

# ELECTROLYTIC ETCHING w/ Cupric Nitrate

## SAFETY GEAR:

1. Rubber gloves
2. Face shield
3. Apron
4. Ventilation



## THE CHEMISTRY

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page 31. Ben Dory. *Tech Talk:*  
*E-Etching Copper and Silver with*  
*Copper Nitrate*

The Chemistry

Copper plate to be etched (+) Cathode plate or grid (-)

$\text{Cu}(\text{NO}_3)_2$   
Copper nitrate

$(\text{NO}_3)_2^-$   
Negatively charged nitrate ion

$\text{Cu}^{2+}$   
Positively charged copper ion

The process begins with copper nitrate  $\text{Cu}(\text{NO}_3)_2$  in solution with  $\text{H}_2\text{O}$

When a current runs through each lead:

The charge at each electrode separates the  $\text{Cu}(\text{NO}_3)_2$  into oppositely charged ions

- 1  $(\text{NO}_3)_2^-$  is attracted to the negatively charged cathode grid, plating the surface
- 2  $\text{Cu}^{2+}$  is attracted to the positively charged exposed areas of the copper plate
- 3  $(\text{NO}_3)_2^-$  oxidizes the exposed copper, releasing  $\text{Cu}^{2+}$  from the plate and into the solution
- 4  $\text{Cu}^{2+}$  bonds with the free  $(\text{NO}_3)_2^-$  creating new  $\text{Cu}(\text{NO}_3)_2$

The process repeats as long as a current is present.

# ETCHING STEPS

## PREPARE YOUR METAL: Copper, Silver, Brass, Bronze

1. Clean your metal very well, leaving no residue or fingerprints.
2. Apply a resist to areas that should not be etched away.  
**Resist options:** Contact paper, vinyl, tape, paint pen (allow to dry), nail polish, sharpie marker, PNP paper, asphaltum. \*Resists are not all equal in strength.
3. Connect your metal to the clean side of the **Anode Hanging Wire**, with duct tape. Your metal **MUST MAKE CONTACT** directly with the hanging wire.
4. **Cover anything that is not to be etched, including exposed areas of the anode wire.** Any exposed metal will be etched!

## ETCHING:

1. **Turn on Ventilation**
2. Put on **Face Shield, Rubber gloves**, (apron suggested)
3. **Make sure that the rectifier is turned off.**
4. Attach your Anode Hanging Wire to the **POSITIVE** copper bar.
  - a. Pattern should be facing the cathode (steel mesh).
  - b. Do not overlap your object with someone else's.
5. Connect the **Positive Lead** to the end of the Copper Bar, marked Positive
6. Connect the **Negative Lead** to the end of the Copper Bar marked Negative
7. Place the lid back onto the container.
8. Switch the appropriate rectifier to ON. **(Do not adjust the voltage)**  
If there is no power, check that the extension cord on the cart is turned on.
9. Set a timer for **15 minutes**. Check Progress.
  - a. Turn the rectifier off, then check etching progress.
  - b. If deeper etch is desired, put back and turn the rectifier on.
10. If etch depth is achieved, submerge into the **NEUTRALIZING bath**.  
**Do NOT place it back into the Etching Bath after this step!**
11. Lift the piece out of the neutralizing bath, and allow as much to drip off as possible. Bring to the sink and clean as necessary for your resist material.
12. Place the lid back onto the etching bath.
13. **CLEAN UP ALL DRIPS** left on the floor or the cart. Wipe down the face shield.