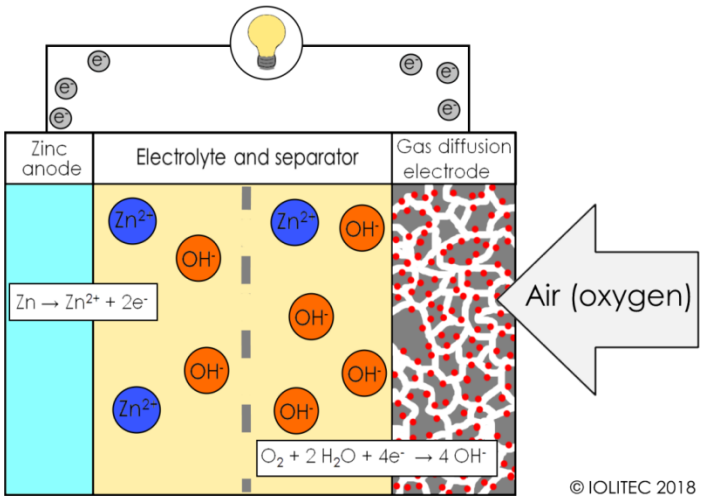
Zinc-Air battery

Zinc-Air batteries are a type of modern battery that generates electrical power through the reaction of zinc metal with oxygen from the air. They are commonly used in devices like hearing aids, pagers, and, increasingly, in larger applications such as electric vehicles and energy storage systems.

Zinc air batteries are the batteries which breathe air, that is , they use oxygen directly from the air to bring about the electrochemical reaction. These are basically alkaline batteries in which the cathodic active material is not stored in the cell.

Construction

- Anode is composed of granulated zinc powder mixed with an aqueous solution 30% KOH and a gelling agent to immobilize the material.
- Cathode is composed of mixture of carbon and the catalyst and a gelling agent held on a nickel coated steel matrix.
- Several hydrophobic, gas permeable, thin layers of Teflon are provided to steady the air entry.
- Electrolyte contains 30% KOH.
- There is also vent for the entry of air or O_2 into the cell.
- The container is made of glass and has a separator made of nylon.



The reactions involved in the cell are:

At the anode:

$$Zn \longrightarrow Zn^{2+} + 2e^-$$

$$Zn^{2+} + 2OH^- \longrightarrow ZnO + H_2O$$

$$Zn + 2OH^- \longrightarrow ZnO + H_2O + 2e^-$$

At the cathode:

$$H_2O + 1/2\ O_2 + 2e^- \longrightarrow 2OH^-$$

The overall cell reaction :

$$Zn + 1/2\ O_2 \longrightarrow ZnO$$

The battery offers an EMF of 1.25-1.35V.

Advantages

- These are light and have high energy density.
- These are relatively eco-friendly and have unlimited capacity.

Disadvantage

- Non Rechargable
- Low C-Rate
- The major disadvantage is the dependence of both performance and operating period on ambient conditions such as humidity and temperature.