



### E3 Electroform Kit includes:

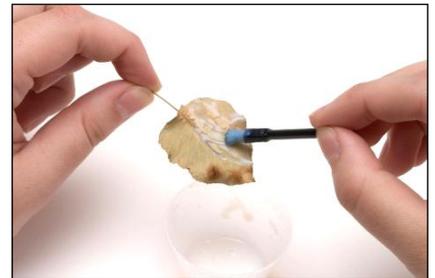
E3 Electroform™ electronic controller with power supply  
 Acrylic sealer  
 Small paintbrush for sealer and conductive paint  
 Beaker  
 Copper anode-wrapped coil  
 2 gauges copper wire  
 E3 Graphite Conductive Paint  
 Electroforming solution for copper  
 Electroforming brightener  
 Wood chopsticks  
 Filter and rubber gloves

### Supplies Needed:

Small object to electroform (small plastic object, twig, pod, etc.), distilled water, tape.

### Steps for Electroforming with Copper:

1. Many small objects are suitable for electroforming with copper. Small toys, glass beads, and twigs are just a few examples. If using an organic object, it must be thoroughly dried and sealed prior to electroforming. Materials like bone and shell may seem non-porous, but they still require sealing. The sealer will waterproof the surface, as well as keep the object from breaking apart or contaminating the solution. Apply two coats of sealer to ensure coverage. Let dry.
2. Paint a layer of conductive paint over the dried sealer, covering the entire surface. Let the object air dry. (Heating to speed the process may cause bubbles on the surface, so slow air drying is best.) Apply a second coat, and let dry. The conductive paint allows the object (a leaf in this photo) to become a cathode to which the copper will plate.
3. Attach a copper wire to the object by wrapping it around, or looping it through, the object. The wire will conduct electricity during electroforming and must be in direct contact with the dry conductive paint. Some paint can be brushed up over the attached wire to ensure that the wire and object conduct as one piece. The wire can be any gauge; 28-gauge copper wire was wrapped around a leaf stem in the photo. You can use heavier wire, or wrap a heavy wire over the thin wire to keep the object from drifting or floating when suspended in the electroform solution. You can also electroform multiple objects at once if they are relatively small and simple in shape. Simply bundle the wires from each object by twisting the wires together, forming a single stem (think of leaves growing on a tree branch). Just make sure the objects don't touch each other or the copper anode coil during electroforming.



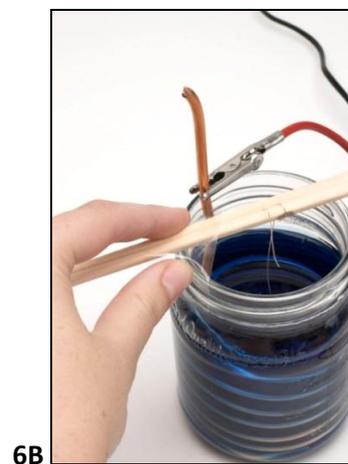
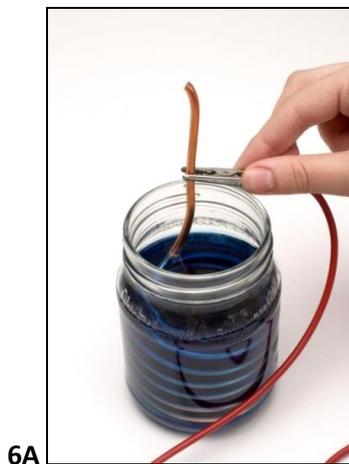
4. Position the copper coil inside the beaker. This is the anode. Leave some copper exposed at the top to attach the electrode clip.



5. Pour the electroform solution and a few drops of brightener into the beaker to cover the coil, leaving some metal exposed at the top (5A). Slide the wire attached to the object between the un-split chopsticks (the tension will hold the wire in place). Adjust the wire so that the object will be in the center of the beaker when suspended (5B).



6. Clip the red electrode from the controller to the exposed copper anode as shown (6A). Place the chopsticks on top of the beaker, suspending the object in the solution, centered in the coils. MAKE SURE THE PIECE DOES NOT TOUCH THE COPPER COIL ANODE (6B). If the piece drifts or floats after placing it in solution, wrap a heavier wire over the attached wire to make it more rigid. Just make sure you wrap or twist the wires together to ensure they conduct as one. A piece of tape is helpful to hold the sticks in place. Hint: Shine a flashlight through the solution to check the placement of the object.



7. Connect the black clip from the controller to the wire attached to the object. (You can attach it to the tail of the wire as shown, or directly to the wire above the solution). Set the current on the E3 Electroform controller to the desired setting\* before plugging in the power supply, as the plating will start immediately. Make sure both lights are on (the red light pulses), and that your piece is not touching the copper anode. Check the object after 20 minutes to make sure a layer of copper is forming. If you do not want the wire holding the object to stick to and become part of the finished piece, reposition it after the initial copper layer forms. If the wire sticks again after a few more hours, reposition as needed. With this leaf stem, the wire was left in place, undisturbed. Depending on how thick you want the metal, full plating can take anywhere from 2 to 10 hours. Remove the piece when the desired thickness of metal is achieved.



\*See the information at the end of this document to determine which setting to use for a desired result.

8. Remove the object when it has a nice coating of copper on the surface. This leaf was removed after 3 hours. Rinse the object with distilled water and pat dry. You can now use the finished copper piece to create jewelry, or you can proceed to electroplate the piece with other metals. To electroplate nickel over the copper, followed by precious metals, you can use various anodes and electroplating solutions specific to those metals.



9. The finished leaf is ready to make into a piece of jewelry.



### \*Variable power level instructions

There are a few variables to consider when deciding which power level to use. In general, start the controller on medium for about 20 minutes until the object has an initial coat of copper. Then turn the power to a low level for a slow, steady plating process that results in a smooth finish. You may wish, however, to turn the controller to a higher level after this initial coating for the following reasons: 1. You have a large object and would like to speed the process along. 2. You would like a rougher, more organic look (which is characteristic of traditional electroforming). The copper will build quickly, especially in protruding areas, forming spurs that look like small barnacles. If you get unwanted spurs, they can be sanded or filed down after forming. 3. Your object has deep recesses or a complex form, and you need more “throw” to cover these areas.

A general rule of thumb is to deliver 100mA of current per square inch for most objects, but experimentation is the best way to see how the copper forms on different shapes and materials. The slider allows current adjustments from 50mA to 400mA.

One great advantage of the E3 Electroform controller is that it monitors and adjusts the voltage and current during the plating process, leaving you free to do other things. With traditional electroforming, you must monitor and make the adjustments manually.



## Troubleshooting and FAQs

### ***How is this product different than traditional electroforming or plating?***

The E3 Electroform controller is a revolutionary substitute for a power rectifier. It was designed for small jewelry projects and can be used with all kinds of plating solutions and anodes suitable for plating a variety of metals. The controller contains a micro-controller, which monitors and self-adjusts the current without user intervention. This saves a great deal of time and effort. It is also a fraction of the size and weight of a traditional rectifier, making it handy for classes or small studios.

### ***My project is a dull color and appears grainy. It doesn't look like copper. What's going on?***

If your solution starts forming or plating with a dull, rough salmon-colored finish, add 2 full droppers of brightener to restore the smooth, bright finish. This acid is vital for bright, shiny copper.

### ***Why is my copper piece turning dark after electroforming? How do I keep the nice shiny copper color?***

Copper is vulnerable to the air and minerals which will oxidize the surface. Be sure to only rinse it in distilled water, and before plating, if you need to thin your graphite paint, only use distilled water. To keep the copper from oxidizing, there is a spray called NIKOLAS SPRAY LAQUER-CLEAR, which is preferred by many jewelry artists. Some use clear wax or varnish. Many prefer to let nature dictate the color and let the piece oxidize. If you want to remove the oxidation, use a pickle solution or a solution of citric acid.

### ***If I want to add more copper to an object, can I put it back in the solution to continue electroforming?***

Yes. Clean the copper well before electroforming an object a second time. Use a pickle solution or a solution of citric acid to remove oxidation before electroforming again.

### ***Can I plate over base metal or old jewelry pieces?***

Yes. The controller works great for plating metal objects or old jewelry. You can plate with nickel silver, silver and gold, just to name a few. Jewelry suppliers sell a variety of plating solutions with instructions detailing which anode is appropriate to use and how long to plate in the solution. Simply substitute the E3 Electroform controller in place of a plating rectifier when following the directions. You won't need to use conductive paint as a metal object is already conductive by itself.

### ***My piece isn't electroforming. I'm not sure if the controller is working.***

When the controller is plugged in, the green light should be on. The pulsing red light indicates that current is flowing to your object. If you do not see anything happening with the red light, touch the clips together while the power is on and observe the red light. If you see the red light, then the unit is working properly. Most of the time, the problem is a bad connection with the wire that is attached to the object. Reattach the wire, making sure the conductive paint and wire are touching, and that your object is properly sealed and painted. If the wire plates but not the object, then the wire is not in proper contact. The other problem may be the solution. Plating solutions must remain pristine and will not work as effectively if contaminated. Use fresh solution or strain the particles out, adding more brightener (acid) as needed to lower the ph.

### ***My piece has little spurs or sharp points on it.***

As your piece is electroforming, loose bits of copper may settle on the surface, causing bumps or sharp protrusions. To eliminate these spurs, follow these steps: 1. Keep the current at a low setting. 2. Strain the solution periodically and change the orientation of the object occasionally. 3. Use an anode bag. For more information, see our tutorial on how to make your own. Polypropylene is a good choice. Place the bag between the coil and your object. This will keep the stray particles from settling on your piece.

### ***Can I plate multiple objects at one time?***

Yes, but make sure they are similar in size and shape so that they electroform uniformly as the copper is distributed to each. Attach each object to its own wire, then twist all the wire ends together so they share a common stem. Branch the objects away from each other so they don't touch.

### ***Can I electroform polymer clay or wax?***

Yes. This is the best part about plating. As long as a coated object will hold up in water, it should work. We have had students who have successfully plated difficult objects like feathers, leather cord and even a fragile gecko skeleton. Polymer and wax make excellent cores for plating.