ALUMINIUM

Electro-chemical Series

- This series is another way to compare metals. Each metal is placed in a circuit and combined with a standard electrode called the hydrogen electrode.
- In the electrochemical series aluminium is the fifth (5^{th}) metal with a voltage of -1.66.

Converting Bauxite to Alumina

Bauxite Supply

Crush and Grind

Digesters

Flash Cooling

Settlers

Precipitation

Calcinations

- *Crush and Grind:* The ore is then fed into large grinding mills and mixed with a caustic soda solution (sodium hydroxide) at high temperature and pressure.

- *Digesters:* The slurry is pumped to a digester where the chemical reaction to dissolve the alumina takes place.

- *Flash Cooling:* The slurry is pumped into a series of flash tanks to reduce the pressure and heat.

- *Settlers:* Settling is achieved primarily by using gravity, although some chemicals are added to aid the process.

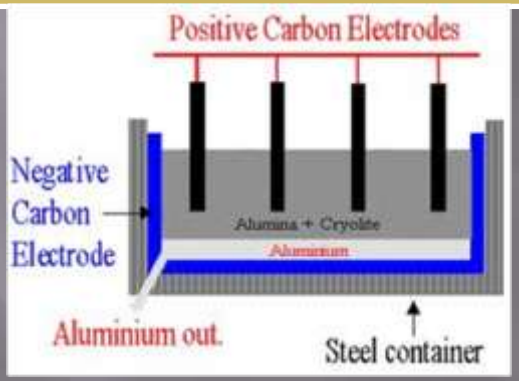
- *Precipitation:* The clear sodium aluminate from the settling and filtering operation is pumped into precipitators.

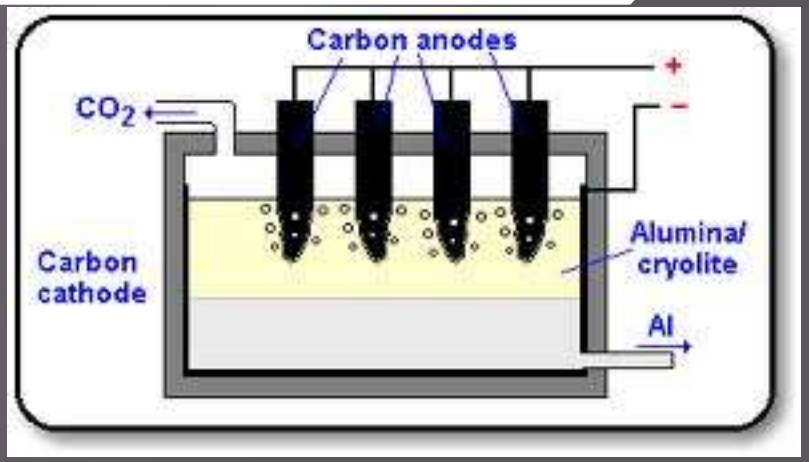
- *Calcination:* Calcination is a heating process to remove the chemically combined water from the alumina hydrate.

Converting Alumina to Aluminium

Calcinations

Smelting





- The Hall-Heroult process takes place in a large carbon or graphite lined steel container called a reduction pot. In most plants, the pots are lined up in long rows, called potlines.

- The immense amounts of power required to produce aluminum is the reason aluminum plants are almost always located in areas where affordable electrical power is readily available.

- The current flows between a carbon **anode** and a **cathode** formed by the thick carbon or graphite lining of the pot.

- When the electric current passes through the mixture, the carbon of the anode combines with the oxygen in the alumina. The chemical reaction produces metallic aluminum and carbon dioxide.

- The electrolytic cell used is a steel tank with a carbon base which is made the cathode. Multiple carbon anodes dip into the cell:

- Aluminium is produced at the cathode (-):

$Al^{3+} + 3e \rightarrow Al(l)$

- Oxygen is produced at the anode (+)

$2O^{2-} \rightarrow O_2(g) + 4e^-$

Uses of Aluminium

- Packaging (drinks cans, foil wrappings).
- Transportation (aircraft, automobiles).
- Construction (windows, building wire).
- Electrical transmission lines for power distribution.
- Powdered aluminum is used in paint.
- Street lighting poles and sailing ship masts.
- Electrical applications (satellite dishes).

END OF PRESENTATION

Group Members

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