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Salt Sulphate Etch

To etch zinc, aluminum, mild steel

Mix 100g (1/2 cup) copper sulphate crystals
with 100g (1/2 cup cooking salt
dissolve in 1 liter (4.22 cups) of warm water

Environmental Safety

Although copper sulfate is a comparatively safe chemical for etching, it is considered a marine pollutant, and if present in rivers or lakes it can kill fish. It is crucial that solutions containing this salt are never poured down a drain without following the above instructions. Only a spent solution that is lacking the green coloration (which indicates the presence of copper ions) and that has been neutralized with sodium carbonate is safe to be discarded.

(multiply or reduce amounts while retaining correct ratios)

Etching Mild Steel
Steel plates need to be purchased as cold rolled mild steel; tempered or hot rolled varieties of steel plate are not suitable for etching. Plates usually have a coating of grease which needs to be removed before any creative work with resists can commence.

Once a plate has been etched to the required depth and rinsed it is crucial to blot off any remaining dampness with paper towels and then speed dry plates otherwise the steel surface will quickly rust.

Refreshing a Saline Sulfate Solution

Simply make up a further batch of a copper sulfate or sodium chloride mixture in a bucket and add just enough hot water to dissolve. Add this refreshing mixture to the etching tank; stir, and the bath will be reactivated. This procedure can be repeated three or four times, and the usable life of the bath can thus be extended from several weeks to up to half a year. As time goes on more solids will build up in this long-lasting bath and can eventually affect the cleanness of the etch. Etching plates on a slatted grid that elevates them above the salt deposits can remedy this unwanted effect.

When a spent copper sulfate based etching solution self-regenerates; this is indicated by the return of the green coloring to a solution that has been left unattended for several weeks (regular stirring and the addition of hot water aids this process). The solution has regained dissolved copper ions and an electric charge, and can be used for etching once again.

Recycling, Neutralization and Disposal The process comes full circle. The very action that makes the Saline Sulfate Etch work so wonderfully as an etching bath - the depletion of copper ions - also facilitates its recycling. Concentrated copper ions are regarded as an aquatic pollutant and must not be allowed to get into waste water. As more and more copper ions react with the metal plate during etching these are converted into their inert cousins: solid copper atoms. If a sufficient quantity of metal is etched, eventually all copper ions are removed. A fully depleted bath is recognizable by two features: (i) the solution no longer corrodes metal and (ii) the solution is no longer green, it is clear.

Spent solution easily separates into a clear liquid and solid particles.

METHOD

Prepare a spent etching bath for recycling as follows:

1 Add hot water to the bath to re-dissolve any solid sulfate particles and stir.
2 Add a pile of metal off-cuts - zinc, steel or aluminum - to the tray
3 Leave to act overnight.
4 On the following day, drain off the liquid into a bucket and add sodium carbonate (about two or three cups per bucket).
5 Once fizzing stops the liquid can be discarded.
6 The remaining solids can now be left to dry out. Keep in labeled, sealed containers and then treat as dry waste.

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Credits to author Nik Semenoff waterless lithography