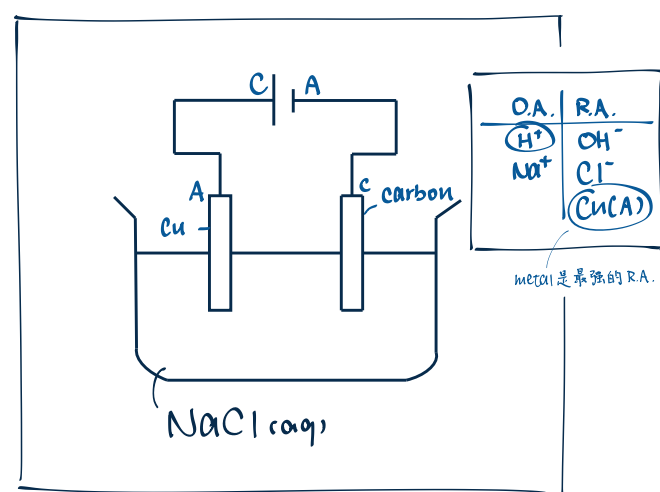


Electrolysis: nature of electrode, electroplating

1 Factors affecting preferential discharge: nature of electrode

- Using metal as electrode (vs graphite electrode: inert)
- Anode metal electrode: may preferentially discharge (as R.A.)
- Cathode metal electrode: 废的 (O.A. 在 electrolyte 中找)

肥 CAT 瘦 AN

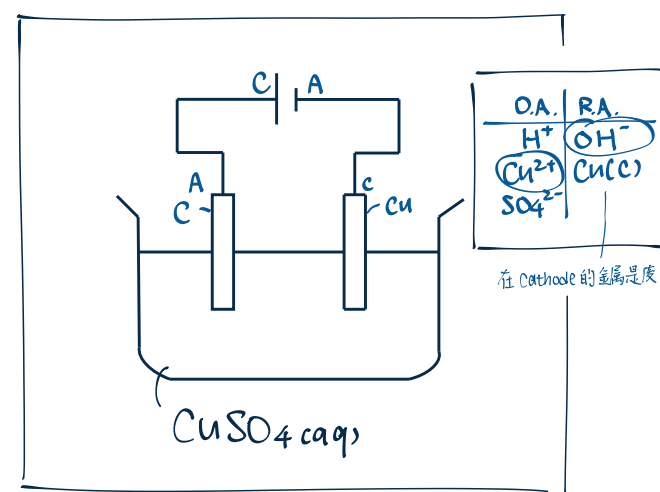


C: $2\text{H}^+ + 2\text{e}^- \rightarrow \text{H}_2$
- colourless gas bubbles evolve

H^+ is stronger R.A. than $\text{Na}^+ \rightarrow$ preferentially discharges
reduction $\rightarrow \text{H}_2$

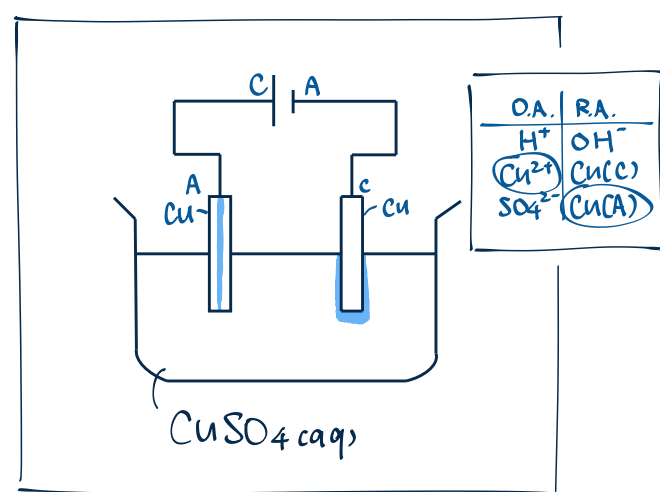
A: $\text{Cu} \rightarrow \text{Cu}^{2+} + 2\text{e}^-$
- anode electrode gets thinner/dissolves
- solⁿ: colourless \rightarrow blue \rightarrow 瘦 AN

Cu is stronger R.A. than OH^- & $\text{Cl}^- \rightarrow$ preferentially discharges
oxidation $\rightarrow \text{Cu}^{2+}$



C: $\text{Cu}^{2+} + 2\text{e}^- \rightarrow \text{Cu}$
- reddish brown solid deposits \rightarrow 肥 cat
- solⁿ: blue \rightarrow colourless

A: $4\text{OH}^- \rightarrow \text{O}_2 + 2\text{H}_2\text{O} + 4\text{e}^-$
- colourless gas bubbles evolve



C: $\text{Cu}^{2+} + 2\text{e}^- \rightarrow \text{Cu}$ \rightarrow 肥 cat
- cathode electrode gets thicker

A: $\text{Cu} \rightarrow \text{Cu}^{2+} + 2\text{e}^-$ \rightarrow 瘦 AN
- anode electrode gets thinner

\rightarrow gain in mass of cathode =
loss in mass of anode

solⁿ pH: neutral (H^+ , OH^- is not consumed)

solⁿ: remains blue / same blue colour intensity
- rate of production of $[\text{Cu}^{2+}(\text{aq})] =$
rate of consumption of $[\text{Cu}^{2+}(\text{aq})]$

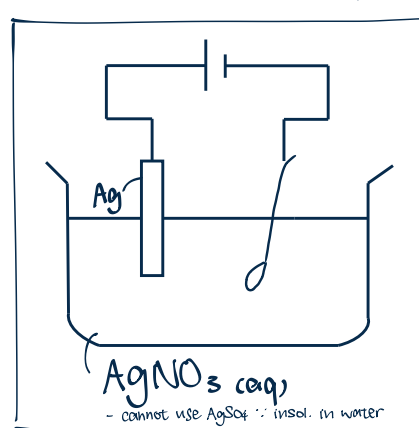
2 Electroplating

DEFINITION, ADVANTAGES

- electroplating = coat metal layer on top of another substance using electrolysis
- advantages
 - > provides better appearance for metal
 - > prevents corrosion of metal (provides protective layer of unreactive metal \rightarrow prevent coated metal from contacting O_2 & water vapour in air)

PROCEDURE

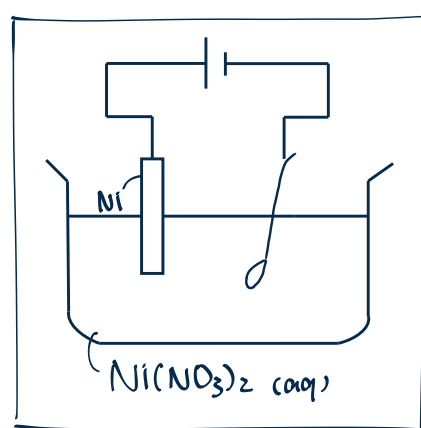
- Task: electroplate silver on iron spoon.
- Apparatus: sandpaper, rusted iron spoon, Ag foil, beaker, battery, wires



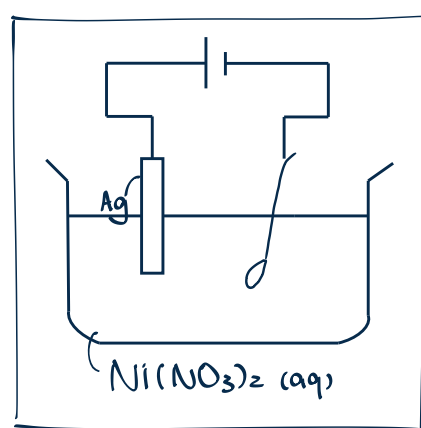
1. Use sandpaper/ vinegar/ tomato (citric acid) to rub iron spoon \rightarrow remove oxide layer
2. dissolve $\text{AgNO}_3(\text{s})$ in excess distilled water in beaker as electrolyte
3. connect Ag to +ve terminal of battery through connecting wires.
4. connect cleaned Fe spoon to -ve terminal of battery through connecting wires.
5. Immerse electrodes in electrolyte

$\text{Fe}_2\text{O}_3 \rightarrow$ ionic bond + solid
 \rightarrow X conduct electricity
 \rightarrow lead to uneven coating

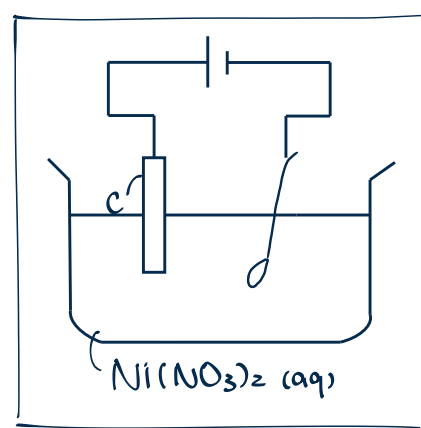
CHOICE OF ANODE ELECTRODE - ELECTROPLATE Ni ON FE SPOON



C: $\text{Ni}^{2+} + 2\text{e}^- \rightarrow \text{Ni}$
A: $\text{Ni} \rightarrow \text{Ni}^{2+} + 2\text{e}^-$



C: $\text{Ni}^{2+} + 2\text{e}^- \rightarrow \text{Ni}$
A: $\text{Ag} \rightarrow \text{Ag}^+ + \text{e}^-$



C: $\text{Ni}^{2+} + 2\text{e}^- \rightarrow \text{Ni}$
A: $4\text{OH}^- \rightarrow \text{O}_2 + 2\text{H}_2\text{O} + 4\text{e}^-$

- Ag 变成 Ag^+ 后会被吸引至 cathode
- R.A. strength: $\text{Ag}^+ > \text{Ni}^{2+}$
- Ag^+ preferentially discharge, reduction $\rightarrow \text{Ag}$
- Ag 会 coat 在勺子上

$[\text{Ni}^{2+}(\text{aq})]$ 不变
- $\therefore \text{Ni}(\text{A}) \rightarrow$ oxidation $\rightarrow \text{Ni}^{2+}$
- provides surplus of Ni^{2+}

$[\text{Ni}^{2+}(\text{aq})] \downarrow$
- 有机会 $[\text{Ni}^{2+}(\text{aq})]$ 比 $[\text{H}^+(\text{aq})]$ 少很多
- H^+ preferentially discharge
 \Rightarrow bubbles at coated Fe spoon
 \rightarrow uneven coating
 \rightarrow wear off of coated layer