Making CuO2 & Other Metal Oxide Ganses

There are two basic methods for producing CuO2 Gans.

Traditional Method
There is the traditional method which involves placing a nanocoated copper plate and a copper plate into a salt solution. These are normally connected to a power supply.
Because this method involves 2 copper plates in a salt solution the electrolytic potential difference between the two is zero. The result being that we don't get the close to 1V potential difference that we get with Cu/Zn for example which drives the current between the plates if they are connected.
However there is still a residual voltage between the nano coated Cu plate and the plain Cu plate of ~50-200 mV (depending on set up, salt concentration, etc) that's caused by the nano coating itself. So connecting the plates with a normal wire will still produce a small current (below 1mA usually) giving us nice blue CuO2 Gans over time, but it's a slow process. Using a power supply helps to speed things up considerably.

Carbon Rod Method
With CuO2 the traditional method and the carbon rod method are actually very similar. The main reason for this is that the electrolytic voltage difference between the two Cu plates is zero for the traditional method, as explained in the previous section, which is also the case for the carbon rod method.
There is however a small voltage between the carbon rod and the Cu plate of about the same magnitude as occurs with the nano coating and the Cu plate caused by the graphite in the rod, which in turn indicates that the graphite and the nano coating have similar properties. The carbon rod method is a lot like having just the nano coating without the Cu substrate.
So connecting the carbon rod and the Cu plate with a wire will produce a small current which gives us blue CuO2 over time. This is quite a slow process so a power source helps considerably.

Different Color Copper Ganses
One of the interesting things about Cu Ganses is that we get different colours as we change the current.
Below 50mA we get the blue colour version that is normally used. Increasing the current we progressively go to green, black, orange and finally red, as shown in the video.

The most likely explanation for this is that a higher current makes more Cu+ ions available to combine with the oxygen dissolved in the solution. If the available O2 is constant then the higher Cu ion concentration will combine with fewer O2 molecules and therefore give the lower O2/Cu ratios.

It follows that the colour can also be varied by changing the amount of O_2 available for a constant current, such as with a bubbler.
The bubbler rate (which can be changed by squeezing the tube for example) will affect the available O_2 and therefore influence at what point the colour changes occur.

One can get colours other than that the 3 main ones shown depending on the mixture of the main red, black, green and blue Ganses.
For example the brown colour that is sometimes observed is a combination of Cu_2O + CuO + Cu_2O_3, orange + green.
Generally I found that the green Gans is unstable and will transform to the black CuO over time, and sometimes quite quickly.
Also if oxygen is pumped into the orange or red Ganses at a later stage they can be turned back to the black CuO variety.

The same principle should apply to other metal oxide ganses.
For example with gold we get the gold coloured AuO_3 as well as the redish-brown Au_2O_3 gans for low current while the purple colour that people get is the high current Au_2O version.

Salt Solution

With regard to the salt solution it was made up by mixing normal pure salt with filtered water in a 1% salt solution.
By pure salt I mean just the normal white salt that one can buy in stores that hasn't had anything added to it like iodine.
People use various other salts, such as natural sea salt; and I'm sure they will have their own unique properties but for the purposes of producing pure Ganses I prefer to stick with a simple formula for now.
The salt concentration will affect the current flowing for a particular voltage but since we are controlling the current by varying the voltage and/or the resistance the salt concentration is not particularly important with regard to the current flowing.
One thing that the salt concentration does influence is the quality of the plasma field in the Gans. Surprisingly I found that the lower salt concentrations give better field strengths in the CuO_2 case as shown in the video (the current was the same for both the 1% & 10% cases). That’s the reason for using a 1% salt solution rather than the typical ~ 10% that people use.

Power Circuit

The current can be controlled by adjusting the voltage on the power supply.
I also include a resistance in the circuit, as shown in the circuit diagram in the video, which helps keep a stable current. You don't really need it, one can keep adjusting the voltage to maintain a steady current, but the resistance makes it simpler in that the current won't go above certain level (as given by

the i<v/r formula) so if the salt concentration or other factors change the current won't change much.
One can also use batteries or a charger as power supply, the downside is that you have much less control of the current. In which case a variable resistor can be useful which allows one to vary the current while keeping the voltage constant.
The other thing I have included in the circuit is the current meter which is needed in my case because my power supply doesn't have a high enough accuracy in displaying the current. If your power supply shows current in the 10 mA range, most don't, then you don't need that.
The current meter I use is available for $10-$20 on eBay. Resistors are also cheap on eBay.

Quality of Copper
One can quite easily get pure Cu online these days.
One thing to watch out for is that sometimes the manufacturers put a thin coating on the Cu to stop it tarnishing.
If such a plate is used in the Gans generation it can produce unusual colours in the solution; I have seen the solution turn yellow in some of my earlier attempts.
If the surface looks shiny and 'brownish' and doesn't darken over time then it's best not to use.

www.youtube.com/watch?v=WbEaD9s9GOM