

Electrolysis



Electrolysis

Everything you know about electrochemical cells applies!

Oxidation at anode

Half equations

Standard reduction potentials

Reduction at cathode

Transfer of electrons

Oxidation number

The only difference between electrochemical cells and electrolysis is that electrolysis requires energy

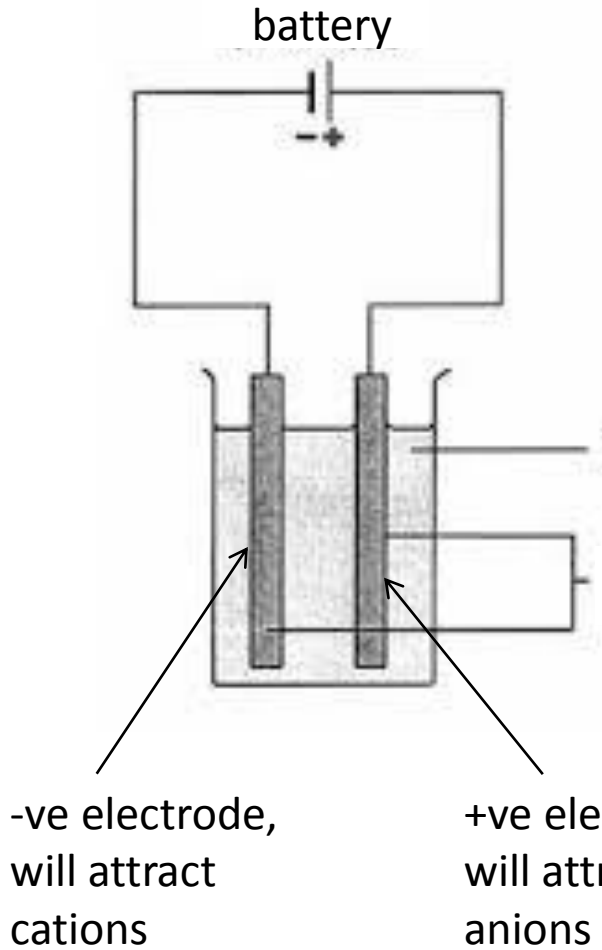
Reaction would not proceed if energy was not provided

Reaction is not spontaneous

E^0_{cell} is negative



Electrolysis



-ve electrode
attracts Cu^{2+}
 $\text{Cu}^{2+} + 2e \rightarrow \text{Cu}$

reduction reaction
cathode

+ve electrode,
attracts Cl^-
 $2 \text{Cl}^- \rightarrow \text{Cl}_2 + 2e$

oxidation reaction
anode

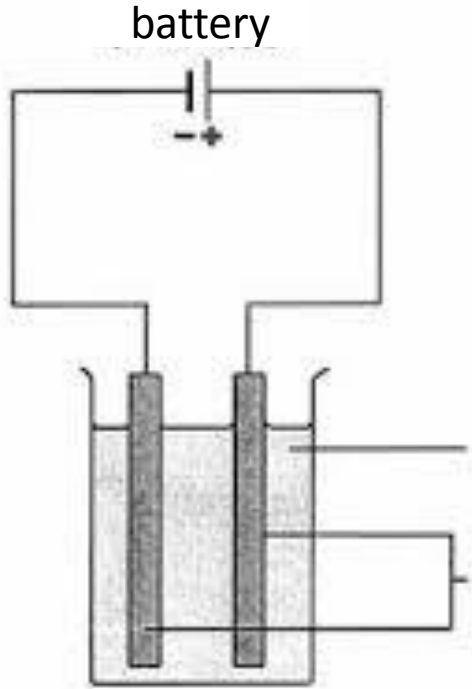
Electrons flow from
anode to cathode

to conduct charge but
will not react

Blue solution fades and pink/orange
solid deposits on cathode
Bubbles form at anode

$$\begin{aligned} \text{EMF} &= E_{\text{red}} - E_{\text{ox}} \\ &= 0.34 - 1.36 \\ &= -1.02 \text{ V} \end{aligned}$$

Electrolysis

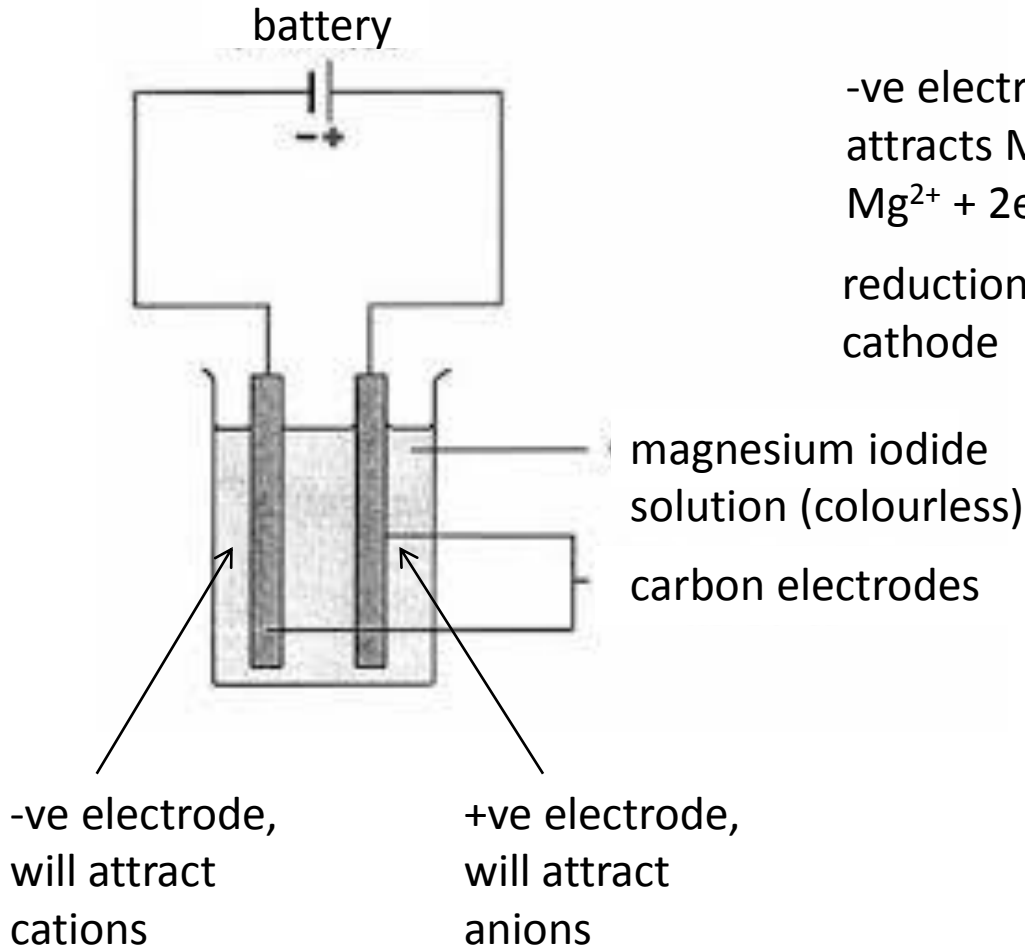


Discuss what occurs in the electrolysis of molten magnesium iodide.

In your answer include:

- the movement of ions and electrons
- identify the oxidation and reduction processes occurring at the anode and cathode
- balanced half-equations for the reactions occurring at each electrode and an equation for the overall cell reaction.

Electrolysis



-ve electrode
attracts Mg^{2+}
 $\text{Mg}^{2+} + 2e \rightarrow \text{Mg}$
reduction reaction
cathode

+ve electrode,
attracts I^-
 $2\text{I}^- \rightarrow \text{I}_2 + 2e$
oxidation reaction
anode

Electrons flow from
anode to cathode

Colourless solution turns brown at
anode (I_2), silver metal (Mg)
deposited on cathode

$$\begin{aligned}\text{EMF} &= E_{\text{red}} - E_{\text{ox}} \\ &= -2.38 - 0.54 \\ &= -2.92 \text{ V}\end{aligned}$$

Do now:

Describe the process of electrolysis in your own words.

Some key words for you to think about...

electrons

energy

anode

cathode

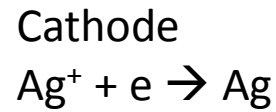
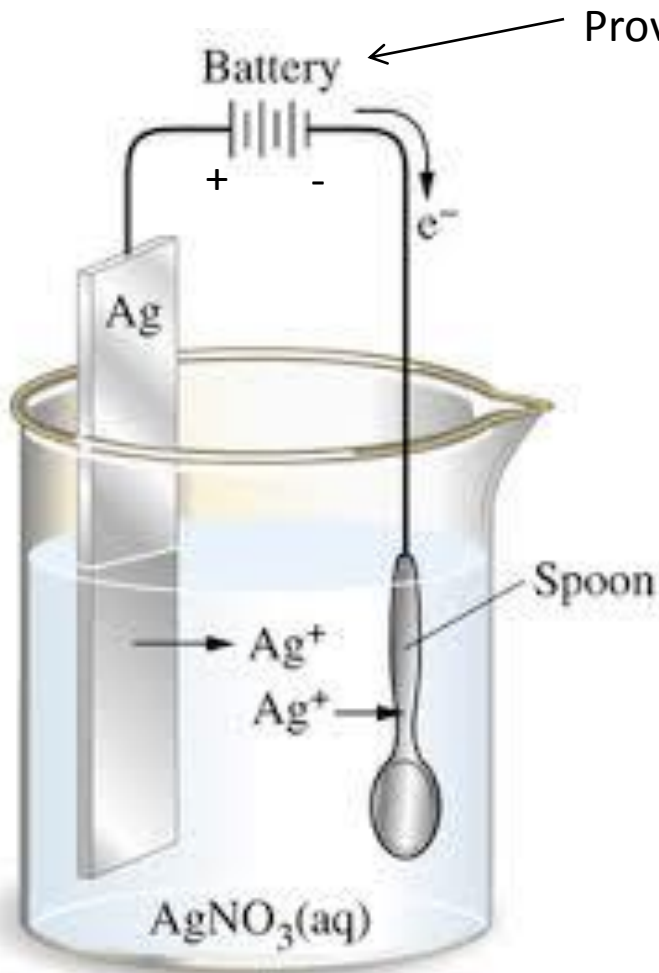
reduction

oxidation

ions

attraction

Example – silver electroplating



<http://www.progressiveelectroplaters.co.nz/>