General Battery Performance Comparison

	Manganese Laminate Li-ion	Cobalt Li-ion	Ni-Mh	Pb
Energy Density	○ 240Wh/L	○ 280Wh/L	△ 190Wh/L	× 38Wh/L
Storage Characteristic	◎ **8 years 50%**	△ 5 years 50%	× 2 years 50%	× 1 year 50%
Cycle Life	◎ **500**	× **300**	× **400**	× **100**
Efficiency per volume	○ 145Wh/L	○ 170Wh/L	× 60Wh/L	× 17Wh/L
Environment	○	○	○	×
Safety	◎ **With safety IC circuit board**	×	○	○
Cost	△ Yen100/Wh	△ Yen100/Wh	△ Yen90/Wh	○ Yen45/Wh

Comparative chart of Li-ion battery

General structure feature

Cell Structure

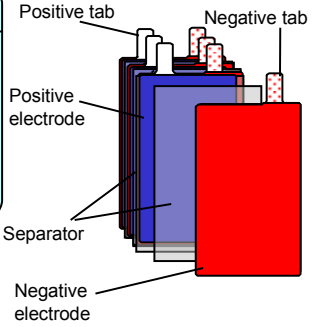
Manganese system — Stacked-laminated

Advantage

- It has a lot of flexibility to ensure performance & quality due to unlimited external size, therefore, it is possible to ensure high safety. (Inside short circuit by foreign body is unlikely to occur since thick separator can be used & inner pressure is low.)

Disadvantage

- Low productivity and high cost



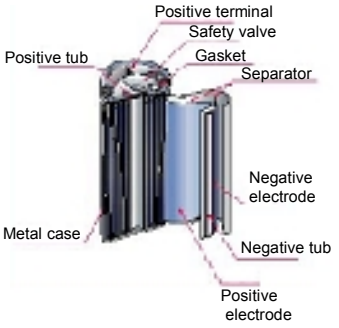
Cobalt system — Can (rolled) structure

Advantage

- External size is standardized and versatility is good.
- High productivity and cost performance

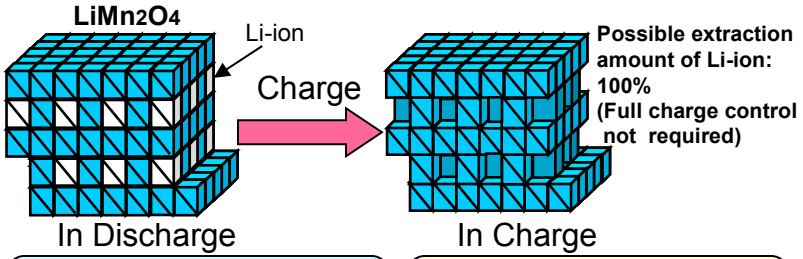
Disadvantage

- Separator is thin due to limited external size and force in rolling is strong, it has high risk of inside short circuit.



Crystal Structure (Positive electrode)

Manganese system — Spinel structure



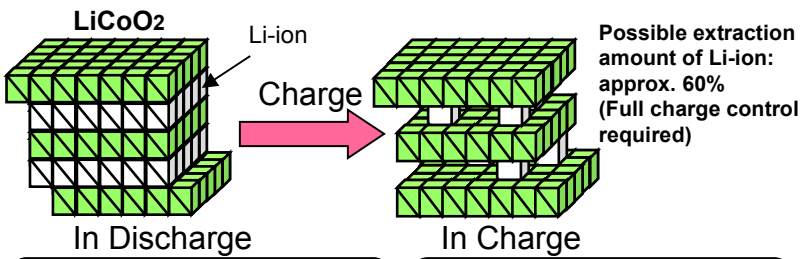
Advantage

- Crystal structure in charge is stable and runway effect due to overcharge is unlikely to occur. (Temperature of runway effect is higher by 100 deg.C and over than cobalt system.)

Disadvantage

- Possible extraction of energy amount is small.

Cobalt system — Layered structure



Advantage

- Possible extraction of energy amount is large. (Approx 110% of Mn system)

Disadvantage

- Crystal structure in charge is unstable and runway effect is likely to occur.
- Full charge control is required. (Control by each cell is required for assembled battery.)

Our Li-ion battery has adopted safer manganese system and also following safety circuit to ensure further safety.

Quadruple safety circuit has applied !