

Etching Aluminium and Zinc with Copper Sulphate

Introduction

Etching aluminium or zinc in a solution of copper sulphate is not a new idea. In recent years the movement in printmaking to improve traditional practices and introduce safer alternatives has led to the revival of this little known etching technique.

Traditional solutions of nitric or sulphuric acid present obvious dangers to the etcher. Copper sulphate therefore has great advantages in terms of health and safety and ease of use. There is no longer the need for expensive and cumbersome fume extraction systems and the solution will not burn holes in the etcher or their clothing.



Health and Safety

Although much safer to use than acids, do take sensible precautions:

- Copper sulphate is classed as an irritant so take care to avoid unnecessary contact with skin, especially when it is in its most concentrated crystallised/dry form.
- Wear rubber gloves and wash hands thoroughly with soap and water.
- Copper sulphate is poisonous so always wash hands after using it to avoid ingestion.
- Use a dust mask to avoid breathing it in whilst handling it in its crystallised/dry form.
- Wear protective eyewear and take great care not to splash the solution.
- Covering the etching bath with a lid will greatly reduce the chance of vapours entering the atmosphere. However, be aware that this will allow hydrogen gas to concentrate which could create a risk of explosion. Work in a well ventilated area and remove lid periodically to disperse gas.

Degreasing the plate



As with traditional etching, plates must first be degreased to achieve an even bite. This can be done in various ways.

For zinc:

- Use 5 drops of soy sauce and a sponge. Rinse with water.
- Use a detergent. Rinse with water.
- Use vinegar and chalk powder. Rinse with water.

For aluminium:

- Use a fine grit (600-1200) wet and dry paper. Sand the metal in the sink with a little water. Rinse with water when complete. Sanding the aluminium is particularly useful when using acrylic grounds.

To check that the metal has been fully degreased watch how the water sits on the degreased metal but runs off any remaining greasy areas. Dry the metal with newspaper or a paper towel and take care not to handle the degreased area.

Grounds

Traditional and acrylic grounds can be used when etching with copper sulphate. However, the salinity of the etching solution tends to break through the acrylic sooner than traditional wax based etching grounds.

It is advised therefore that a neat application of Klear floor polish be used for hard ground and that after the drawing has been made, the acrylic grounds are allowed to heat cure in the drying cabinet for 30 - 60 mins. Allowing the plate to heat cure is also advised when working with acrylic stop out and acrylic aquatint. *Acrylic lift ground cannot be used at all.*

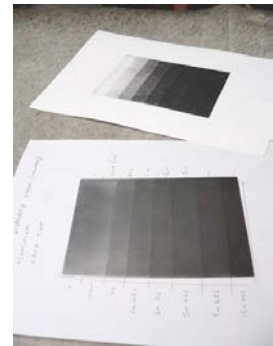
Backing the plate

Before an image can be etched in to the front of the metal, it is important to protect the back from the effects of the etching solution. Failure to do so will result in an uneven plate and an etching solution that has been needlessly exhausted. To back a plate:

- Apply parcel tape to the reverse and trim the over lapping tape with a sharp knife or scissors. *Make sure that the tape is removed before printing.*
- Paint the reverse with acrylic paint or acrylic grounds.

Test plate

Before beginning to etch a plate, it is advisable to either make or consult a test plate. This will give a reasonable estimation of the etching time in relation to the depth of bite intended. It can also be used to compare a plate in progress with one that has already been printed. *This is especially important when the solution has already been used because etching times are lengthened as the strength of the solution diminishes.*



Etching



When aluminium or zinc comes into contact with a copper sulphate solution, an electro-chemical reaction occurs. The result of this reaction is that the metal from the plate enters the solution and the metal from the solution solidifies to form a reddish by-product.

It is recommended that in addition to the etching bath, a water bath also be used to stop the etching process and to keep the by-product from running down the sink.

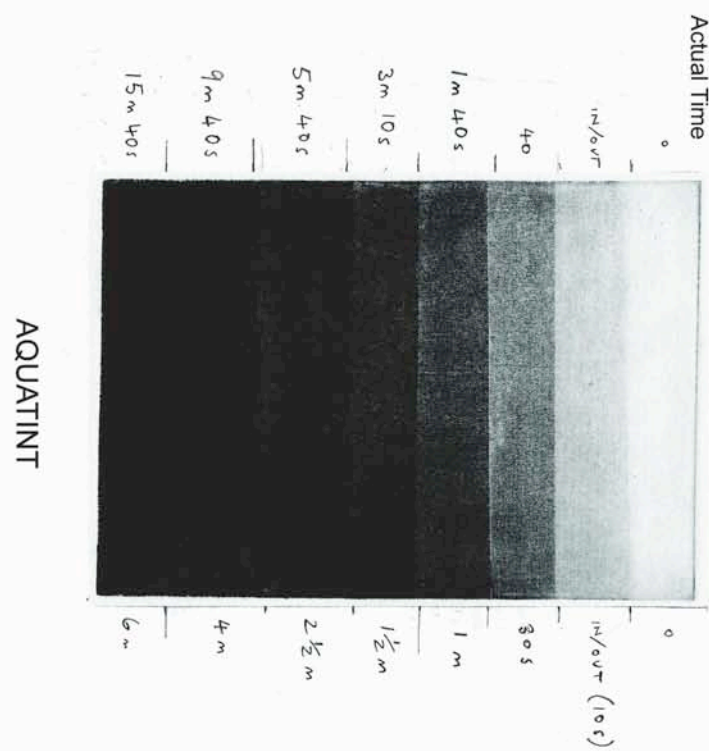
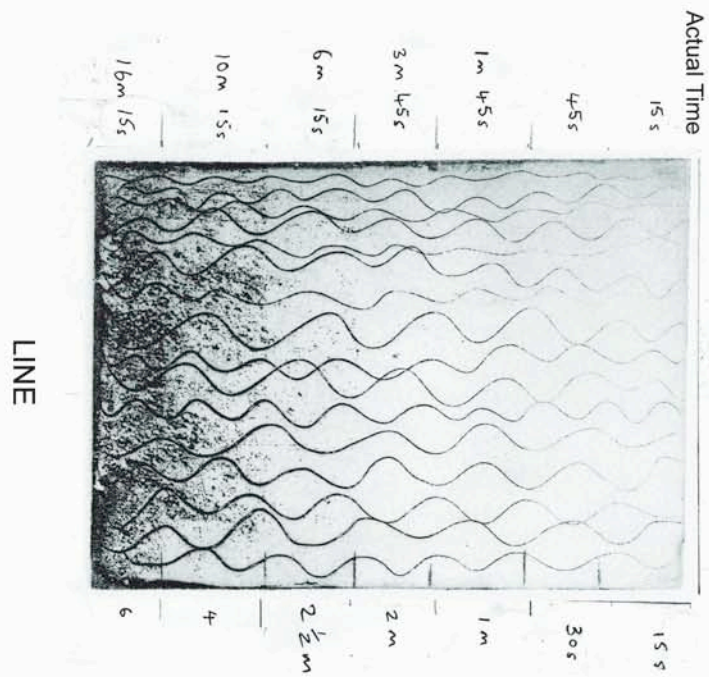
Because of the way that Saline Sulphate Solution gradually weakens as it etches, times will vary.

This means that the etching process cannot be exactly predicted by timings unless a new solution is used every etch. Timings are however still useful as a guide, but the etcher must rely on his or her own judgment to compare the plate in progress to the test plate. It is only by doing this that an accurate estimation of tone can be made.

Although both aluminium and zinc can be etched with the same solution it is not recommended that the same bath be used for both.

Strip Tests for Aluminium Plates

Saline Sulphate Etching Solution (K. Howard)



Please note:
These tests are for guidance only. They indicate etching times for fresh solutions only. To estimate timings for used etching solution refer to the actual plates.

To etch either aluminium or zinc the process is the same:

1. Gently lower the metal face up into the solution, cover the etching tray and begin timing.
2. Leave the etching solution to do its work, allowing the copper oxide to float off by its self. Do not be tempted to over brush or feather it away as this can cause flecks of copper to form in the plate.
3. When the time is up, remove the plate from the solution and immerse in the water tray. If necessary brush the plate with a soft brush under running water to remove the copper oxide.
4. Take care to retain the reddish by product.



Aluminium or Zinc?

Aluminium:

Aluminium sheet has the great advantage of being cheap to buy and easy to work. Its biggest attraction however is the fact that it has a natural grain. This means that there is no need to apply an aquatint. An open bite will produce a range of subtle tones depending on how long it is allowed to etch.

However, this advantage is also its drawback. Aluminium has quite a distinctive plate tone and is not ideally suited to very fine linear work. The grain in the metal can also sometimes be seen to run one way due to the way that the sheets are milled.

Zinc:

For quality and price, zinc plate is second only to copper. An aquatint will need to be applied for tonal work and very fine linear work is possible.

Disposal

WARNING: WEAR RUBBER GLOVES AND EYE PROTECTION WHEN HANDLING COPPER SULPHATE SOLUTION

As the copper is gradually depleted the etching solution will become paler and weaker. Eventually the solution will lose its colour completely. This is a good indication that the solution has been exhausted and means that the copper has completely solidified. The solution is now either aluminium or zinc sulphate solution. Because this solution is slightly more acidic than the original avoid direct contact with skin.

To dispose of this solution:

- Separate the liquid from the reddish copper by-product by pouring off.
- The liquid should then be neutralised by adding sodium carbonate (washing soda). To do this mix 1 tsp of sodium carbonate with 5 litres of water and add this to the spent etching solution.
- This liquid should then be further diluted and the taps left running after it has been put down the sink.
- The reddish by-product should be stored and disposed of as hazardous waste.
- Alternatively it can be restored to blue copper sulphate solution by adding a solution of sodium bisulphate (2 tsp pool acid dissolved in 5 litres of water) and left to stand for a few days, stirring occasionally.
- The bluish liquid that results can be poured off and used in the next etching solution.

For Further Information

Cedric Green FRSA – Green Prints, a handbook on some new methods for safe intaglio etching and metal plate printmaking, published by Ecotech Design. (Available in SPW library).

Keith Howard – The Contemporary Printmaker, Intaglio-Type and Acrylic Resist Etching, published by Write-Cross Press: New York. (Available in SPW library).

Henrik Boegh - Handbook of Non-Toxic Intaglio, The Printmakers Experimentarium, ISBN 87-987757-2-3

www.intaglioprintmaker.com

www.greenart.info/

www.artbag.dk

www.printstudio.org.au