Secondary Batteries

Secondary (rechargeable) batteries can be recharged by applying a reverse current, as the electrochemical reaction is reversible. The original active materials at the two electrodes can be reconstituted chemically and structurally by the application of an electrical potential between the electrodes to “inject” energy. These batteries can be discharged and recharged many times.

Applications:

These fall into two categories:

(a) The battery is used as an energy storage device. It is constantly connected to an energy source and charged by it. It can then release the stored energy whenever needed, e.g. in

- Car battery used to start engine
- Aircraft systems
- Standby power resources
- Emergency no-fail systems

(b) The battery is used as a primary battery would be but is then recharged instead of being disposed of, e.g. in

- Electric vehicles
- Mobile phones
- Cameras
- Power tools
- Toys
- Portable computers

Advantages:

- High power density
- High discharge rate
- Good low temperature performance

Disadvantages:

- Lower Energy density

- Poorer charge retention
- Safety issues
- Lack of standards
- High initial costs

The table below demonstrates the properties of various rechargeable batteries:

System	Nominal Cell Voltage (V)	Capacity (Wh/kg)	Advantages	Disadvantages	Applications
Pb/Acid	2.00	35	Low cost; good high and low-temperature operation	Low cycle life; low energy density; poor charge retention	Cars; lawn mowers; aircraft
Ni/Cd	1.20	30	Good physical durability; good charge retention; good cycle life	High cost; memory effect	Aircraft; emergency power applications
Ni/Fe	1.20	60	Good physical durability; long cycling and standing life	Low power and energy density; high self discharge; high cost	Stationary applications; fork lift trucks
Ni/Zn	1.60	27	High energy density; low cost; good low-temperature performance	Poor cycle life	Electric scooters/bikes; military vehicles
Zn/AgO	1.50	90	Highest energy	High cost; low cycle	Military

			density; low self discharge; high discharge rate	life; low performance at low temperatures	equipment eg torpedo propulsion, submarines
Cd/AgO	1.20	55	High energy density; low self discharge; Good cycle life	High cost; low performance at low temperatures	Portable power tools; satellites
Ni/H_2	1.40	55	High energy density; good cycle life; can tolerate over charge	High initial cost; self discharge proportional to H_2pressure	Aerospace
Ag/H_2	1.40	80	High energy density; good cycle life	High cost - limited to military and aerospace applications	Aerospace
Li/Poly	up to 4.2	135	High specific energy; good shelf life; moldable; non-volatile	High cost; expensive control methods needed for charge/discharge	Mobile phones

Source : http://www.doitpoms.ac.uk/tlplib/batteries/secondary.php