Stop using Ferric Chloride etchant! (A better etching solution.)

by **The Real Elliot** on December 12, 2006

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Intro: Stop using Ferric Chloride etchant! (A better etching solution.)

Ferric chloride is a traditional home-use circuit board etchant. It's easy enough to come by, and the Ferric by itself is no big environmental problem. However, once you've etched a board with it, you're left with a solution with a bunch of copper chloride in it. This dissolved copper **is** an environmental problem, and you can't just pour it down the drain (legally) -- you're supposed to take it to a hazardous waste facility. (For instance: How to Dispose of Ferric Chloride in this FAQ.)

Wouldn't it be nice if there were an etchant that you could re-use indefinitely so that you don't have to worry about disposing of the copper, and that could be made in lifetime supply for like $10.00 with ingredients bought at hardware and drugstores? (And it's prettier too.)

I got seven words for you: Copper Chloride in Aqueous Hydrochloric Acid Solution! (Exclamation point!)

But how're you going to get CCiAHAS? Conveniently enough, by starting out with a simple two-ingredient starter etchant, and doing a bunch of etching.

Step 1: Ingredients: The Starter Etchant

For the starter etchant itself, you only need two ingredients: hydrochloric acid and hydrogen peroxide.

(OK, actually three. But the third one's copper. See the chemistry section for an explanation.)

Hydrochloric (muriatic acid, "pool acid", etc.) is available at a hardware store. The acid I got is 31.45% (or 10M) and should run around $5 per gallon. Which is more than you'll ever, ever need.

The peroxide is normal 3% for mouthwash or cleaning cuts, and can be bought at a drug store for $2-3 for a big bottle.

You'll also need a non-metallic container that fits your PCB and two standardized measuring cups.

As long as you're in the hardware store, pick up some acetone if you don't already have some. It's useful for removing the etch resist. (That's for another instructable.)

Image Notes

1. Not part of etchant, but needed for removing the etch-resist.

Step 2: Put the Lime in the Coconut...

Measure out two quantities of hydrogen peroxide and pour it into your non-metalic container.

Measure out one quantity of hydrochloric acid and pour it in. ("Do like you oughta, add acid to water" to minimize the chance of an out-of-control exothermic reaction.)

Be careful with the acid. This stuff (at 10 molar) is strong. Mine fumed a bit when I took the cap off. Don't breathe it directly, and be sure you've opened the kitchen window.

The starter etchant you've just made, on the other hand, is not so bad -- around 3M HCl with a medium-strong oxidizer. I find it doesn't fume much at room temperature when I'm re-using a batch.

That said, you've got to be very careful to keep it away from metal -- especially your stainless-steel kitchen sink. It'll eat the stainless coating right off. Keep plenty of water flowing at all times when you've got any of this (even a drop) near the sink.

Image Notes
1. No joke. This stuff is STRONG!

Step 3: Add PCB and you're Etching.

Toss the PCB into the solution and it'll take off.

If this is the first time you're using this batch of solution (and I presume it is), it'll etch super-fast. This small board took only 2 minutes. Yikes!

Since I use a deep container, I tend to swirl it around as it etches. This stuff is so active, though, that I'm not sure it's necessary.

Keep the window open for ventilation because the starter solution gives off a little chlorine gas. (The end-etchant gives off much, much less.)

Also, note how the etchant gets greener over time as it eats away the copper. This is good news.

What's happening is that you're dissolving the copper from the board and turning it into cupric chloride. In the long-run, the cupric chloride will be doing most of the etching (instead of requiring disposal). For now, just watch your solution turn light green. Next time you use it, the color will deepen.

Image Notes
1. Almost done. Only a few traces of copper left.

Step 4: Chemistry Break

(Note: I'm an economist, not a chemist. Please leave a comment if you've got any corrections and/or additions to this stuff!)

I stumbled on this idea when I saw this website: Etching with Air Regenerated Acid Cupric Chloride by Adam Sechelle. Cupric chloride can be re-used indefinately by topping up the acid levels and adding oxygen (bubbled in from the atmosphere). Sounds cheap and environmentally friendly to boot.

The website's got a lot of good chemistry info on cupric chloride etching. His data on etching speeds is great, and his simple titration procedure for maintaining the acidity of the solution is pretty nice.

To make the cupric chloride solution, he dissolves a bunch of copper wire in hydrochloric acid, and mentions maybe using hydrogen peroxide to speed up the oxidation, but doesn't go into detail.

Which got me thinking. You didn't have any cupric chloride yet, but you can make it by dissolving copper. Dissolving copper is the name of the etching game. So we can make one etchant that makes another etchant that's infinitely re-chargeable. Elegant.

Turns out that hydrochloric/peroxide is a common home-brew etchant (and I've re-re-invented the wheel, again) but I guess that people got so used to throwing away their "spent" etchant that they don't think about re-using it. The whole point of this instructable is that you don't throw it away, but use the dissolved copper forevermore as your long-run etchant.

Here's what's going on chemically:

Before there's much copper dissolved in the solution, Cu + 2 HCl + H2O2 -> CuCl2+ 2H2O is the dominant net reaction. That is, the extra oxygen in solution from the peroxide is oxidizing the copper metal, in presence of the acid, to make copper (II) chloride. That's our starter etchant. The resulting CuCl2 shoud be a nice emerald green color.

After you've dissolved a lot of copper into the solution, and used up all the peroxide, the copper chloride does most of the etching for you: CuCl2 + Cu -> 2 CuCl. That's the end etchant.

Eventually you etch so much that you convert all the CuCl2 into CuCl, which doesn't dissolve copper (and is a yucky brown color). As long as you've got enough acid in the solution, you can simply add more oxygen to re-oxidize the copper(I), making more copper(II) chloride and water: 2 CuCl + 2 HCl + O -> 2 CuCl2 + H2O. And then you can etch again.

Bottom Line:

Two things to maintain: CuCl2 levels and acid levels.

CuCl2: After all the peroxide is used up, and the solution starts turning brownish, you'll have to add oxygen to regenerate the solution again: toss in a few more capfuls of peroxide or bubble air through the solution or swirl it around vigorously, or just pour it into an open container and wait. It's easy to tell when you're ready to etch again, because the solution turns green.

It's also impossible to add too much oxygen by adding air, so bubble/swirl to your heart's content. If you're using peroxide to add oxygen, be sparing -- a little goes a long way, and it's mostly water so you're diluting your etchant by adding it.

Acid: Note that HCl is being consumed in the starter etchant and the regeneration reactions. So we're going to have to add a bit more acid as time goes by. If you notice that it's harder to re-green your brown etchant, it's probably time to start thinking acid.

I've tried the titration described on Adam's site a couple times, and it's pretty easy but requires an accurate scale and pure lye (back to the hardware store...). It's easier to just toss in a capful of acid every few batches of boards, which seems to do the trick for me.

Step 5: Save the etchant for next round. You're done.

Once you're done etching, pour the etchant back into your storage bottle, rinse off the board, flux, drill, populate, and solder.

Some final notes here:

1) You can make quite a bit of this stuff very easily, and since you're re-using it, there's no real reason to skimp; put plenty of etchant in your "tank." When you use too little FeCl etchant, for instance, it can get saturated with copper and slow down which can result in long etching times and pitting or undercutting or worse. When I'm etching a board with copper chloride, I'll pour a couple extra inches of solution into the container. It's reusable anyway, and the extra exposure to oxygen just regenerates it. Live large.

2) Don't make too much. As you keep re-using the solution, you're going to need to add a little more acid and a little more peroxide every once in a while. If you've got a 750 milliliter container, start out with less than 500 milliliters of solution. Give yourself some room to grow over time. After all, the main point is to avoid having to dispose the copper in spent etchant.

3) If you've got too much volume of etchant (it will happen eventually) you can evaporate out the extra water by putting it in a shallow (non-metallic) pan or beaker or whatever and letting it sit for a while. This concentrates the copper in solution, giving you a stronger etchant. It'll also re-oxidize some of the copper for you, a bonus. Remember when you're adding the peroxide that you're actually adding 97% water.

4) The linked website suggests that the acid levels in the etchant are not critical as long as there's some acid in solution to do the CuCl2 regeneration. The amount of CuCl2 (vs CuCl) present is easy to diagnose by the color of the solution. Add oxygen to re-green, and add a bit of acid if that's not working. Worst case is that you may have to wait a few more minutes per etch with a sub-optimal bath. This isn't rocket surgery.

5) I do have an aquarium pump ($6 at fish store) that I've used to re-activate my solution. Sometimes I'd leave it on for a few hours while I'm at work if I've been etching a lot. But lately I've been lazy/impatient and tossed in a couple capfuls of peroxide. Both seem to work just fine.

6) The environmental benefit of etching with copper over ferric lies mostly in not having to dispose of the copper that comes off your boards every few times you etch. When and if you do end up with too much copper etchant, please treat it like the hazardous waste that it is -- look into your local hazardous chemical disposal options. There's no getting around the fact that copper salts are (for instance) poisonous to fish even in very dilute concentrations.

Image Notes
1. Pretty green color means it's working. This is just from the one etching session.
2. Really deep green is what you get after re-using the same 500 ml of etchant for months. Note: You probably shouldn't store etchant in food containers. I've since labelled this container "poisonous" and "etchant." Keep out of reach of children.

Step 6: Alternative (overly-complex) Method: Make Cupric Chloride Faster.

When I originally started trying to make Cupric Chloride etchant, I hadn't thought of just using the regular procedure of etching to get there. So I deliberately dissolved a bunch of copper from a wire.

I don't think it's a particularly good idea, but here's how I got to the end-stage etchant faster.

I mixed the acid/peroxide 1:1 instead of 1:2. The idea was to have a bunch of acid leftover for later regeneration. I don't think it's a good idea, and I wouldn't do it again. 1:2 is probably better, and results in more copper in solution faster with less fuming.

To control the fumes, I used the patent-pending (just kidding) Two-Pint-Glass Fume-Containment-Apparatus. Pour in the peroxide, add the copper, then put one glass on top of the other. Pour the acid down through a small gap between the two glasses and re-seal. Voila. No fumes. (See video. I think I did it with water as an example.)

I also kick-started the formation of cupric chloride by first making copper oxide, which turns to cupric chloride just in the presence of acid alone. This isn't necessary at all, but it was fun. Heat up a coil of copper wire on the stove to red-hot and you get a flakey coating of copper oxide.

Otherwise, it's basically the previous procedure, so just see the pics for notes. I wouldn't recommend it anyway. The less copper you dissolve, the less copper needs to be (eventually?) disposed of, and the acid/peroxide etchant is plenty easy to use.

The two-cup technique is cute. I still recommend it.

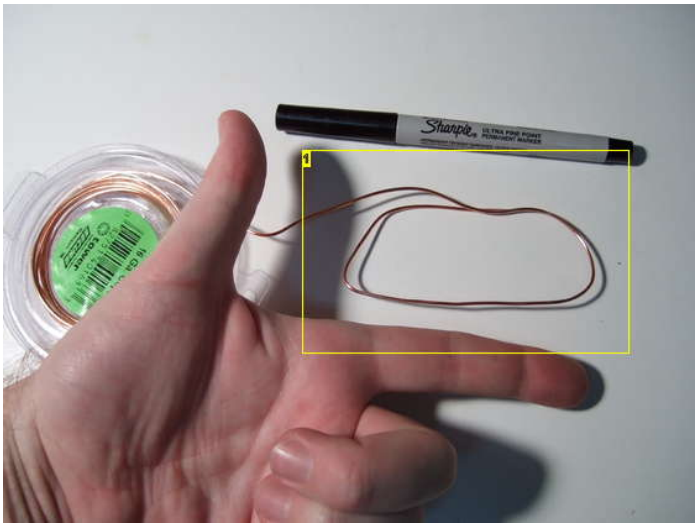
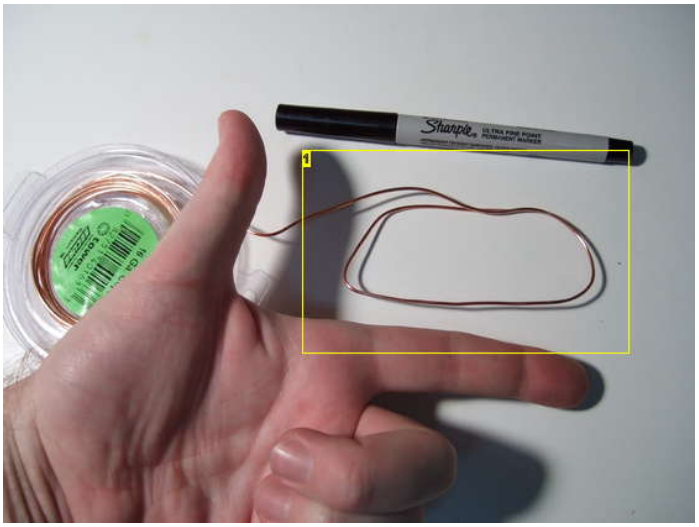


Image Notes
1. About this much wire. Didn't end up all dissolving anyway.



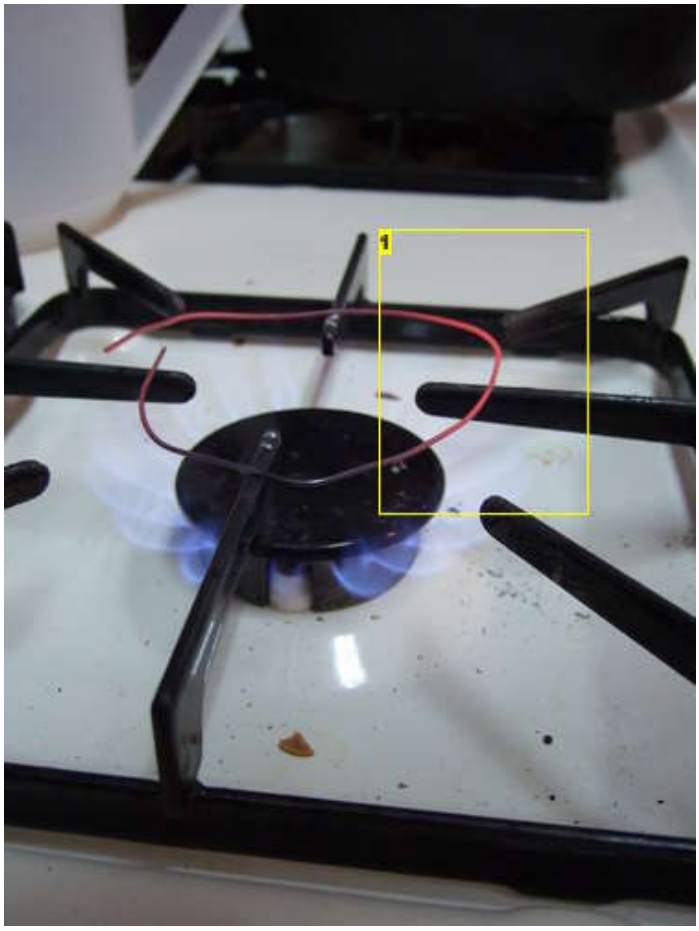


Image Notes
1. Red hot on stove. Let it cool!

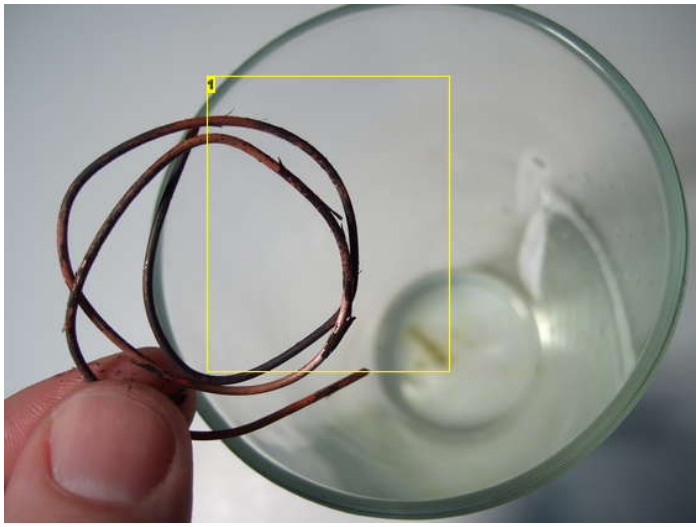


Image Notes
1. Closeup of copper oxides on the wire after cooling. They're cracked b/c I re-bent the wire. Save the flakes.

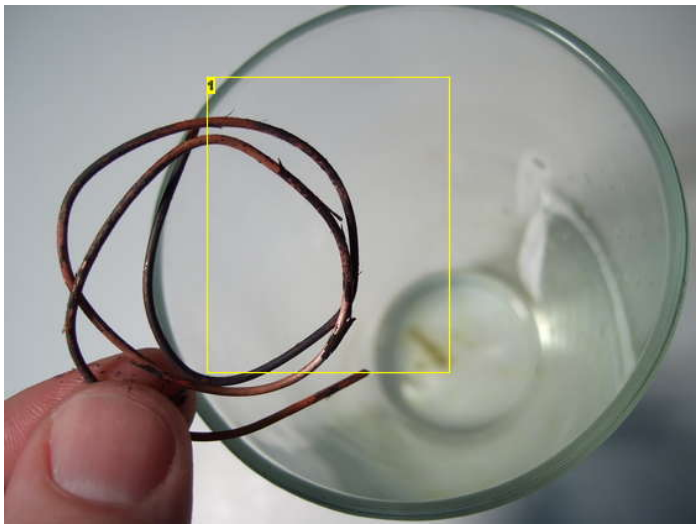


Image Notes
1. Doubled pint glasses to contain fumes

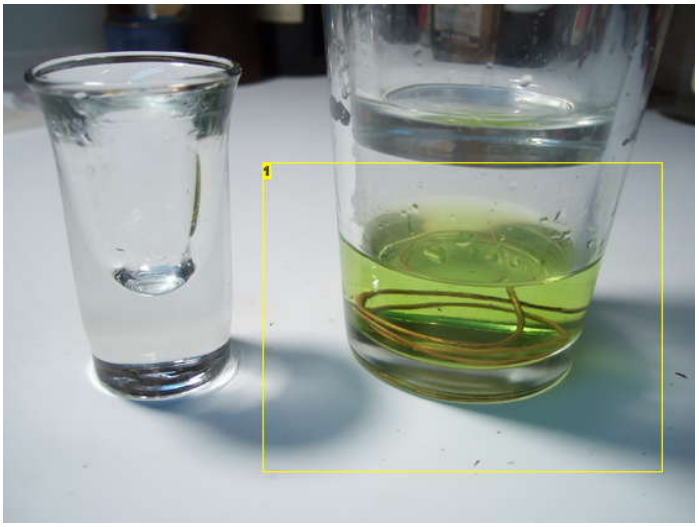


Image Notes
1. Peroxide and wire first. Slide acid down between the two cups. See video demo.

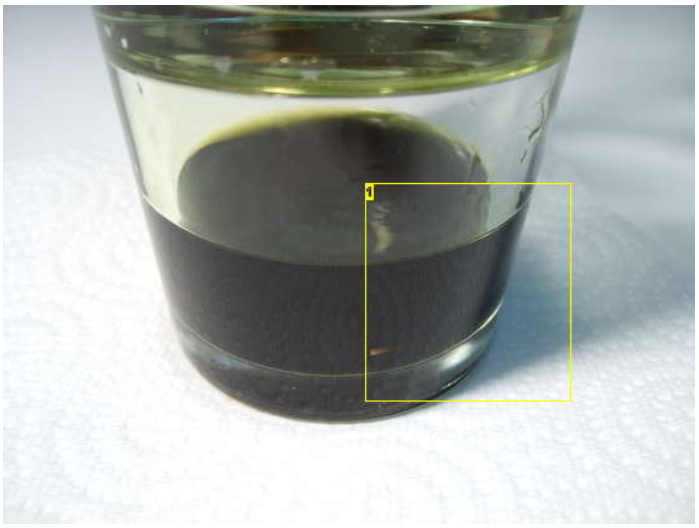


Image Notes
1. The endpoint. All the copper in solution is spent.

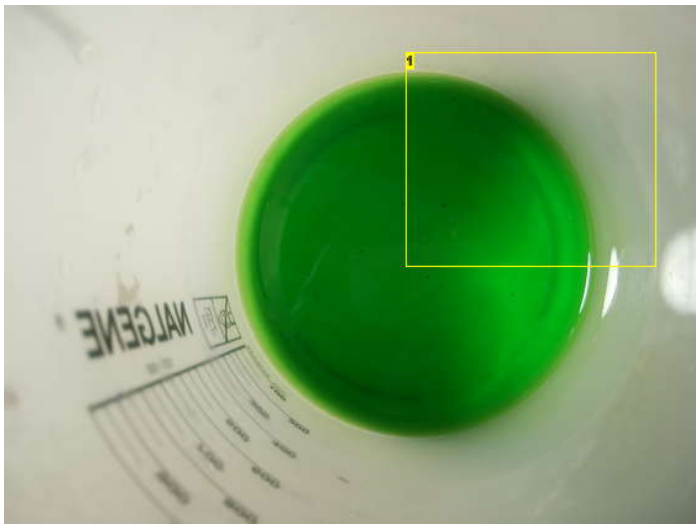


Image Notes
1. Capful of peroxide and it's green again.

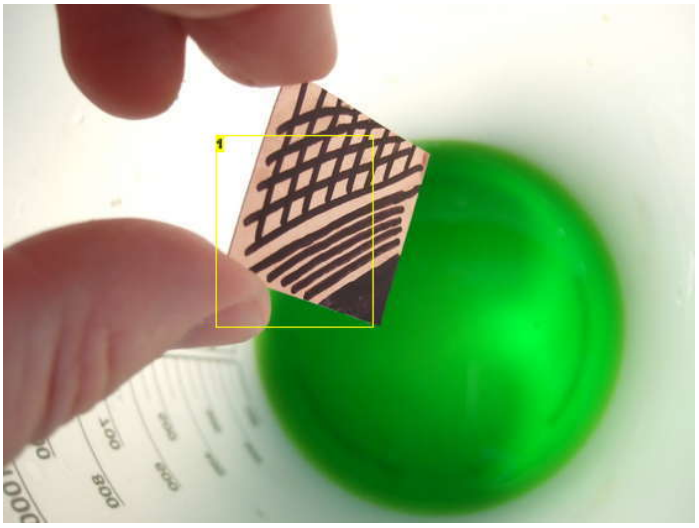
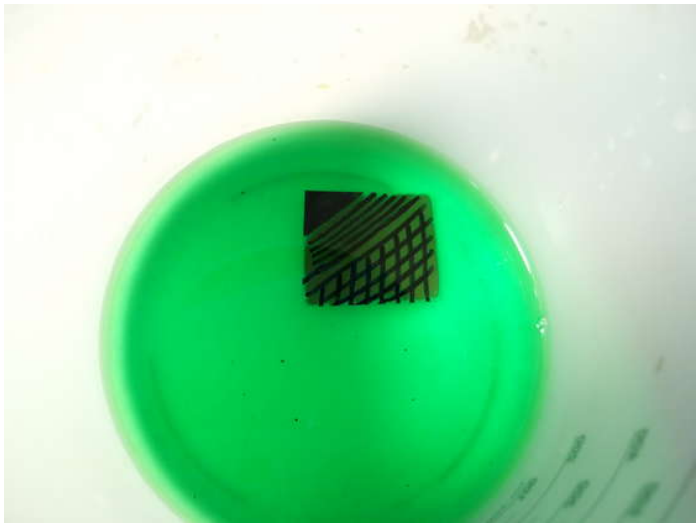


Image Notes
1. Groovy test pattern.



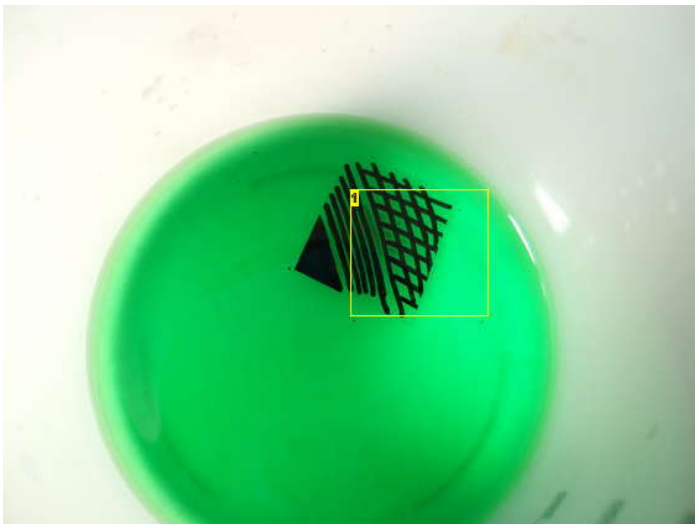


Image Notes
1. Almost there...

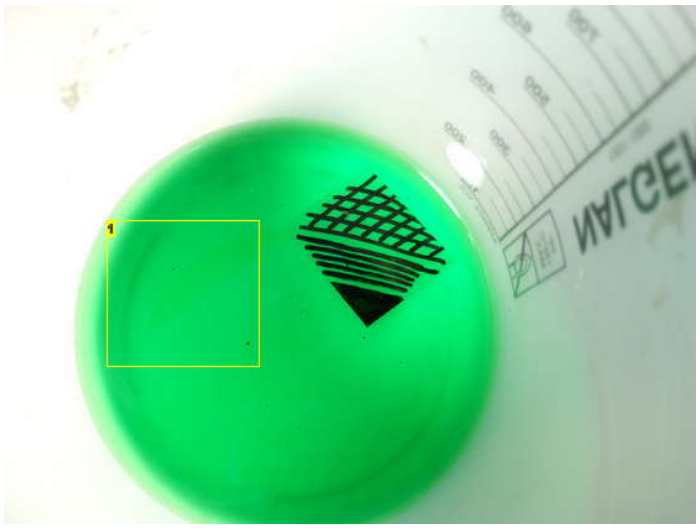


Image Notes
1. Done.

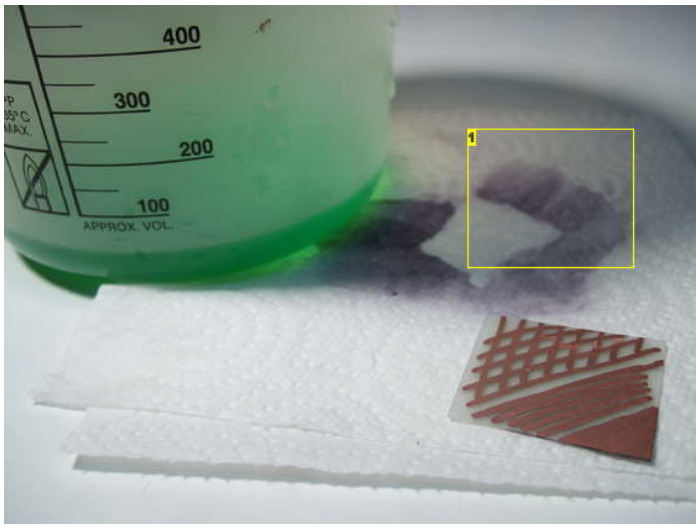


Image Notes
1. Acetone bled through the paper towel and stained my countertop. Use something waterproof. It does come clean eventually, but the scrubbing sucks.

Image Notes
1. Plenty of headroom!

Related Instructables

Etching a circuit with toilet bowl cleaner by RapidMustang

Sponge + Ferric Chloride Method -- Etch PCBs in One Minute! by TechShopJim

(easily) etch images in copper by prank

DIY Flexible Printed Circuits by ckharnett

PCB Etching Machine. Save money and time.... by SAGUTRIC

Killer PCBs by incoherent

Comments

50 comments **Add Comment** **view all 405 comments**

shaunak says: Dec 5, 2007. 6:41 PM **REPLY**

Is it OK to drill the holes for the components before etching? I have four 16pin ICs on my board and drilling them later will be a real pain.

Davad says: Dec 26, 2009. 8:44 PM **REPLY**

Yes you can. Industry drills the hole first for making vias. The holes are drilled then the board and the via holes are electroplated before etching.

shaunak says: Dec 27, 2009. 8:26 PM **REPLY**

Thanks for the insight.

LIELOREN says: Jan 15, 2010. 4:15 PM **REPLY**

Better etching first, it makes the drilling part way easier.

GTechno13 says: Mar 3, 2011. 2:33 PM **REPLY**

Agreed, drilling can let the echant reach under your resist a bit. I find that the copper circle also helps center the bit.

Stokes says: Oct 5, 2009. 8:20 AM **REPLY**

I've found drilling after the etching to be better. In the transfer, I make the holes just tiny dots so I know where to drill. This way, I am sure that the copper completely surrounds the hole -- no crescent moons of bare board on one side or the other.

haptotrope says: Dec 8, 2008. 12:47 PM **REPLY**

I'm not certain about this specific etchant, but its speed may make it necessary to coat the inside edges of the holes with a resist to keep the acid from eating the board from the side of the hole -- and under the printed resist.

Electricsrb says: Feb 22, 2011. 8:25 AM **REPLY**

Mine board took 8h to etch. The solution is perfect I swirl the container around, but it's taken me a looooooong time to fully etch it. Am I doing something wrong?

The Real Elliot says: Feb 23, 2011. 1:38 PM **REPLY**

8 minutes is about right. 8 hours, not so much.

What is the concentration of your acid? Is the peroxide fresh?

At this point, there's only two ingredients, so that makes troubleshooting easy....

thecheatscalc says: Jan 26, 2011. 7:54 PM **REPLY**

I'm having trouble with the solution turning blue instead of green.

when I initially mix H202 and the muratic acid, it's clear

I add copper, the solution starts turning green.

I let the solution sit for a while and most of the H202 seems to have broken down because the solution is MUCH slower than it was initially.

I add H202, and the solution turns blue?

the solution is still pretty slow...

kalsara01 says: Feb 15, 2011. 10:42 PM **REPLY**

the pure CuCl2 is blue color. (same as CuSo4, Cu(NO3)2 etc). and complex ion [CuCl4]^2- is yellow.if add excess con. HCl to a Cu^2+ (CuCl2, CuSo4, Cu(NO3)2) solution turns in to yellow. if u add diluted HCl or other Cl^- sources (NaCl) to a Cu^2+ it turns to green because of both Cu^2+ (blue color) and [CuCl4]^2- (yellow color)

CuCl2 + Cl^- <==> [CuCl4]^2-

this is a reversible reaction. so if the concentration of the [CuCl4]^2- is lowered the ion breakdown to CuCl2 and Cl^- and make solution more blue.

so my idea is to add more HCl to blue solution. (or NaCl. NaCl is also do the same thing. but im not sure about how may it effect on the etching)

The Real Elliot says: Feb 18, 2011. 11:24 AM **REPLY**

I agree with Kalsara. If you look at the page I linked about the chemistry, he even uses the green -> blue transition as a means of figuring out how acid your solution is.

That all said, I'm not sure _how_ you could be using up all the acid. What strength (% or molarity) HCl solution are you using? I wonder if you're using something that's fairly dilute and thus watering your mix down.

beehard44 says: Sep 8, 2010. 8:23 AM **REPLY**

i have a problem. i made the starter batch and right after my first etch, the etchant won't work anymore. it's dark green and i dumped all the muriatic acid and hydrogen peroxide i have in there to no avail (yes it was 2:1 ratio) i shaked the container but nothing happened. i noticed is that when i leave my board in for 10 minutes, the copper turns reddish-pink, like severely corroded copper. can it be too much oxygen? or do i just evaporate it like you said?

votecoffee says: Feb 15, 2011. 11:53 AM **REPLY**

Sounds like a film is forming and keeping the acid from working on the copper. Try agitating it by shaking, wiping it with a paper towel whenever the reaction slows, or adding a vertical bubble agitator to keep the film from forming/get rid of it.

pricklyrobot says: Oct 19, 2010. 9:15 PM **REPLY**

Hey, I tried this etchant on Sunday to etch my first-ever PCB. I used 40-volume peroxide (the stuff from the beauty supply store for hair bleaching) and 20°-baume muriatic acid. The solution turned green quickly and the board etched in a minute or so.

I left the solution in the plastic bin I etched in for a couple of hours, then I transferred it to a glass bottle for storage (a thoroughly cleaned whiskey bottle). It still had lots of stationary bubbles in it at this point.

I stuck the bottle underneath my bathroom sink, and sometime between last night and now I guess it exploded (there was just a bunch of broken glass and etchant residue in there). I threw out a bunch of stuff and put some baking soda in there to try and neutralize anything still going on.

Any ideas what I did wrong? Does the storage container need to be able to vent? Did I somehow make the etchant too strong.

votecoffee says: Feb 15, 2011. 11:45 AM **REPLY**

Could either be pressure or vacuum that caused it, or someone you live with. Wouldn't recommend venting it if it is putting out gases, but you could put a balloon on top to see which one it is, maybe store outdoors to vent? Another possibility is that the glass bottle contained a chemical that reacted to the material (some used lead or other such metals for coloring and all), or the chemical reaction from etching may have left the mixture hot or cold and a temperature change could have caused the glass to shatter (though it sounds more like an explosion from what you said).

I'd put my money on gasses forming too much pressure. You're using a different mixture than many specified, so you should check your acidity and specific gravity to see how they compare. Also, get the MSDS sheet for your products and look for other ingredients that might cause the gaseous reaction you seem to be getting

klee27x says: Oct 28, 2010. 7:55 AM **REPLY**

Hydrogen peroxide is very unstable, unless it is 100% pure. Once you mix this stuff, it's got a limited lifespan, measurable in hours. The copper ions catalyze the breakdown of peroxide, and it reverts to water and oxygen gas. It sounds like you capped the bottle, and the gas pressure broke the glass.

adamazing says: Feb 12, 2011. 12:05 AM **REPLY**

With respect to storage, can you store the end-stage etchant in a plastic bottle? Or does it have to be glass?

The Real Elliot says: Feb 14, 2011. 1:43 PM **REPLY**

Plastic works just fine. I've used a gatorade bottle (clearly labeled!) for years now with no signs of trouble.

PaulMakesThings says: Feb 5, 2011. 7:56 PM **REPLY**

I explained this idea to the head chemistry professor at my school to get her input on it. She seemed to think it was a good idea. When I asked her about disposal she suggested drying it out. She wasn't very specific about how this might be done but she explained that a solid is much easier to dispose of safely and also there is less of it. As a side note, she didn't seem to think it was particularly dangerous, beyond wearing the proper safety gear she didn't have any suggestions. But she's used to dealing with dangerous chemicals.

jaydenr says: Jan 11, 2011. 12:10 PM **REPLY**

Help, my mix just dissolves the copper. My muriatic acid doesn't tell me what percentage the acid solution is, it just says "industrial strength". will this start etching when more copper is dissolved in to it? what can i do?

static says: Nov 14, 2010. 12:40 PM **REPLY**

I wonder if there's a way to recover the copper from the etching solution? On line hobbyist may never recover that copper from their etching solution. Perhaps in more populated area enough could be recovered for it to be slight revenue for groups as hacker spaces, etc..

hinge says: Nov 29, 2010. 8:34 AM **REPLY**

It is very easy.Drop a piece of aluminum into copper chloride solution and after 2-3 minutes a layer of pure copper sediment will form on the bottom of your reaction vessel,It can be washed and filtered for any use

Unit042 says: Nov 19, 2010. 8:06 PM **REPLY**

I read somewhere that you can get the copper out by doing a sort of galvanic reaction in reverse: graphite anode, copper cathode. Pump some voltage through that for a while, and copper dissolved in the solution should be given up to stick to the cathode, making the copper wire thicker because the copper is coming out of the electrolyte.
No, wait, it was electroplating....
Anyway, I'm thinking of a modified procedure seen here:

http://robotroom.com/Rust-Removal.html

When I run out of ferric chloride, I will certainly try this ible's etchant, then try the previously described experiment. Perhaps, if it works, by introducing some zap-spark electricity into the mix, the ions would go away....

-Dustin

PS: I wonder if this re-use could be done with ferric chloride?

elias.alberto says: Apr 30, 2010. 2:36 PM **REPLY**

All this environmental concern about copper and disposal reminded me of something: when you're dealing with copper wires and end up with useless pieces of thin copper wire (about 2 inches long) what do you do to them? Usually I just throw them out with other garbage at the trash bin. Should I throw them in the recycling bin, even if they're wrapped in insulation plastic? What if they're not copper, just an unknown silvery metal?

static says: Nov 14, 2010. 12:32 PM **REPLY**

Most likely wire with a "silvery" appearance is tinned copper. A wire than "burns green", when a flame is applied to iy the wire has copper content. Why not save copper wire for recycling. How much copper will be worth when you accumulate enough to bother with selling will be unknown, but when you do sell it you will have more in your pocket than you did before you sold it. As another said copper in the land fill is less a problem.

ancienthart says: Oct 14, 2010. 5:03 AM **REPLY**

Copper metal in landfill is less of a concern, as it's hard to get copper ions off the metal at an appreciable rate. Basically the copper has to corrode, and even then, copper oxide isn't very soluble. Some will get free as soluble copper hydroxide, but a properly managed landfill will be separated from the water table.

elias.alberto says: Oct 14, 2010. 3:43 PM **REPLY**

Btw I haven't seemed much thankful in my last comment, but I only realized that after I posted. So I'm posting again just to thank you and let you know I appreciate your will to share knowledge. :)

elias.alberto says: Oct 14, 2010. 3:42 PM **REPLY**

So we won't have many trouble if we throw them out as regular garbage... for now. Nonetheless recycling is a good habit. I've been working in a mining company on my last vacations and the environment people there told me I should throw pieces of copper wire in the "metal" recycling bin. They said something like "the plastic will burn when the metal is melted anyway". But then I had someone else telling me every metal that is not too thick will be shredded and then put in a flotation tank, where dirt (such as the plastic insulation on copper wires) will float. So, you can safely recycle your pieces of wire as metal.

votecoffee says: Feb 15, 2011. 11:36 AM **REPLY**

The main reason that people strip the wire before recycling is to increase the money they obtain per unit of weight. Pure copper gets a higher price per pound that copper with insulation still on it. If you're not concerned about the money difference, don't bother stripping it. Just determines the recycle grading.

icecreamterror says: Nov 10, 2010. 5:31 AM **REPLY**

Can anyone tell me why after about 1 months of using this solution in my etching tank it goes a very cloudy green and leaves a THICK smooth deposit on the bottom of my tank (like the consistency of double cream) its happen half a dozen times now??????

Im etching nothing but copper PBCs and the creamy deposit just appears out of no where, it not a gradual process.

kumy says: Oct 18, 2010. 8:09 AM **REPLY**

Hi, thanks for your responses. Your right maybe I have put hydrogen peroxide into muriatic acid (I can't remember). I've re-tried this WeekEnd, temperature was not excessive as last time. But, my etchant was blue instead of green ! A beautifull blue :p My hydrogen peroxyde is something for swimming pool, maybe it's not ONLY hydrogen peroxyde. My grand Father give me a pharmaceutical bottle of hydrogen peroxyde, I'll try tonight...

mashmellow23 says: Oct 16, 2010. 6:03 PM **REPLY**

hello, i was wondering if this would work with an 8% hydrochloric acid and a 2% hydrogen peroxyde, those are the only things i have in home, does anyone know?, so i don't have to go to my hardware store x_X.

kumy says: Jul 17, 2010. 7:32 AM **REPLY**

Hi, I done it, and it works great ! but one question: It's been an hour since I finished my etching and it is still bubbling. The sollution is hot. Is this normal? It will last much longer? Is it possible to store the mixture in a bottle of soda? thank you

kumy says: Jul 17, 2010. 8:35 AM **REPLY**

Okay, it stopped bublling and it now "cold" (ambient temp). I've added another piece of copper with no reaction. i should have missed something.

ancienthart says: Oct 14, 2010. 5:09 AM **REPLY**

Acid/metal reactions WILL give off heat, especially if you want them to go fast. Several times I've done hydrogen gas demonstrations using HCl and Zinc, and had to put the flask into a sink of water because it got too hot to handle.
Additionally, always make sure that you add acids to water rather than water to acids when preparing solutions.
That will ensure that the acid is always diluted immediately.

beehard44 says: Aug 18, 2010. 7:13 AM **REPLY**

did you use anything other than listed herein? check the labels of what you used and post back here.

beehard44 says: Sep 8, 2010. 8:41 AM **REPLY**

now i know why
you poured hydrogen peroxide into muriatic acid, right?

Zak says: Sep 1, 2007. 1:15 PM **REPLY**

Acid vapors will destroy metallic and electronic items. Be sure to do the aeration outdoors for that reason.

ancienthart says: Oct 14, 2010. 5:00 AM **REPLY**

Not to mention destroying yourself. :)
The author mentioned that he was using "fuming HCl" - that's about as concentrated as you can get, and the fumes are HCl gas. If it redissolves in the liquid on your mucous membranes (eyes, nose, throat), it will form concentrated acid.
I had an incident in the university lab where I accidentally inhaled a _small_ amount of HCl gas from a chemical reaction and had to rinse out my nasal passages. Took 1/2 an hour before the stinging stopped, and the "taste" to disappear. :/

The Real Elliot says: Sep 3, 2007. 8:37 AM **REPLY**

Good advice! I think (from very early experiments with way too much acid) I rusted one of my kitchen knives pretty badly from vapors. I'm an apartment-dweller, so I'm stuck in the kitchen with the windows open. I'm leaning more towards the add-more-peroxide school of lazy maintenance these days anyway...

Snipeye says: Sep 1, 2010. 9:08 PM **REPLY**

Disposal - could you not neutralize with baking soda, then dump down the drain?

ancienthart says: Oct 14, 2010. 4:36 AM **REPLY**

Hi Snipeye. As the author has stated, the problem isn't the acid. Even in a chemical lab, basic disposal of weak acids is just to wash down the sink with lots of water. (As long as your pipes can handle it).
The issue is the copper - even tiny amounts in water supplies are very poisonous to fish.

Doug Wood says: Oct 8, 2010. 8:42 PM **REPLY**

I have been trying for a long time to produce successful PC boards using Electrolube PRP . (positive photoresist) I have not been able to stop it forming "bubbles" or cavities as it dries. This leaves the final tracks full of holes, a bit like a sponge. I have tried cleaning the copper with turps, meths, acetone, soap, and several other solvents. I have shaken and not shaken the can. I have used old and new sprays, with a damp atmosphere and a dry one. I do not touch the cleaned board. I do not have a laser printer (I do have ink jet printers, which I use to draw the art-work and print on to overhead transparency film) and am loth to buy pre-coated boards, as cuting them to size would be uneconomical - my projects come out different sizes.
Has any of you chaps any ideas as to why the bubbling ? The Electrolube people haven't
Regards
Doug Wood

redstarsrbija says: Sep 18, 2010. 10:19 PM **REPLY**

hmm, wouldn't one of those bubble thingamajigs for fishtanks do the job pretty well?
sh*t you can just use the fishtank as well.

redstarsrbija says: Sep 18, 2010. 10:21 PM **REPLY**

oh... i see some already beat me to it :S
Props to The Ideanator

iffee says: May 28, 2010. 11:22 PM **REPLY**

Makers of Positiv 20 photo resist (Kontakt Chemie) mentioned in their technical letter No 7 also mentioned the following etching solution mixture besides normal ferric chloride.
To make 1 Lit.
200 ml hydrochloric acid (HCL 35%)
30 ml hyderogen peroxide (H2O2 30%)
770 ml water (H2O)

Comments please

beehard44 says: Sep 8, 2010. 8:42 AM **REPLY**

yeah, they recommended it, will work

robot797 says: Aug 19, 2010. 12:24 AM **REPLY**

i use amoniumopersufaat at works great when hot it is fast (my smily test print in 15 min) and is reuseable and it can be stored some years

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beehard44 says: Aug 18, 2010. 9:27 AM **REPLY**

another advantage: you can see the board etch in action....

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view all 405 comments