

Electrolysis is a chemical change caused by passing an electrical current through a solution or molten compound. Used to extract reactive metals from the reactivity series.

Electrolyte is a liquid or solution that undergoes electrolysis (being destroyed).

Electrode is a solid material placed into a liquid which conducts electricity (site of electrolysis) - made of chemically inert substances (do not react easily).
- often carbon/graphite (because it is inert and a good conductor).
• **Cathode** = negatively charged electrode (cations move towards)
• **Anode** = positively charged electrode (anions move towards)

Ion is a charged particle.

- **Cation** = positively charged ion (e.g. metals)
- **Anion** = negatively charged ion (e.g. non metals)

Electrolysis of copper sulphate solution ($\text{CuSO}_4(\text{aq})$)

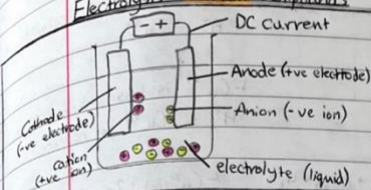
Anode (+)	Cathode (-)
Ions arriving at the anode	Ions arriving at the cathode
• OH^- • SO_4^{2-}	• H^+ • Cu^{2+}
• SO_4^{2-} is not halide ion, so OH^- is oxidised	• Cu^{2+} is less reactive than H^+ , so Cu^{2+} is reduced
• $4\text{OH}^-(\text{aq}) \rightarrow 2\text{H}_2\text{O}(\text{l}) + \text{O}_2(\text{g}) + 4\text{e}^-$	• $\text{Cu}^{2+}(\text{aq}) + 2\text{e}^- \rightarrow \text{Cu}(\text{s})$

Electrolysis

14th March 2023

When ionic substances conduct electricity a chemical reaction occurs. Electrolysis is a redox reaction. Reduction @ cathode, oxidation @ anode.

Electrolysis - Molten Compounds



When electrolysis occurs, the ions will move towards the electrode of the opposite charge.

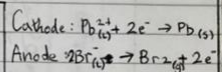
- Lead ion (Pb^{2+}) will move towards the negative electrode (cathode).
- Bromide ion (Br^-) will move toward the positive electrode (anode).

When the ion reaches the electrode it will be neutralised (either gaining or losing electrons from/to the electrode). When this happens, for example lead bromide you will get:

- Lead metal forms at the cathode ($\text{Pb}^{2+} \rightarrow \text{Pb}$)
- Bromine gas forms at the anode ($2\text{Br}^- \rightarrow \text{Br}_2$)

When an ion loses its charge (gains or loses e^- and becomes neutral) it is sometimes called discharged.

We can write this as half equations.



Observations
Bubbles form at Anode
Metal forms at Cathode

Electrolysis of ionic compounds in a solution

21st March 2023

(Aqueous)

- When a substance is in water the situation is more complex.
- Water itself is a weak electrolyte.
 $\text{H}_2\text{O} \rightleftharpoons \text{H}^+(\text{aq}) + \text{OH}^-(\text{aq})$
- Therefore we need to consider H^+ and OH^- as well as ions in the substance.

At the cathode, H^+ ions compete with other positive ions. The less reactive element is formed.

- The OH^- ions compete with the other negative ions.
- If halide is present it will form, otherwise OH^- ion will be oxidised.

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