ADD A TOUCH OF GOLD WITH *Keum-Boo*

COME-WHAT-AGAIN?

The name is the hardest part!

Keum-Boo is an ancient Korean gilding technique for applying 24K gold to silver. You might also see it written as 금부 (if you read Korean), Geumbu, Kum-Boo, or Kum-Bu). The name basically means "attached gold" - exactly what we're doing. The technique can also be used to bond gold to other metals like copper, iron and steel, but in this hand-out I'll be referring to bonding gold to fine silver, and techniques that are suitable for metal clay artists.

The hardest part about this wonderful technique is the name! It is surprisingly easy, and fun - and you don't need expensive equipment or a fancy studio to get started. All you need is heat, some gold foil, and a sense of adventure.

I love the combination of gold and silver. Whether it is left highly polished, satin or brush finished, or with a patina, I think the two metals combined is just beautiful. The gold adds a little drama, and draws your eye to it. And of course, adding gold to your silver will add real value, a benefit I think everyone appreciates when it comes to selling!

I am really looking forward to introducing you to Keum-Boo through this handout, where I'll be sharing tips and tricks that I've learnt over the years. *Feel free to share, but please keep the document intact with all pages included.*

Let's dive in!
Petra

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REAL LIFE ALCHEMY

Like magic - but it isn't

Whilst Keum-Boo feels pretty magical, it doesn't need any spells.
Apart from gold and silver you only need two things: heat + pressure = gold bonding.

The heat and pressure create a **diffusion bond**, which simply described means molecules of the two metals start to move, sort of "swap places" and link together. You're not fusing or melting any of the metals. Diffusion bond takes place at around 350°C - 450°C which is a temperature far below each metal's fusing or melting point!

By applying pressure (burnishing) whilst heating layered gold and silver, you're encouraging the metal atoms to move and bond, and giving the gold more points where it will bond. You don't need a rolling mill or high powered machinery, the pressure you apply with just a burnisher is enough.

> Diffusion bond
> The solid state joining of two surfaces under intimate contact and under high pressure and temperatures resulting in an undetectable original bond line.
> -ScienceDirect.com

Is it plating? Will it wear off?

Keum-Boo is far superior to gold plating. Done correctly there is a permanent bond between the silver and gold, **Keum-Boo will not rub or flake off.** Gold plating uses lots of toxic chemicals. The Keum-Boo process involves no chemicals affecting your health or the environment.

Will gold leaf work?

Gold leaf is too thin for this technique. You want to use gold foil which is substantially thicker. You can handle it without it disintegrating or simply gilding your fingers.

The best and most economical foil I have found is the 24k Gold Foil supplied by Art Clay.

It's a beautiful foil, manufactured by stacking many many ultra-thin layers of gold flakes and hammering and pressing to build a thick foil. It is approximately 0.012-0.016mm (12-16 micron) thick. Gold leaf is often around 0.12 micron, meaning Art Clay's gold foil is about 100 times thicker!

Sterling silver? 950 Metal Clay?

Keum-Boo is incredibly easy to get started with for metal clay artists, as we're usually working with fine silver.
Fine silver needs no preparation (apart from cleaning it) as it will have an oxide free surface straight from firing.

If you're working with milled sterling silver sheet and wire you will need to **depletion guild** it before applying gold. This is done by repeatedly torching/heating the silver, quenching and pickling, until the surface is white (and looks like metal clay straight out of the kiln). This process removes the copper/brings the fine silver to the surface, making it ready to accept the gold.

You'll be pleased to know that enriched sterling clay, like Art Clay Silver 950 Sterling Clay, is ready to accept Keum-Boo straight from firing - it doesn't need to be depletion gilded!

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HOW DO I START?

You only need a few things to get started. To be clear - if you fall in love with the technique you might want to invest in a UltraLite Studio kiln which makes it super easy (and is also great for granulation, enamelling, glass fusing, annealing, and firing silver clay) but you do not need one to get started. Want is not need...

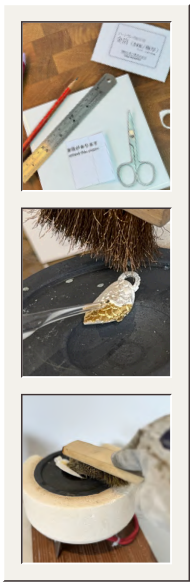
- Gold foil and fine silver
- A heating method - see page 5
- Round edged tool to hold the hot silver (tongs, rounded tweezers, blunt burnisher)
- Fine tipped tweezers for placing the gold
- Heat-protective gloves - snug fitting leather gardening gloves are great
- Burnisher - agate, steel, or borax glass. Agate is ideal as it won't scratch nor stick to the foil. Avoid plastic or rubber handles that can melt.
- A quenching bowl - to cool down stainless burnishers and silver (don't quench agate or it'll break)
- Soft brass brush to press gold into textures, and brushing once finished
- Scissors or paper punches to cut out gold shapes

Ok, I have the tools!

Get a good quality gold foil and cut a shape or two. Go freehand and tear the foil, or cut precise shapes with small sharp scissors or scalpel. Or use a paper punch. Place the gold foil inside a folded piece of paper to make it easier to cut.

Use fine silver clay and make a flat design with only a shallow texture. Fire, but don't brush or burnish - white silver is ideal. Avoid touching the surface.

Prepare and preheat your heating method if needed. Plan your tools and setup. Where will you put down hot tools? What will you burnish with? And consider how you will hold the silver steady (rounded end of a scribe or blunt tweezers work well).



Heat your silver. Depending on if you use a torch, kiln or hotplate, this will vary in time.

Once the silver is hot, put your gloves on and place the gold using tweezers. Let the gold warm up. If using a torch be extra careful to not melt or blow the the gold out of position until it bonds.

When warm, hold the silver steady using a blunt tool or tweezers in one hand and with the other hand, use your burnisher to tap-tap-tap, pressing down on the gold to anchor it. Once the gold is bonding you can start burnishing in a side-to-side motion. Keep burnishing. You may need to add more heat/reheat as the metals cool down.

You should be able to see when the gold has bonded. Cool down the piece and check carefully along the edges. Heat and burnish again if neded.

Oooops! Burned tools

- A soft brass brush is perfect for pressing down the foil into textured areas.
- Be careful with wood or rubber handles - they burn and melt! Oooops.
- If using a metal burnisher, remember this technique works for bonding gold to steel... Quench regularly to cool the tip down to stop the gold sticking to it.
- Don't quench glass or agate burnishers or they'll crack from the thermal shock.

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TIPS AND FAQ

Whilst this is an incredibly easy technique to get right, as with everything there is a learning curve. Start simple to give yourself a higher chance of it working amazingly with no discouraging failures - yay! When you know and understand the process it is time to start experimenting.

- **START WITH A FLAT SHAPE AND ADD ONLY A VERY SHALLOW TEXTURE**
  - A flat shape is easier to heat evenly, hold still, to keep the gold in place, and to burnish evenly.
  - Deep textures means you need to get the gold foil into the groove, not always easy when you're learning the process.

- **CLEAN THE SILVER**
  - White fine silver straight from firing is ideal for Keum-Boo. If it has been sitting around for a while, scrub it with a paste of baking soda and water and then avoid touching the surface. You can even "heat clean" the silver in a kiln (650C for 10 minutes should do the trick) or blast it with a torch for a couple of minutes.

- **HOW DO I GET THE GOLD WHERE I WANT IT?**
  - It might sound gross, but a touch of spit is amazing for holding the gold in place temporarily! I sometimes lick the back of the foil before applying it to the silver. Some people use very watered down craft glue, but for most designs I find this an unnecessary step that just slows down my process. I'm all for shortcuts.
  - Ensure the silver and gold is hot (to encourage adhesion) before you start burnishing. To anchor the gold in place, start by just tap-tap-tapping it with the burnisher, no side-to-side movement, until you can see it starting to "stick".

- **THE GOLD RIPPED OR MY DESIGN BROKE**
  - Not a problem. Just patch it up! Repairing or adding gold to a design will be almost invisible.
  - Complicated designs can be done in parts.
  - Save ALL gold scraps. Little bits are ideal for fixing/repairing designs.

- **HOW DO I KNOW IT HAS STUCK?**
  - When cool, carefully check the edge of the gold with magnifier. Run a finger nail across it, you shouldn't feel an edge, it should be completely smooth with the two metals blended. If there is an edge, heat and burnish a little longer.

- **I GOT BUBBLES IN THE GOLD!**
  - Bubbles are often due to the metal being dirty (or glue), or uneven burnishing/not heated long enough. If it is a big bubble, use a needle to prick a hole, heat and burnish from the edge of the bubble towards the hole until it is gone.

- **MY GOLD HAS ALMOST DISAPPEARED? I PUT IT BACK IN THE KILN TO HEAT, HAD A COFFEE AND IT IS GONE?**
  - Overheating (at an extended time) will make the gold diffuse into the silver. It will survive short bursts of heat, say whilst soldering, but 15-20 mins in a kiln at 800C would make a lot of the gold disappear into the silver. This is another reason why you want to be careful when working with a torch, as it is easy to overheat.
  - You can also use this in your favour! You can get several different "strengths" of gold showing, by manipulating the thickness (several layers of gold, and/or leaving parts to heat-dissipate). Faint layers show up more on patinaed silver.

- **HOW DO I FINISH/POLISH THIS?**
  - Start with a soft jewellery brass brush. Then you can burnish, tumble polish, hand polish, and/or add patina depending on what effect you're after. The gold will not come off if bonded properly. Weak but hot Liver of sulphur doesn't effect the gold (unless it has got very absorbed by the silver) and gives a stunning contrast.
  - A high shine makes the gold less visible, so you might want to play around with different finishes. You can even use pumice, a pink 3M Bristle Brush, or Hone & Highlight in your tumbler to bump back the shine and soften the finish.

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PLEASE TAKE CARE WHEN WORKING WITH HOT EQUIPMENT OR FLAMES - ASSESS YOUR SET UP
Keep the area clean from flammables and fire hazards. Tie back hair, wear gloves, closed shoes, and a protective apron (avoid synthetic fibres). Place kilns, firing bricks, or hotplates on heatproof surfaces, and consider where you will put down hot tools whilst working and what would happen if you drop a hot piece.

HEATING METHODS

You need to get your silver to hold a temperature of approximately 350-600C for the gold to bond. You can heat and reheat as the silver cools down. All methods below will work, though some are easier than others.

With a standard kiln you need to take a hot kiln shelf in and out of the kiln and have a heatproof surface to work on. A cooking hot plate is likely your cheapest option, but most have a sensor which keeps turning the plate on and off (and often only allows it to get to full temp once per usage) so the process will take longer as the temperature will keep dropping. A torch can blow your gold foil off the silver before it starts bonding, and can overheat and melt the the gold foil.

KILN WITH CONTROLLER - like Paragon SC2, Prometheus PRO1/PRO7

- Heat the kiln to 800C and set it to hold for an hour or so to give you time to work. We set it to hotter than needed as the silver will cool down when you work it outside the kiln.
- Place your silver in the kiln once it has reached temperature.
- Leave in the kiln for about 3-5 minutes to heat up, then remove and place on a heatproof surface. to apply and burnish the gold. If you had the gold placed on the silver in the kiln, you might want to tap the gold a couple of times to anchor it before lifting out the shelf (or it might blow off).
- As the silver cools down you will need to put it back in the kiln to reheat. Repeat the process until the gold is perfectly bonded.

ULTRALITE STUDIO KILN WITH BRASS PLATES

Easy-to-use, use very little electricity. Great for granulation, enamelling, glass fusing, annealing, and firing silver clay

- Use a brass plate to moderate the heat and protect your heating element. The indented brass plate is used to hold rings and rounded pieces like lentil shapes and beads.
- Place the brass plate on the kiln and preheat, for about 15-25 minutes. Once a wooden toothpick starts charring when pressed against the plate you're ready to start. Burnish until you're done.
- Turn the opening in the kiln body away from you/your hands.
- I've never used a temperature controller for Keum-Boo - I don't think it is needed.

TORCH AND FIBREBRICK

A little harder as you need to manage an open flame, and will need to reheat regularly.

- Be careful as you can easily blow away your foil, or worse, melt it!
- Be even more careful with yourself - don't get distracted and wave the open flame about.
- You will likely need to reheat your silver as it cools down.

COOKING HOTPLATE OR KITCHEN STOVE

- It is best to get a large brass sheet to cover the hot plate (to protect the silver and to even out the temperature).
- If the plate doesn't get hot enough the safety switch might have activated, turn it off 15 mins and then start again.

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TOOLS & MATERIALS

SCAN WITH YOUR PHONE TO LEARN MORE AND TO BUY THESE PRODUCTS

Art Clay exclusive gold foil

UltraLite Studio Kiln

Soft brass brush

Agate burnisher

Keum Boo on Silver by Celie Fago

Tweezer set

Micro-Mesh FlexiFile polishing stick

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LEARN MORE

As with everything, there is a learning curve. You can shorten that by joining a class, and of course, taking advantage of all the written and filmed instructions we all have access to.

Here are some quick links to information that will help you learn fast.

Use your mobile to scan the QR code below to go straight to the link. On most smart phones you just open the built-in camera app. Point the camera at the QR code (make sure it is on Photo, not video or any other setting). Tap the banner that appears on your screen. You might need to go to settings and tick the box under Camera that says Scan QR codes. Or you can download an app which scans QR codes.

Scan to watch

Celie Fago, the Keum-Boo & Metal Clay Queen
I think we can confidently say that Celie introduced Keum-Boo to the metal clay market. The video quality on this old video is terrible (and the sound even worse) but it's still worth watching.

Pam East - Keum-Boo with UltraLite Kiln
A great free 15 minute tutorial which introduces the UltraLite kiln and how to use it for Keum-Boo. As with all Pam's videos it is clear, concise, and super-informative.

Jessica Rose, Jewellers Academy - FREE course
Jessica from Jewellers Academy offers a free course teaching you three different ways to add gold to your metal clay, including Keum-Boo using a hotplate.

The Jewellers Bench - Online course
Joanne Tinley from The Jewellers Bench offers a range of online courses in Keum-Boo. Here is the first one, teaching you the foundations.