

Primary Batteries

Primary batteries are not easily rechargeable, and consequently are discharged then disposed of. Many of these are “dry cells” – cells in which the electrolyte is not a liquid but a paste or similar. The cell electrochemical reactions are not easily reversible and cell is operated until the active components in the electrodes are exhausted. Generally primary batteries have a higher capacity and initial voltage than rechargeable batteries.

Applications:

- Portable devices
- Lighting
- Toys
- Memory back-up
- Watches/clocks
- Hearing aids
- Radios
- Medical implants
- Defence related systems such as missiles

Advantages:

- Inexpensive
- Convenient
- Lightweight
- Good shelf life
- High Energy density at low/moderate discharges

Disadvantages:

- Can only be used once
- Leads to large amount of waste batteries to be recycled
- Batteries put into landfill sites have severe environmental impact
- Life cycle energy efficiency < 2 %

The table below demonstrates the properties of various primary batteries:

System	Nominal Cell Voltage (V)	Capacity (Wh/kg)	Advantages	Disadvantages	Applications
<u>Carbon/Zinc</u>	1.50	65	Lowest cost; variety of shapes and sizes	Low energy density; poor low-temperature performance	Torches; radios; electronic toys and games
Mg/MnO₂	1.60	105	Higher capacity than C/Zn; good shelf life	High gassing on discharge; delayed voltage	Military and aircraft receiver-transmitters
<u>Zn/Alk/MnO₂</u>	1.50	95	Higher capacity than C/Zn; good low-temperature performance	Moderate cost	Personal stereos; calculators; radio; TV
Zn/HgO	1.35	105	High Energy density; flat discharge; stable voltage	Expensive; energy density only moderate	Hearing aids; pacemakers; photography; military sensors/detectors
Cd/HgO	0.90	45	Good high and low-temperature performance; good shelf life	Expensive; low energy density	
<u>Zn/Ag₂O</u>	1.50	130	High Energy density, good	Expensive (but cost effective)	Watches; photography;

			high rate performance		missiles; Larger space applications
Zn/Air	1.50	290	High Energy density; long shelf life	Dependent on environment; limited power output	Watches; hearing aids; railway signals; electric fences
Li/SOCl₂	3.60	300	High Energy density; long shelf life	Only low to moderate rate applications	Memory devices; standby electrical power devices
Li/SO₂	3.00	280	High energy density; best low-temperature performance; long shelf life	High-cost pressurized system	Military and special industrial needs
Li/MnO₂	3.00	200	High energy density; good low-temperature performance; cost effective	Small in size, only low-drain applications	Electrical medical devices; memory circuits; fusing

Source : <http://www.doitpoms.ac.uk/tlplib/batteries/primary.php>