable indicator. Use flux as an indicator by brushing a little flux on the surface and heat evenly until the flux melts. Remove the heat source and cool until the flux solidifies and then quench in water.

Recommended annealing temperature is 620°C (1150°F). The material may be torch or kiln annealed. Protection from oxygen by annealing in a reducing atmosphere will reduce the amount of oxide formation on the copper. Pickle as needed to remove oxides on the copper alloys and sterling, taking care not to leave in the too long to prevent unwanted etching. White vinegar may be used as the pickling solution, though it might work somewhat more slowly.

Over annealing in frequency, time and temperature is not recommended. Over annealing can cause excessive grain growth and significantly weaken the metal.

**Finishing:** This mokume may be finished using standard jewelry finishing techniques. Heavy buffing is not recommended as this may smear the surface of the metal and muddy the pattern. Use abrasives and tools that cut rather than grind. If a rotary file tool is used, it is often best to remove the tool marks with abrasive paper or water stones before buffing.

A matte surface will best show off the colors of the metals in the mokume. Sandblasting or glass beading can produce interesting results; experimentation with surface finish is recommended before determining a final form.

**Etching** may be done with nitric acid, ferric chloride, ammonia, vinegar (overnight) or by reverse plating.

Special Note: 5% Shibuichi will often form a film of silver on the surface from pickling and etching. To obtain darker oxidation colors using Baldwin's Patina or Rokusho this film must be carefully removed in such a way as to not remove the topography created by the etching. Gently rubbing with fine steel wool, sharp pumice powder and/or the finer grits of 3M radial bristle disks. Re-polishing the surface after removing the silver skin may be done by light buffing or use of finer bristle disks.

**Patina:** The copper and 5% Shibuichi will readily patina from handling. This mokume may be patinated with Baldwin's Patina, Rokusho, and some commercial coloring products. Experimentation is recommended, keeping in mind that all patinas may change with use.

**Note:** Be sure to take proper safety precautions when using any chemicals or tools. This information represents the best knowledge and experience regarding the use of Shining Wave Metals products by their manufacturer, however it is not guaranteed to produce an expected result and is no substitute for experimentation by the user of Shining Wave Metals products.



**Shining Wave Metals**

## Data Sheet

# Mokume-gane

## Banha (Night Wave) Sheet, Rod & Flat Sheet

Sterling • Copper • 5% Shibuichi

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# Banha (Night Wave)

STERLING • COPPER • 5% SHIBUICHI

## Sheet:

**Composition:** 21 layers of alternating Copper, Sterling, 5% Shibuichi, Sterling, repeat 5 times plus one copper layer all on a heavy silver slab. Approximately 50% sterling, 27% copper and 23% 5% Shibuichi by weight, with the heavy silver backing accounting for 36% of the weight and about 1/3 the thickness of a finished sheet.

**Description:** A single sided, silver backed billet with a wave pattern with the crests forming a line perpendicular to the long edge of the sheet. Very fine grain with the alloy layers three and a half times the thickness of the silver layers. Can be deep etched and made in many different thicknesses, from .016" to .062" suitable for production. 24ga (.5mm) and 18ga (1mm) are stock sizes.

**Pattern:** Wave pattern die cut in the spring and summer of 2006 by PHB.

**Uses:** Jewelry, flatware and other decorative metalwork. Not recommended for continuous skin contact jewelry, such as bridal rings, or on utensils that will have the copper and shibuichi surface in contact with food or drink.

**Melting Point:** Starts to melt at the silver/copper eutectic temperature, 1435°F (779.4°C).

**Nominal Density:** 5.096 troz/cuin or 9.675 gr/cc. Please note that the density and composition figures are for the billet with undeveloped pattern. The compositions will change due to metal loss from pattern development. These figures are for estimation purposes only.

**Quality Mark:** No existing category in the current quality marking system.

## Working the Material

This mokume is easily formed by raising, cold forming, die striking and sawing. Anneal after a 40% to 50% reduction has been achieved. Use a solder that flows at a temperature lower than the melting point. Easy and medium silver solder are recommended.

**Annealing:** Recommended annealing temperature is 1250°F (675°C). This material may be torch or kiln annealed. Soaking at the annealing temperature is not necessary. Protection from oxygen by coating with flux or annealing in a reducing atmosphere will reduce the amount of oxide formation on the silver and copper alloys. Pickle as needed, talking care not to leave in the pickle too long to prevent unwanted etching.

Over-annealing in frequency, time and temperature is not recommended. Over annealing can cause excessive grain growth and significantly weaken the metal.

**Finishing:** This mokume may be finished using standard jewelry finishing techniques.

Heavy buffing is not recommended as this may smear the surface of the metal and muddy the pattern. Use abrasives and tools that cut rather than grind. If a rotary file tool is used, it is often best to remove the tool marks with abrasive paper or water stones before buffing.

A matte surface will best show off the colors of the metals in the mokume. Sandblasting or glass beading can produce interesting results; experimentation with surface finish is recommended before determining a final form.

**Etching** may be done with nitric acid, ferric chloride, ammonia, vinegar (overnight) or by reverse plating

**Patina:** The copper and 5% Shibuichi will readily patina from handling. This mokume may be patinated with Baldwin's Patina, Rokusho, and some commercial coloring products. Experimentation is recommended, keeping in mind that all patinas may change with use.

## Rod & Flat:

**Composition:** 15 layers (rod), 21 layers (flat) of alternating Copper, Sterling, 5% Shibuichi. The rod has 7 layers of Sterling, 4 layers of Copper & 5% Shibuichi arranged in this order: Cu-Stg-5%-Stg four times without the last layer of Sterling. Copper/5% layers are twice as thick as sterling layers. 29% Sterling, 35.5% Copper and 35.5% Shibuichi by weight.

**Description:** An unpatterned rod 8mm (.320") square rod, 14ga or 1/8" flat sheet

**Pattern:** Rod is a section used to make other patterns or to be used as forging stock. Common methods used for patterning are twisting (rod), stock removal or distortion from forging.

**Uses:** Jewelry, flatware and other decorative metalwork. Not recommended for continuous skin contact or on utensils that will have the patterned surface in contact with food or drink.

**Melting Point:** Starts to melt at about 1435°F (779.4°C).

**Nominal Density:** 4.93 troz/cuin or 9.366 gr/cc. Please note that the density and composition figures are for the billet with undeveloped pattern. The compositions will change due to metal loss from pattern development. These figures are for estimation purposes only.

**Quality Mark:** No existing category in the current quality marking system.

## Working the Material

**Do NOT hot work this material! Doing so will void the warranty.**

This mokume is easily formed by raising, cold forming, die striking and sawing. Anneal after a 40% to 50% reduction has been achieved. Use a solder that flows at a temperature lower than the melting point. Easy and medium silver solder should be used, a test piece with any new batch of solder is recommended.