

Comparison of Secondary Batteries

| | Lead-Acid | Ni-Cd | Ni-MH | Li-Co | Li-Mn | LiFePO4 |
|---|-----------|--------|--------|---------------------|---------------------|---------|
| Commercialization (since) | ~1956 | 1990 | 1990 | 1992 | 1997 | 2004 |
| Operation Voltage (V/Cell) | 2V | 1.2V | 1.2V | 3.7V | 3.7V | 3.3V |
| Capacity (mAh/g) | -- | -- | -- | 140~150 | 105 | 150 |
| Energy Density (Wh/L) | 100 | 150 | 250 | 466 | 285 | 270 |
| Energy Density (Wh/Kg) | 30 | 57 | 80 | 167 | 110 | 112 |
| Power (W/Kg) | 300 | 855 | 800 | 320 | 400 | 2,240 |
| Cycle life | 400 | 500 | 500 | >500 | >500 | >2000 |
| Working Life(Yr) (* Charge one time per day) | 1 | 2 | 2 | 2 | 2 | 5.5 |
| Energy Efficiency(%) | 60 | 75 | 70 | 90 | 90 | 95 |
| Charging Time(h) | 8hrs | 1.5hrs | 4hrs | 2~4hrs | 2~4hrs | 0.5~1hr |
| Self-discharging rate(%) per month | 20 | 30 | 35 | 10 | 10 | 8 |
| Safety | Good | Good | Good | Worse ^{*1} | Average | Good |
| High Temperature Performance | Good | Good | Good | Average | Worse ^{*2} | Good |
| Memory Effect ^{*3} | No | Yes | Little | No | No | No |
| Green Product | No | No | Yes | Yes | Yes | Yes |

*1: Extremely low safety. Protection circuit is required preventing from overcharge/discharge which may cause explosion.

*2: The capacity drops from 20% at 50°C, and drops 50% at 80°C in which the capacity could not be refilled.

*3: the batteries with memory effect such as Ni-Cd or Ni-MH have to completely discharge before recharge; otherwise, the capacity will decrease. Li-ion batteries, however, without any memory effect, so they can be charged in any situation.

Human Safe & Eco Friendly