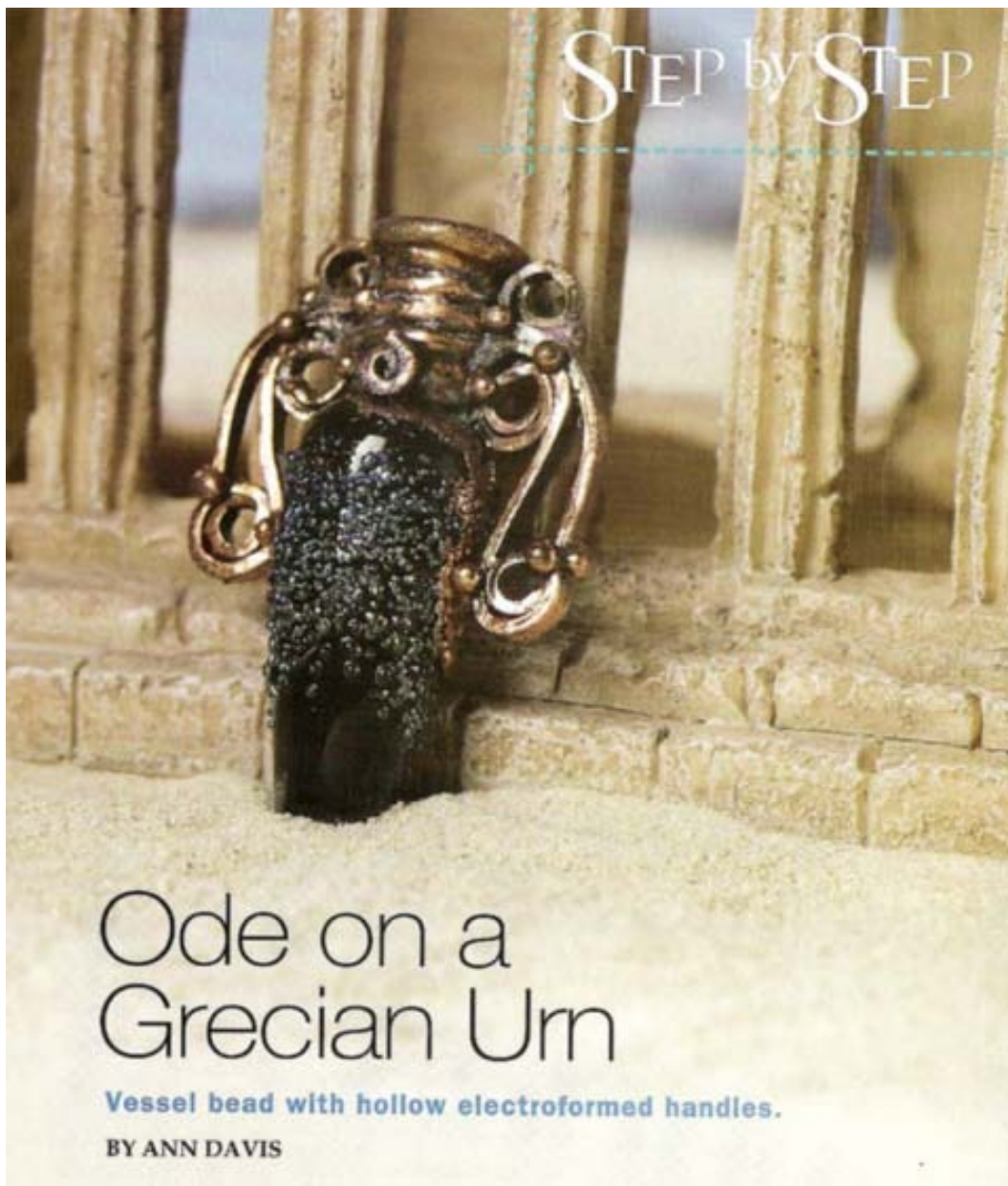


ODE ON A GRECIAN URN – MAKING A VESSEL BEAD WITH HOLLOW ELECTROFORMED HANDLES

This early article on electroforming was first published in the October 2004 issue of *Lapidary Journal* and is reprinted here with the editor's kind permission.



Electrodeposition, the use of direct electrical current to move metal, is truly fascinating art form. Just imagine myriads of tiny copper atoms, being carried on an electrical "Gulf Stream current," like a school of fish migrating from one place to another across a cerulean sea of solution. To me the process has that mysterious quality that Einstein called "spooky effects at a distance." Every step of the method I use to create my vessels involves materials that morph from solid to fluid and back to solid.

The glass starts out as a solid, is then liquefied to work, and returns to a solid. The wax also starts out as a solid, is partly liquefied, returns to a solid state and is then vaporized! Likewise the copper starts out as an anode, is dissolved in the acid solution, and ultimately forms a solid encrustation over the wax. This gives me a great feeling of continuity throughout the process.

As a metalsmith, I also love combining metal with glass in new and technically challenging ways. The look of metallic handles on a glass vessel harks back to Imperial Chinese vases brought to Victorian England, which were given sterling lips and handles because they often arrived chipped around the edges. Sometimes, as in the bead pictured here, I give my work ornate Victorian handles and combine that with the patinated, "just-unearthed" look of ancient Greek vessels. I hope you will find the following process as exciting as I do!

Skill level: Advanced

What you need:

- 1 glass vessel shaped bead
- 20-gauge pure copper sheet 1.5"X6", 18-gauge copper wire (available at hardware or hobby stores)
- Jewelers wax wire, 10&12-gauge round, assorted sized packs are good
- Midas Bright Copper Electroforming Solution, 1qt.
- Conductor Waterbased Electrodeposition paint (available from Safer Solutions, PA)
- Heated wax tool
- Rectifier with leads
- Burn-out kiln
- Bamboo skewer
- Styrofoam block small
- Brush, a small soft mop works best
- 1000ml jar
- Copper Alligator clips
- Dishwashing soap
- Old toothbrush
- Patinating solution



Step 1

First make a vessel-shaped bead approximately 2.5 inches in length with a .5 inch thick diameter neck. I use a 2.5mm mandrel, (10-gauge) to build my vessels on.

Step 2

Now you are ready for the second part of the process, shaping the wax. Take a length of 12-gauge round wax wire and cut the end at a 45° angle, then wrap it around the neck starting at the shoulder of the vessel so that it fits snugly. Continue spiraling up the neck until you almost reach the top. Leave two or three mm of the glass neck visible. Cut the remaining end of the wax at a 45° angle and hold in place. Secure the wax to itself with a hot wax tool. I use a digital wax pen because I like to set the temperature accurately for the different waxes. If you have one, set the pen to 300° F. With a fine tip, gently poke it in between the rounds of wax wire quickly, just till they melt and tack together. Don't try to melt the whole length of the spiraling, because wax shrinks when heated and you will end up with a holy mess. After you have tacked the spiral in 4 or 5 places, you will need to fuse it in those places to make sure it holds.



Set the bead aside and cut up some wax wire into very small pieces, about the size of seeds, to use as filler fusing scrap. Touch the hot pen to a small piece of scrap, picking it up. The wax will flow toward the pen and the heat. Then use the pen to secure the first round of wax at the base and "fuse" it together. Here's how. Stick the pen with the liquid scrap between the first 45° joint and move it around just slightly in order to heat both sides of the wax, and let the liquid that was on your tip flow into the joint. Repeat until the joint is full and fused. Do the same for the end of the wound wax at the top of the vessel. Continue to fuse all the places you have tacked.



Step 3

Next make the lip. First you need to get the measurement of the lip. Take 12-gauge round wax wire and go around the outside of the top of the neck, just at the place where you left the glass visible. Wind the wax around until it comes together, then overlap it a few mm. Put down the wax circle you have made, and take a sharp blade and cut the wax where it overlaps at a 45°

angle. That will be your joint. Fuse the joint: Now you should have a wax ring for the lip. Tack the lip to the spiral by slipping the wax ring snugly over the glass, where the lip touches the 10-gauge wax spiral around the neck. Tack in a couple of places and then fuse the two together, this time all the way around under the lip. You should now have a fairly smooth wax neck and lip on your vessel. If there are any bumps where you filled in too much wax, you can remove them with a wax file.



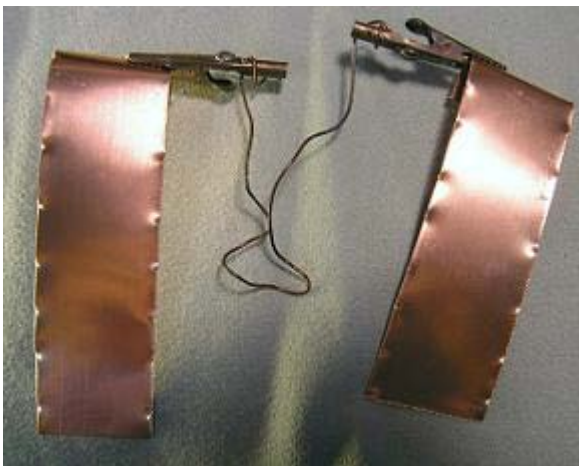
Step 4

Make the handles and decorations. Take 10 or 12-gauge round or rectangular wax wire and warm between your hands for a moment, then bend into a handle shape. If you fail to warm the wax first and you are doing tight spirals, it will only crack or become thin as you form it. Make two identical handles, one for each side. Tack the handles onto the round wax wire neck, as you did before, then come back and fuse the joints where you have tacked. Use enough of your scrap wax to fuse a nice seam. This will give you a strong bond and a nice finish which you will see when we paint the bead Remember that in electroforming, what you get is at least what you see, and it may be even more!! Every little mistake will show and be magnified, and every crack will become apparent! Take some time at this point and make sure its finished the way you want it. I usually finish polish with a flameless wax finisher, but you can use a piece of ladies' hose wrapped around your fingers as a polishing cloth and that will give you a nice finish too.



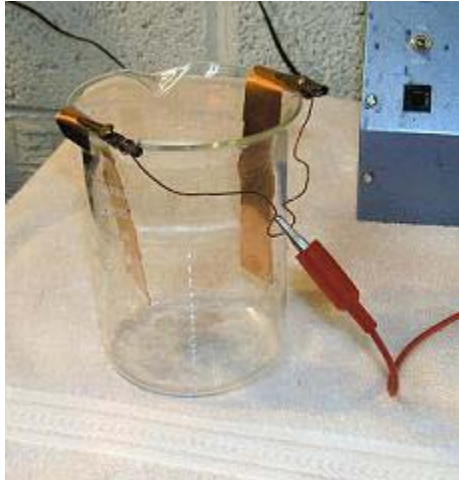
Step 5

Now we are ready to paint the vessel with electro-conducting paint. I like the water based paint. It's fast and cleans up easily. Stick the bead onto a bamboo kitchen skewer or something similar so you can rotate the bead without touching it and then have a way to support it while it dries. I stick the bamboo skewer into a block of Styrofoam to dry. Put a teaspoon of paint in a small jar, and thin if necessary to a light cream consistency. Take a small soft round brush and gently paint a coat of paint all over the wax work. Use the brush to get into all the cracks and crevices. Don't paint too fast, as you don't want air bubbles. Set aside until dry to the touch. Paint a second coat over the wax. If your paint seems extremely thin, do a third coat. Use the brush to get in between the wax where it touches the glass. You want a firm connection from the wax to the glass. Paint the top and inside the top neck of the bead. It gives the lip a nice finished appearance and makes it easy to electroform. Set aside to dry thoroughly. The paint must be completely dry all the way through for successful electroforming.



Step 6

You are now ready to electroform the wax handles. I use a 25-amp rectifier for electroforming because it is so versatile. It can do both large and small baths. First take about 8 inches of 18-gauge copper wire and string through the holes of two copper alligator clips, twist around securely. Then connect each copper anode to an alligator clip. You have now made a double anode. You will see that the purpose of this is to electroform all around the bead at once so you won't have to be turning it.



Step 7

Next take your 1000-ml jar and hang the anodes from the jar at opposite sides by bending the top of the anode with the alligator clip over the lip of the jar, letting the long side of the anode hang inside the jar with the small bent part and clip on the outside. You should have the wire connecting the two parts of the anode hanging between them outside the jar. Connect the red anode wire and clip from your rectifier to the middle of the copper wire hanging outside.

Step 8

Now take about 8 inches of the 18-gauge copper wire and bend an "L" shape about 2 inches from the end. Slip it through the bead hole so the bead is upside down and resting on the L. (Remember, we used a 10-gauge mandrel, so it will fit nicely.) If you have made your bead properly, the top of the painted bead should be touching the L. It must touch to electroform! If you are not sure, then bend the end of the wire back just so it touches the electroforming paint. That should give you a connection in two places. Now take the 4-inch Styrofoam block and stick the end of the wire protruding from the bottom of the bead up through it and make a loop or L on the top. The loop will secure it to the Styrofoam block that holds the bead in the middle of the solution. I use Styrofoam instead of a bus bar because it is easier to deal with, and if the bead is hanging freely through the Styrofoam, you can manipulate the loop at the top like a little dial to turn the bead in the solution so that it has the largest face toward the copper anodes. Connect the



black cathode wire from your rectifier to the loop on top of the Styrofoam. You have now created the work end of the process.

Step 9

Try setting the bead/cathode section into the 1000-ml jar. The whole bead should come down below the 1000-ml mark but not touch the bottom. The bead should not be touching either copper strip. Sometimes you have to bend the copper strips so they go back against the inside of the jar. Adjust if necessary.

Step 10



Remove the bead setup carefully and set aside. Fill the jar with bright copper electroforming solution to the 1000-ml mark. Please read the MSDS sheet that comes with the solution and take all precautions. Wipe up any spills and rinse skin if you come into contact with it. Turn on the rectifier. If you are using an analog rectifier there will be a needle gauge, it should just barely move. If you are using a digital rectifier you need to set it to .5 volts. Always immerse the work into the solution with the current turned on, because the solution will flash-plate to the work if

there is no live current, and that will cause a thin layer of copper scum to form making it hard to electroform properly. If there is bubbling you should turn the power down, as bubbles interfere with the plating process. Wait a few minutes and check to make sure that you have bright copper depositing on the painted surface. To do that you will need to remove the work from the solution and immediately immerse the bead end gently in a bowl of cold water. This is very important any time you check your work to avoid getting dark spots caused from the electroforming solution coming into contact with the air. Turn off the power. Inspect the work. You should have a nice layer of copper plate looking like very bright new penny everywhere you have painted. If there is no plating then you don't have a connection and must rewire. Turn on the rectifier and immerse again. Each time you check, make sure to take it out "live" and dunk in water then turn off. When you are sure things are going right, leave for about 4 hours. I do check the brew every hour just to make sure it is plating evenly.



Step 11

When you have an electroform coating that suits you, unwire the bead and clean under running water with dishwashing soap and an old toothbrush.. The idea is to wash the solution off completely or it will stain the copper.

Now you are ready to burn out the inside wax, if you choose.. Not only will it leave the electroforming hollow but it will be lighter. If you don't burn out the wax, you risk having it melt if left in a hot place. Also, if a customer dunks it in cleaning solution or puts it in an ultrasonic cleaner, the wax could begin seeping out and make an unsightly mess. I suspend my beads from mandrels supported on kiln furniture. You must use a proper burnout kiln! If the vaporized wax comes into contact with an unprotected electric element like your kitchen oven, it will result in a flash fire! You also need proper ventilation to burn out wax, please consult your kiln instructions. Set your burnout kiln to ramp up quickly to 500° and hold for 1hour. When cool, remove from the kiln. Clean the copper with copper cleaner. I use a homemade recipe of 1cup

vinegar, 1 tsp. salt, and 1 tsp. sugar. Patinate if you like. The vessel is now ready to bead into a necklace.

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