A Method for Patinating Copper and its Alloys with Ammonia and Walnut

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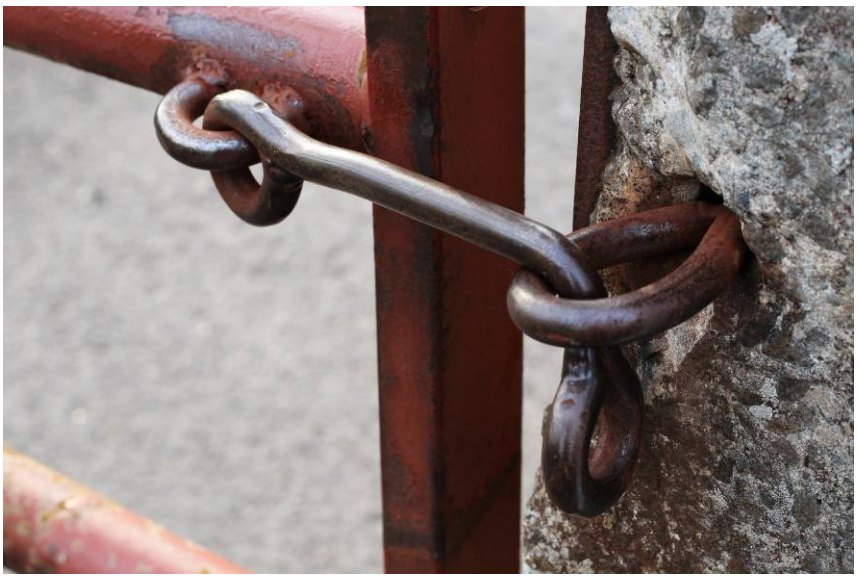
Patination of metals occurs naturally over time, when metals react with their surroundings to form new compounds on their surfaces of a different colour. Take a lead cathedral roof, for example. Lead is naturally bright and silvery, but it soon reacts with compounds in the air to form a grey lead carbonate and eventually lead sulphate layers, which afford it protection from further corrosion. On steel, we see red-brown rust, and on copper and copper alloys such as brass and bronze, we see compounds ranging from dark brown through to bright green. In sculpture particularly, metals are often artificially patinated to give them a desired colour.

There is something special about patinated metal. We see the metal's capability to achieve a surface appearance quite different to that of it in its pure form. Take the combination of natural weathering and thousands of hands greasy from picnics and sun cream on a decades-old steel gate catch on a well used right of way, rich dark brown and worn smooth; or the almost fluorescent green on a Henry Moore bronze seen only when the sun catches it in the right place. These colours are far from those of the raw metal microns below the surface, yet they are derived directly from it through ordinary but unique circumstances. The weather, pollution, dirty fingerprints, or a founder's recipe developed over years of trial and error with different chemical combinations all contribute to a specific destiny. Recreating these colours and textures is an art, and one can only ever expect to reach a close approximation. That is why patinas are special. They have often formed over decades and can never quite be reproduced in exactly the same way. Altering or removing them should not be undertaken lightly.



In the conservation and restoration of metals, it is sometimes necessary to patinate new components or repaired areas to match an existing natural or artificial patina, and there are various ways of doing it involving different chemicals, or by heating the metal, or both. One technique which was taught to me for copper alloys is to fume the item in a mixture of ammonia and walnut shavings. It's a classic method that is spoken of in craft circles but not really written down anywhere.

The idea is that the two are mixed and the fumes given off will colour copper, brass and bronze to give it a patina akin to one which has formed naturally over many years in just a few hours, depending on how you wish to colour the metal. The high tannin content of walnut, and oak too, mixed with ammonia serve to react with the bright metal almost straight away. Remember, the patina is a new compound on the metal surface, made as a result of a reaction between the metal and surrounding compounds. Rust, for example, is a compound made from the reaction between the iron and oxygen.

Here is what to do.

1. I started with bright pieces of brass, copper and bronze. I achieved this with fine wet and dry paper. However the surface doesn't have to be smooth. In fact, more textured surfaces often take a better patina. Make sure the metal is clean. If it has greasy fingerprints or other matter shielding the surface, you will not get even results, if those are what you are seeking.

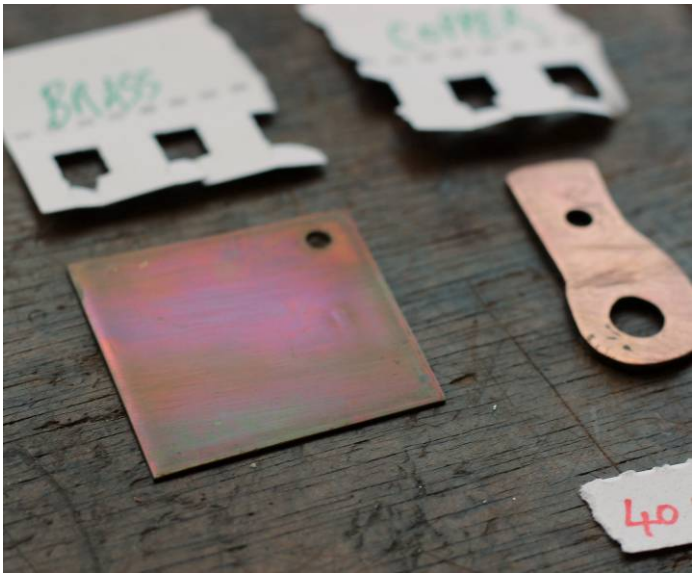
2. Get a jar of suitable size for your piece, and rig it up with hanging wires in the lid. If your piece has no holes to hang from, then use a container with some means of raising it above the wood and ammonia. It is the fumes which do the work, and you do not wish to let the piece touch the solution, nor do you want any surfaces to be obscured from the fumes.

3. With a plane, obtain some walnut shavings. A brief razz in a liquidiser will make them a bit smaller. The ammonia solution I use is pictured below. The liquid is harmful and the fumes very strong (they will make any cuts you have sting), so take suitable precautions and work in a ventilated place. Put the shavings into the jar, an inch or so deep and just cover them with the ammonia.

4. Put the lid on the jar with the piece hanging or suspended within. You will see the surface start to change colour almost immediately, because clean bare metal is eager to react with things. You can see this in the picture, taken just a few minutes after the pieces were put in.

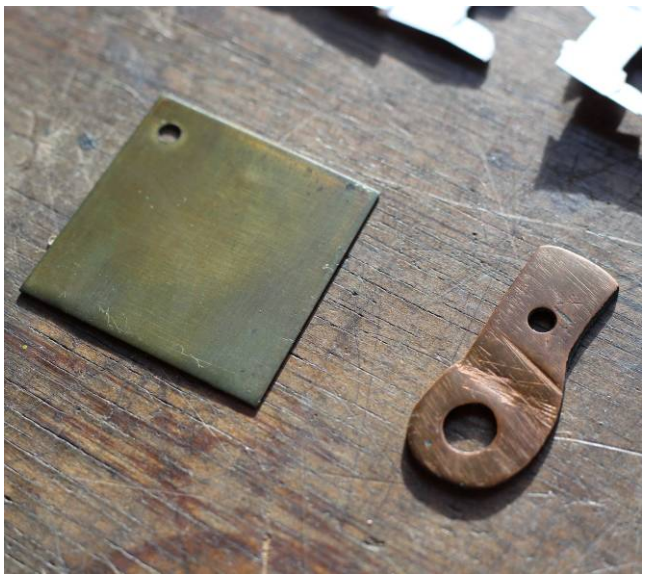
5. After ten minutes, here are the results:

6. After forty minutes, on this occasion with the brass, we see pinks, purples and the beginnings of blue. This is because the film that has formed on the surface of the metal is of such a thickness that wavelength interference occurs between light reflected off it and off the brass surface just below. As the patina layer gets thicker, the whole colour spectrum can sometimes be seen before this effect vanishes as it becomes opaque. This fuming method is not what I'd typically use to achieve more vivid colours, because it is mainly used for dulling down bright metal. Note that the different metals react in different ways, at different rates.



7. After 160 minutes, the rate of change has slowed and the colours have settled towards those you might expect to see on naturally patinated metals of these types.

8. Over two hours later, the samples have darkened further:



9. Left overnight, we really see a change on the brass, with clear beginnings of green-blue copper corrosion products. In the second picture I have added a layer of clear microcrystalline wax to the surfaces. This enhances the colour and beauty of patinated metal, like water on a rock. However, powdery patinas created in a relatively short time are very delicate and much of the blue rubbed off when I applied the wax to reveal a very dark surface underneath.

This, as with most methods of colouring metal is somewhat by trial and error. You can never be sure of the results and it's hard to achieve exactly the same result twice. Sometimes it is worth trying different iterations of patina application; try rubbing the surface back a little with the scouring side of a sponge in between doses to give a more varied or worn appearance, or try heating up the metal with a clean blue flame to see how heat alters it.

In my profession, I am often asked to clean up a piece of brassware that has become caked in Brasso after someone has tired of doing a thorough job of cleaning it all off. While some objects are meant to be bright and shiny, so often I think how lovely an object would be if it had been allowed to settle to a natural appearance over the course of its life.

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