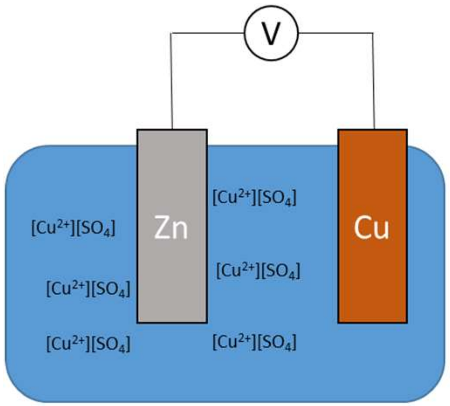
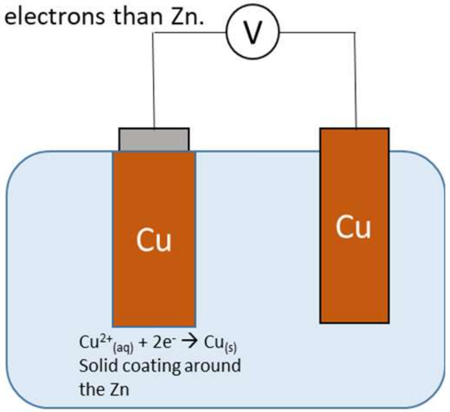
Building a battery

Imagine we put zinc and copper in a copper sulfate solution.

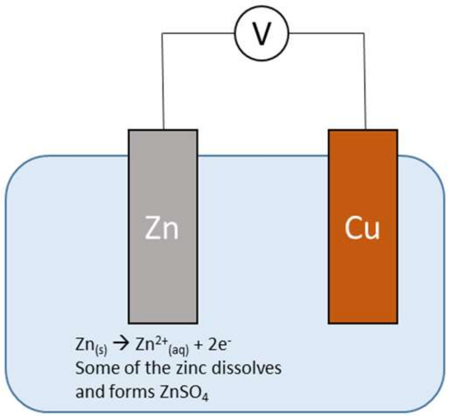


Copper half reaction:
Copper has greater affinity for electrons than Zn.



The blue colour is from the $CuSO_4$ so as it gets used up to form Cu, the solution loses its blueness.

But we know this reaction cannot be taking place on it's own because the electrons need to come from something. The zinc oxidation reaction is happening too.



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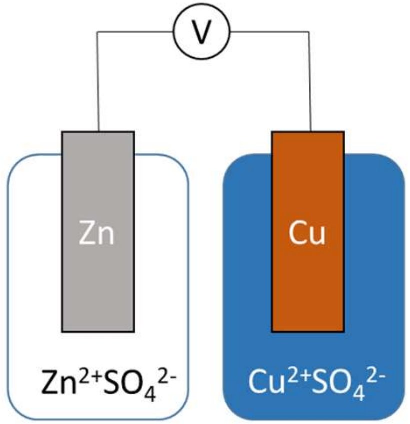
Here, the electrons are simply lost from zinc at the surface and react there with the copper sulfate.
Eventually, the zinc is covered in copper and the reaction stops. This is not useful, because the entire amount of zinc has not reacted, and because the electrons do not travel around the external circuit, the reaction just happens on the zinc electrode. We need some way to make electrons travel through the wire.

What if we separate the copper sulfate from the zinc electrode and use different electrolytes at each one?

If we could ignore the accumulation of charge, the Cu would take the electrons from the Zn electrode, and the Zn would be oxidised to a Zn^{2+} cation and dissolve in solution, whilst Cu^{2+} from the other solution would be reduced to $Cu_{(s)}$. Now all we need to get working is something to solve the excess of charge on each electrode, so the same amount of charge is involved on both sides.

Now we are getting somewhere.



ELECTROCHEMICAL CIRCUS
INSPIRATION THROUGH FASCINATION