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The birth of electrochemistry: building a simple voltaic pile

How it works

A battery converts chemical energy into electrical energy through **spontaneous redox reactions**.

The following are essential elements for electricity production:

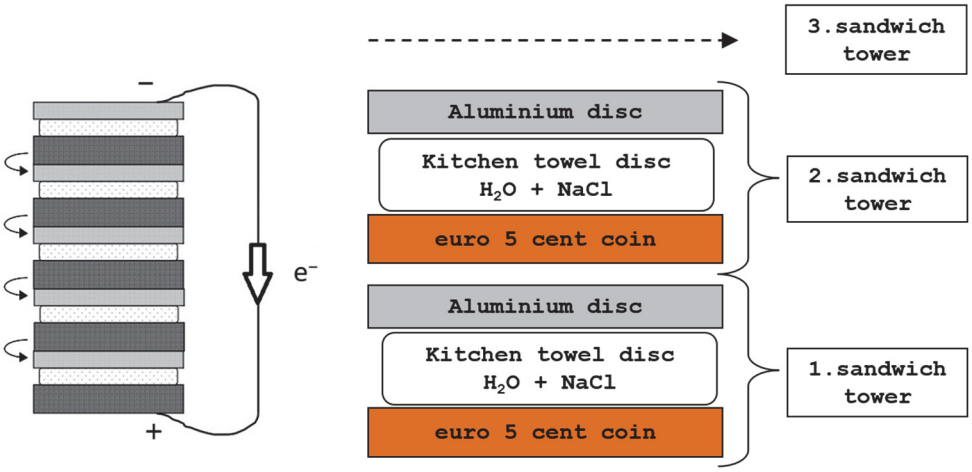
Anode (−): site of oxidation (loss of electrons)

Cathode (+): site of reduction (gain of electrons)

Salt bridge: contains an electrolyte that facilitates the free movement of positive and negative ions

Electrons flow from the anode to the cathode via a conductive wire.

The battery constructed in this activity is a prototype air/aluminium battery and its composition is as follows: aluminium anode; oxygen cathode; water and NaCl solution electrolyte.



$$4 \mid Al + 3OH^- \longrightarrow Al(OH)_3 + 3e^- \qquad \text{Anode } (-)$$

$$3 \mid O_2 + 4e^- + 2H_2O \longrightarrow 4OH^- \qquad \text{Cathode } (+)$$

$$4Al + 3O_2 + 12e^- + 12OH^- + 6H_2O \longrightarrow 4Al(OH)_3 + 12e^- + 12OH^-$$

$$\mathbf{4Al + 3O_2 + 6H_2O \longrightarrow 4Al(OH)_3}$$

The voltaic pile and the half equations for each electrode, along with the overall balanced reaction

Image courtesy of the author