

Maintaining Copper Plating Solution

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A brand new bottle of acid copper plating solution will produce a bright shiny surface to the surface of an object you are plating. If you keep the conditions pristine with no contamination you will be able to maintain a shiny surface even after plating several objects. However, after a few plating sessions the pH levels will change resulting in a dull salmon color on the surface of the copper. This is especially true when you've plated organic items. The solution becomes contaminated quickly due to the changes in the pH caused by leaching of the organic material into the solution. Even with non-organic objects the solution will change due to repeated use. This simply happens after a period of time has passed. So the question is: How to remedy the solution if you are looking for a nice bright shiny copper finish? The most obvious and easy solution would be to buy new plating solution, which is what most manufactures of these products suggest. Most hobbyists who electroform pieces occasionally purchase new solutions to avoid the hassle of maintaining a plating bath. One can also boost the brightening power of an existing solution by adding a few large dropperfuls of brightener, which contains leveling and wetting agent components. The use of brightener often brings back the shiny surface desired. I would recommend adding brightener to an existing solution before replacing it. To summarize, first try brightener and then if that fails buy new solution.

Now for the more complicated answer: If you choose to maintain a plating bath, you move into territory that requires a lot of study and careful observation of what is happening chemically to your solution. You need to become well acquainted with the science of plating by understanding metallurgy and electrochemistry. Commercial plating companies either hire or have someone in house who "maintains" their solution because it is complicated. There are a few who have managed to DIY the process. One artist I know has kept the same solution without replacing it for over 10 years. She keeps meticulous records of what is being electroformed in the tank, length of time, temperature and what is added chemically to maintain the bath. She has a method that works for her, which is dependent on the size of her tank and pieces she produces. The same "recipe" will not work for everyone but rather must be customized for what you are plating, how often, etc. I might add that this artist is not looking for shiny copper; she burnishes the finished copper mechanically after plating it. It might be noted here that for electroforming you want a heavy layer of copper so that you will be able to burnish without the coating flaking off. Thin coatings are simply "plated" and they will not hold up for jewelry making processes like drilling or sanding.

There are a few standard things that can be done to re-use or maintain a solution if you choose to tackle the science of it all. There are many "recipes" online for copper electroforming or plating solutions. These will educate you on what is added in addition to copper sulfate to make the solution. Basically acids (sulfuric and hydrochloric) are added to copper sulfate and distilled water. An organic brightener is also used as mentioned above as a leveler. The artist I mention above periodically

strips (cleans) the solution by straining it through a carbon filter and then adds acid to bring it back to its original composition.

There are several texts used in jewelry schools by well-respected experts in the field that contain recipes for plating solutions. Even though documented in books for use by jewelers, extreme respect must be paid to these chemicals.

CAUTION: Working with acid is extremely dangerous and should not be attempted by the casual hobbyist. There are many safety precautions and warnings you must be educated about before attempting to make your own solutions. In good conscience I do not recommend this for the demographics I teach. I am aware that art jewelry makers often do not have labs or professional safety gear that is familiar to them. I am simply trying to reveal the nature of copper plating solutions used for electroforming by explaining how they are made. A splash of straight acid or ingestion could be catastrophic to life or body.

In addition to the chemistry and pH level of the plating solution, electrical current levels have an affect on the surface structure of the copper. If the current is too high you get a brown crust that flakes off. The aim is for a current that delivers a smooth shiny penny look. This can be tricky to figure out if your solution is also interfering so trial and error is needed to make adjustments for a desired result. Other conditions such as the room temperature (warm is better) and the shape of the object factor in on how the copper is deposited. The best way to learn is by doing. Electroforming is in theory very easy, but the chemistry of maintaining solutions is very complicated. I have called many labs and jewelry suppliers on behalf of students or customers about maintaining the solutions for repeated use. I get the same advice every time in that new solution must be purchased unless the customer plans on setting up a commercial lab. Even though our E3 Eform controller is different than the rectifiers traditionally used, the solutions and the physics behind the process are all the same.

This is an intensive book written in 1905 that explains the process in great detail and is available for free in the national archives.

Electro-plating, with numerous engravings and diagrams by Paul N. Hasluck

<https://archive.org/details/electroplatingwi00hasl>

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Rev. 03/05/2014