

Copper plating Aluminum surfaces

This procedure will cover the process of chemically bonding copper metal to an aluminum surface. Uses for this procedure can include, but not limited to, attaching wires to an aluminum electrostatic shield, aluminum heat sink, the aluminum element (driven element) of a Yagi antenna, etc. (even artistic use)

Materials:

Chemicals:

Copper Sulfate – pentahydrate crystals used in swimming pools [*order online*]

Ferric Chloride (Fe Cl_3) solution – same solution used to etch Printed Circuit Boards (PCB) [*order online*]

distilled water, *do not use tap water*

table salt – used as a rosin flux for this process

Tools: (All tools contacting the solutions must be non-metallic. No exceptions!)

leak-proof containers – to hold plating solutions

plastic teaspoons

paper towels

cotton swabs – for small areas (most pharmacies and large retail stores carry this)

sponges (or cotton balls) and plastic clothes pins– for large areas (see image below)

eye dropper – used with the ferric chloride solution

syringe used with baby medicine – obtainable at most pharmacies, marked in course and/or fine increments. Buy 2 of these if you cannot get an eye dropper, one for the copper sulfate solution and one for the ferric chloride solution.

steel wool, Grade '0000' (fine) – to polish the plated copper surface. The steel wool is not part of the plating process. It can be found at most hardware (DIY) stores in the paint area.

Swabs and sponges will need to be ‘one time’ usage. Do not reuse either one as you cannot guarantee the old swab / sponge / cotton ball will be free of contamination.

Creating base solution:

In a leak-proof container, pour in 250 ml of distilled water. Using the plastic spoon, add 3 heaping teaspoons plus half a teaspoon of copper sulfate crystals. You will be making a saturated solution of copper sulfate. Seal and shake the container to dissolve the crystals. As the solution reaches saturation, it will take longer and longer for the crystals to completely dissolve. The process can take up to 2 days to complete at room temperature.

Mixing the final plating solution (this solution can be saved for future use):

For a small batch:

In a separate leak-proof container, add 7 ml of copper sulfate base solution. Add 1 drop (and only 1 drop) of ferric chloride solution and mix well with a clean plastic spoon. You might want to practice making a single drop.

For a large batch:

In a separate leak-proof container, add 135 ml of the copper sulfate base solution. Add 1.25 ml of ferric chloride solution and mix well with a clean plastic spoon.

Process:

1. Pour some table salt into a small container or onto a paper/plastic plate.
2. Make sure the aluminum surface is clean of paint, anodizing finish or dirt / oil contamination. The intended plating area **must** be bare aluminum metal.
3. For a small area, use a cotton swab. For a large area, use a sponge. Going forward, I will refer the swab/sponge as the **applicator**. Dip the applicator into the plating solution and saturate it with solution.
4. Dip the applicator into the table salt and then rub the applicator on the aluminum surface vigorously. The salt will act like the rosin flux used in PCB soldering. You will notice some bubbling with a temperature rise.
5. Remove the residue with a clean paper towel.

6. Using a new applicator, dip the applicator into the plating solution and directly rub the aluminum surface. **No salt!** You will notice the copper readily plates the aluminum surface.
7. Wipe the surface, repeat many times the dipping and rubbing of the plating solution on the aluminum surface *using a new applicator each time*.
8. Wipe dry the new copper surface with a new paper towel. Burnish the copper with the steel wool.

Now you are ready for soldering a wire or component to the copper plated aluminum surface.

Notes:

The smoother the aluminum surface, the better your results will be with plating copper onto the aluminum.

Depending on the thickness of the aluminum, you will need a higher wattage soldering iron (*as compared to soldering a PCB*) since the aluminum conducts the heat away quickly. Thin aluminum (*like a soda can*) will need a least a 50 watt iron. Thick aluminum could need a propane torch.

Support the thicker aluminum with a vise or clamp as it will get very hot during soldering. Be mindful of the environment during the soldering process.

While rubbing the aluminum or copper surface with steel wool, do this over a plastic lined trash can. The steel wool will shed small pieces of steel while you burnish the surface.

Dispose of the used materials into the plastic lined trash can.

Pros and Cons:

Electroplating will cover very large areas (even the object itself) but could require a masking surface to limit where the plating occurs. Also, a battery is required.

This documented method covers small areas and no battery is needed. Also, plating very large areas can be time consuming.

Both methods will require preparing the surface for plating with copper.