

# Aluminium extraction

**Main ore of aluminium:** Bauxite

**Percentage of  $\text{Al}_2\text{O}_3$  (alumina)**=50-65%

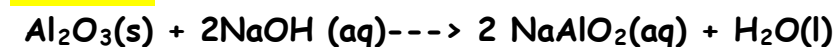
**Impurities in Bauxite are** oxides of Silicon, Iron and Titanium (SIT)

**The anode and the cathode are made up of** carbon (graphite)

**Process of removing the impurities:**

- Crush the ore and mix it with NaOH.
- Aluminium oxide reacts with sodium hydroxide and dissolves in it.
- The impurities are insoluble they are removed by filtration.

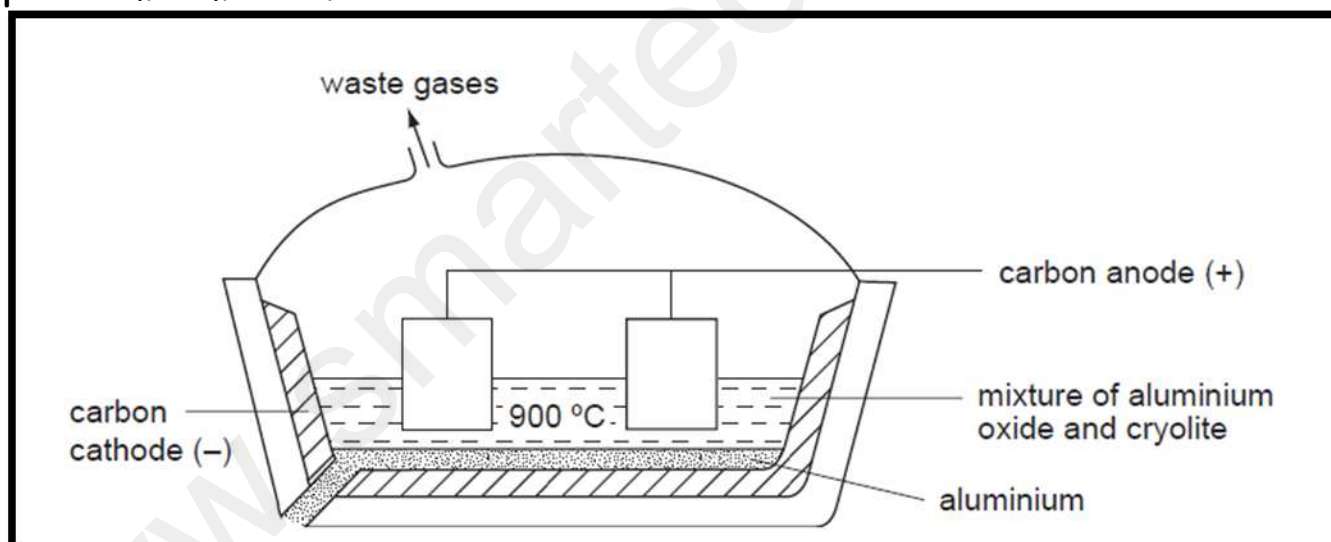
**Reaction:**



aluminium  
oxide

sodium  
aluminate

The sodium aluminate undergoes further treatment and is finally heated to make pure aluminium oxide.

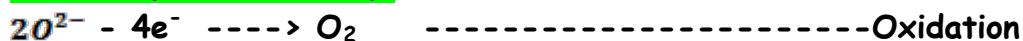


**Dimensions of the electrolytic cell:** 8m long x 1 m deep

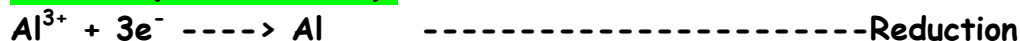
Melting point of pure aluminium oxide is  $2040^\circ\text{C}$ . To provide this high temperature for too long is very difficult. Also a lot of energy is needed to melt it and energy is expensive. Also pure  $\text{Al}_2\text{O}_3$  is a poor conductor. To overcome all these difficulties, cryolite ( $\text{Na}_3\text{AlF}_6$ ) is added to pure aluminium oxide. This reduces the melting point to  $1000^\circ\text{C}$ . Adding calcium fluoride further reduces the temperature to  $900^\circ\text{C}$ ,

**Half reactions :**

**Anode (+ve electrode):**



**Cathode (-ve electrode):**



**Overall reaction:**



The carbon anodes need to be replaced from time to time. This is because the hot carbon anodes burn away as they react with the oxygen gas and form carbon dioxide.

Thus there are 2 gases released during the experiment: oxygen and carbon dioxide. Aluminium has wide applications. Use of aluminium depends on its use.

Use of Aluminium	Property of Aluminium
Used in the manufacture of aircraft	Low density/light/resistant to corrosion/
Used to make food containers	Not attacked or corroded /unreactive as it covered by the oxide layer./It can be easily shaped/It is malleable and ductile.

Also aluminium electricity cables have a steel core: This is because steel gives it the strength and prevents it from sagging. Hence the pylons can be made further apart.

---