How to Anodise at Home

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How to anodise at home

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For the IAP Community

And so it begins...

The methods i will discuss in this thread are methods I use which work well for me. There are many scientific calculations which can be applied for calculating how much Ampere is required which is determined by the surface area of the work piece, to the temperature of the acid bath along with acid concentrations and voltages.

As all of the parts I anodise are small, I generally just use a 12V 2A power supply.. more on that when we get to it

A note on safety:

I would also like to point out you are using ACID... so be careful, and please if you're not confident on what you are doing, you may want to take a pass on this. Please read as much safety information as possible with regards to not only handling Acid but using it safely

Always add Acid. Put your water in your tank, then add the acid to the water slowly. This prevents flash boiling and potentially splashing Acid everywhere!

THROUGHOUT THE WHOLE PROCEDURE YOU SHOULD BE WEARING CHEMICAL RATED GLOVES AND GOGGLES AT A MINIMUM.

You also need very good ventilation. what isn't shown in these pictures is the powerful fan sucking the air straight outdoors. The fumes are corrosive, and generally not good to breathe.

Try and avoid using water which has impurities such as tap water. buy a lot of distilled water, you will get through a lot of it. Use it for rinsing and cleaning your parts, for making up your dye solution and your acid bath. I even use it for boiling the piece sealed at the end.

What is anodising?

Anodizing, or anodising if you are british, is the process of using a piece of aluminium as an anode in an electrolyte which causes an oxidised, microscopic crystal like layer to be built on its surface when a positive charge is passed through it.

Why do it?

Well, mainly two reasons. The first of which is to give a piece of aluminium corrosion resistance and to strengthen it. Anodising under the right processes can be nearly as tough as diamond. Helping to protect the aluminium which lives under the oxidised layer you have created. Anodising alone gives a clear layer and it can be left as is if you are only doing it to protect the piece.

The second reason as to why you would anodise, is to enhance its cosmetic appearance. Because you have created a microscopic layer of crystals on the surface of the non porous aluminium, you have now given it a layer which can soak things up. Mainly, Dyes. This allows you to choose from a whole host of specialist anodising dyes to colour your work. The shades can be varied depending on how long you leave the piece in the dye bath, or by how much dye you add to the water in the first place.

Here are some examples:

What can be anodised?

By using the methods described in this tutorial, only Aluminium can be placed into the anodising tank to be anodised. Everything else will corrode, with the exception of lead (which we use for contact plates) and titanium, which can be used for your anodising jigs. Sorry guys, no wood ☺

What you will need

Two containers:
The first should be large enough to accommodate the part you wish to anodise so that it can be completely submerged with clearance so it does not touch the sides. The second should be larger than the first, with a sealable lid

Sulphuric Acid, diluted to 10% -15% strength

Lead flashing

12V 2A DC power supply

A multimeter which can read Ampere

A length of 6A mains cable.
Distilled or deionised water, lots of. (10L should get you started)
Pure aluminium rod or titanium
Anodising Dye of your colour choice.
Caustic soda
Tooth brush
Thermometer
Latex gloves for handling your work
Chemical gloves for handling Acid
Respirator
Overalls
Eye goggles, not protection glasses.

Building your anodising tank

You will need a suitable material for making the Cathodes of the tank. (the negative plates). I use Lead flashing. I would advise this as many metals will react in the tank causing undesired results

You will need a suitable container for your acid bath. Here i have a 3L container. Make sure its sturdy and not thin plastic like an ice cream tub. You should avoid containers which flex easily. As you can see by the pictures i have cut two pieces of lead flashing off, and bent the tops of them over so they hang on each side of the container.

I am using very strong Acid. This is 97% Sulphuric acid, and pretty nasty too. Hence why i am wearing chemical rated gauntlets, a gas mask, and overalls. I would not recommend using Acid this strong unless you are very confident on what you are doing. it needs to be heavily diluted to around 10 - 15% I have added 1800ml of **distilled** water, and 200ml of sulphuric acid

REMEMBER- Always add Acid.

Once you add the acid, a chemical reaction will occur which will result in the container becoming quite warm! **Do not** anodise in this solution until it has cooled back down to room temperature.

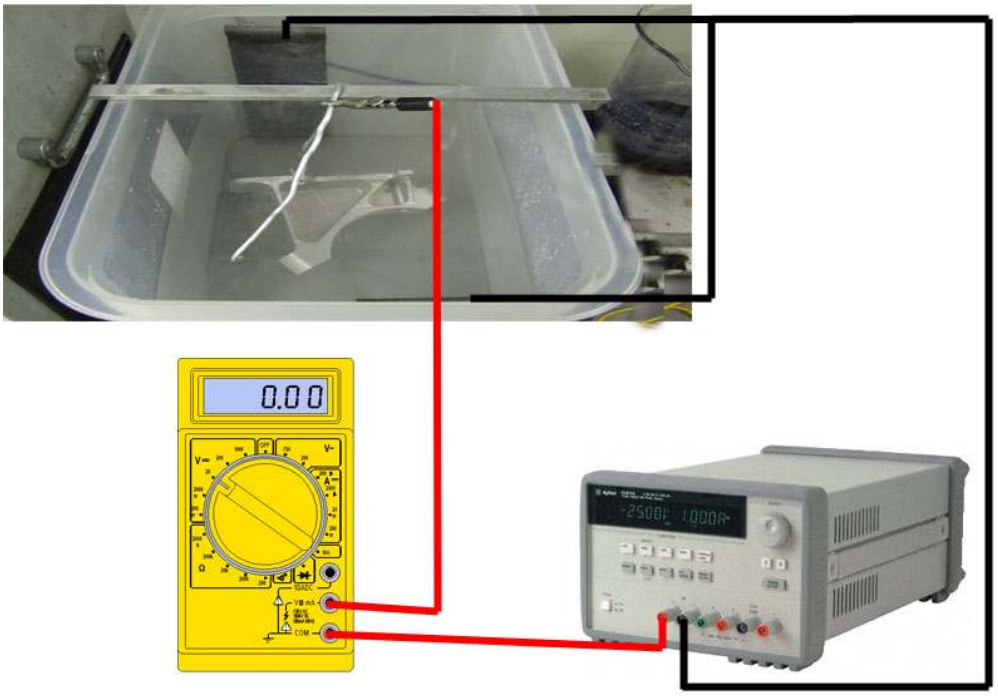
It is perfectly acceptable to use battery top up acid from auto stores. This is generally 30% strength, and can be diluted with de-ionised or distilled water on a 1:1, or a 1:2 Ratio.

Please remember to keep your skin and eyes covered. A splash of acid in your eye is likely to blind you. A splash on your skin will start to burn after a while.

It is generally good practice to keep some bicarbonate handy, as this will neutralise a spill being as it is an alkali

Place your acid bath inside a larger container which has a sealable lid for storage. This is to prevent dripping and spillage, and it also gives you a handy failsafe if something was to go wrong with your main tank resulting in it leaking. The last thing you want is a few Litres of acid leaking everywhere.

Wiring your tank



Take a piece of wire which has a high enough ampere rating for what you are going to be drawing (i used a piece of 6A mains cable as thats what i had laying around) and connect the two pieces of lead together These are illustrated as the black line in the above example. You can cut the lead with a pair of wire cutters and then fold it over the bare wire in effect crimping it into place. Note that these connections are done outside of the tank. This wire is then connected to the negative of the power supply. For best results you should use a bench top power supply with a constant Ampere output. This way you can set the power supply to use the correct Ampere and it will vary the voltage required to give you those figures. To keep things simple as we are pen makers, i can tell you that one section of a metal pen will draw around 800mA. To anodise both sections of a pen in one go will draw around 1.6A (Hence why i use a 2A power supply). If you was to anodise lots of sections of pens at the same time you will draw more current, thus needing a larger power supply. You may want to google current requirements of anodising if you want more information on this.

This then completes your Cathodes (your negative plates)

I have taken a piece of wood which is the width of the outer container, and drilled a hole through the middle of it.
A piece of aluminium welding wire has been passed through and then bent into a V and pushed down the barrel of this pen piece to secure it. This is not the best practice, especially if its not pure aluminium wire as you will find it will corrode on the surface and give you a poor connection and prevent the part from anodising correctly. It is seriously worth the extra time to turn an offcut of aluminium down so that it's a tight push fit into the drilled hole of the pen piece to ensure you have a great connection. Drill a hole through the offcut and push your aluminium wire through the whole you have just drilled. It should be so tight you have to knock it with a spanner for example to get it

into the hole. An alternative to this is to use Grade 2 Titanium, as this can go into an anodising tank without it anodising or corroding, so it can be used time and time again. Note though, it has to be grade 2 (pure titanium) and it comes with a price.

An additional note

The part must be perfectly clean before anodising! Anodising will not hide a poor finish, it will enhance it. a finger print will also show up in the anodised layer from the grease on your fingers effecting the results. Always wear gloves not just for Acid protection, but to keep those prints off your pieces. Soak your pieces in caustic soda for a couple of minutes prior to anodising. this will strip off any dirt. after this place it into a container of distilled water for rinsing and scrub it with a tooth brush, still with your gloves on. when you are sure its perfectly clean, you may start to anodise

The top half of the aluminium wire is kinked over to prevent the part from slipping down, so that it is freely suspended not touching the sides or the bottom of the container.
I then connect the positive wire of the multi meter to this, and the negative wire of the multi meter to the positive of the power supply.

With the multi meter set to read amps, it will give you a reading of the current being drawn. The figure above is incorrect because:

1) You can see the minus sign. This means the wires are back to front on the multimeter. (as you can see i have the Red pluygged into the common. This should be black.
2) The acid is still warm from mixing! Let it cool down.

When you Anodise you are creating an insulating layer over the piece of aluminium. As this layer gets thicker and stronger the conductivity of the piece will decrease. A general rule of thumb for anodising for good results is about an hour. (I usually run it for 2 hours to get a nice thick layer.)

An image of the setup running.

Dyeing your work

After the part has finished anodising, rinse it off in distilled water, and place it into a pan of the dye colour of your choice. I personally prefer to use professional anodising dye as I find it has better lightfast properties and therefore is a lot more resilient to fading. Many however simply use clothes dye. At this point, you will most probably notice the piece has changed in the following pictures! and that's because I had a blunder. Always keep the temperature of the dye solution between 55'C and 60'C ... if it rises higher than this it will begin sealing the oxidised layer before taking up the dye. In my case, the phone rang and I didn't turn off the heat..... well, all's not lost as you can place the piece into Caustic soda for 10 minutes which will strip off anodising! This is also great if you have something you don't like the colour of and would like to reanodise it. Simply scrub off after a soak in caustic, and you can start from scratch.

The longer you keep the piece in the dye for, the darker the outcome will be. After 20 minutes there would be no more dye uptake and it would be safe to assume that this is the darkest it will get. Always read the notes which comes with your dyes. Some colours like blue require up to 40 minutes for the darkest shades.

Using Gold dyes can be literally seconds as its more of a chemical reaction with the oxidised layer oppose to actually dyeing it. Keep removing the part from the dye until you have the shade you desire.

Another good tip is to dye both pieces of the pen at the same time to ensure both pieces match in their shade!

After the piece has been in the dye, drop it into some near boiling water (anything over 95'C) for half an hour, to seal the oxidised layer

After this, let the piece cool, and take pleasure in admiring your handy work :)