What is the cycle life of rechargeable battery?

When a battery experiences a charge and discharge, we call a cycle or a period. In the stated charge and discharge principles and the capacity decline before a stated standard, the total cycles it can undergo called rechargeable battery cycle life.

What is rechargeable battery self discharge?

Primary battery or full charged secondary battery, when put aside for a period, it is capacity will decline or lose, this phenomenon calls self discharge that is electricity flee away. It is decided by the inner electro chemistry system, similar to water leakage from pond or reservoir.

What is battery inner impedance?

Battery impedance is the resistance when the current flow through an operating cell, in general the internal resistance is included both d.c. and a.c. resistance. For the rechargeable cell resistance is small and electrode is easy to be polarized along with producing a polarization resistance while measure d.c. resistance, the accurate value can't be measured.

What is the memory effect?

Memory effect only happens on Ni-Cd batteries. As in traditional technology a Ni-Cd battery's negative is agglomeration with thick Ni crystal, if Ni-Cd batteries are recharged before they have been fully discharged, Ni crystal easily gathers to form agglomeration, which makes the primary discharge platform come into being. The battery stores the platform, which will be considered as the end of discharge for the next cycle even though the capacity decides that the battery can be discharged to a lower platform. The battery will store this process in its memory so during the next discharge, the battery only remembers this reduced capacity. Similarly any further incomplete discharge in each use will aggravate the effect makes lower capacity. The effect there are two methods to remove the effect: firstly deep discharge at trickle current (i.e. 0.1C to 0V), secondly several cycles at high currents.

What does the ambient temperature affect the battery performance?

Low temperatures will obviously reduce Ni-Cd and Ni-MH battery discharge rate. At -20? electrolyte is at its freezing point, charge speed will greatly slow down. At low temperature (under -15?) charge will raise the internal gas pressure and probably unseal the safety vent. Ambient temperature of 5?to 30? is the best range to get effective charge. Generally with temperature rising charge efficiency will become higher. But when the temperature rises to 45? or higher, the materials performance in the battery will be degenerated and battery service life will be shorten greatly.

What does the "Over-charge" affect the battery performance?

"Over-charge" is described as a continuous charge action after the battery has been fully charged by a certain charge method. Since the capacity level from positive polarity is higher than the negative polarity, the positive polarity will generate Oxygen, which can be composed with the Cadmium generated from negative polarity via separator. In general condition, the internal pressure will not increase significantly, however, if the charging-current applied for battery is too much, the charging-time is extremely long and finally the Oxygen could not be used up in time, the battery will be defected by a pressure risen, battery distortion, leakage and so on. Definitely the battery's performance will decline as well

What does the "Over-discharge" affect the battery performance?

If a cell's voltage reaches a designed value, that means the battery has discharge the stored capacity, but still the discharge action is continual, over-discharge will cause. Commonly the end voltage can be identified through discharge current, for example the end voltage is set at 1.0V/cell as discharged at 0.2C-2C, and 0.8V/cell at 3C or more, e.g. 5C or 10C. Over discharge may cause disaster, especially at heavy current or repeated over discharge. Commonly over discharge can make cell inner pressure raise, and the reversibility of activity materials both in positive and negative will be damaged. Even by charge only part can recover and the capacity is reduced obviously.

What does the short circuit affect the battery performance?

Any kinds of conductive material being bridged with the external terminals of a battery will result in short circuit. Based on the battery system, a short circuit may have serious consequences, e.g. rising electrolyte temperature or building up internal gas pressure. If the internal gas pressure value exceeds the limitation of cell cap endurance, the electrolyte will leak, which will damage battery greatly. If safe vent fails to respond, even explosion will occur. Therefore don't short circuit.

What is the performance of Nickel Cadmium battery?

►Low cost;
►Excellent overcharge endurance;
►Excellent quick charge performance;
►Long cycle life;
►Extensive temperature range;
►Mid-degree self-discharge;
►Good safety performance.

What is the performance of Nickel Metal Hydride battery?

►Low cost;
►Good quick charge performance;
►Long cycle life;
►No memory accumulation;
►Green energy sources, no pollution;
►Extensive temperature range;
►Good safety performance.

What is the performance of Lithium ion battery?

►High energy density;
►High operation voltage;
►No memory accumulation;
►Long cycle life;
►No pollution;
►Light weight;
►Very low self-discharge rate.

What is the performance of Polymer Lithium ion battery?

►No liquid electrolyte, so never leak;
►Can be made into various shape;
►Can be made into thin battery, such as 3.6V, 400mAh, the thickness can decrease to 0.5mm;
►High voltage in an battery: several battery with liquid electrolyte can be connected in series to get a high voltage only; the Li-polymer battery can get
►High voltage in an cell through multiplayer combination;
Same volume Li-polymer batteries` capacity is two times of Li-ion battery.

What is the performance of Lithium MnO2 and Li-SOCL2 battery?

►High energy density;
►Long shelf life;
►Wide operating temperature;
►Good sealing feature;
►Steady discharge voltage

Why do batteries packs with zero voltage or low voltage?

►One of the cells voltages is 0V;
►Plugs are short or open circuit, or ill touched;
►Lead wires are broken from the soldering or weakly soldered;

►Wrong battery connection or the connection tabs are miss or weak weld or broken off.

Safety Precautions:

1. Read specification carefully or consult how to use correctly.
2. According to electric appliance indication, please build in the battery positive pole and negative pole correctly.
3. Do not put new and old battery or different kind and model battery into use together.
4. Do not charge for the primary battery.
5. Do not heat or disassemble the battery, even put it into fire or water.
6. Do not short-circuit, in case of battery exploding, leakage or other casualty.
7. If finding exceptional conditions, such as terrible odor, leakage, cracks and deformation on the battery crust, please stop using the battery immediately.
8. Put the battery where children can not reach.
9. If leaked liquid gets into eyes, flush eyes thoroughly with clean water at least 15 minutes, lifting upper and lower lids until no evidence of the chemical remains. Seek medical attention.
10. If the electric appliance do not use for long-term, please take the battery out and store in a cool, well ventilated area.

Why Li-ion battery pack has 0 voltage?

For safety consideration, our li-ion battery pack has PCB protection which will protect the battery packs from over charging and discharge. When the li-ion battery is over charging or discharged, the PCB will cut off automatically. Then you may find the battery pack is 0 voltage. This doesn't mean the battery pack is dead. You can just use our charger to charge it, everything will back to normal. Please make sure to use SUNBEST's recommended chargers. We are not responsible for other brand chargers. However, this is not applied to battery which hadn't been charged for more than two months. You should charge battery every 2 months to keep it fresh if you don't use it.

How to recover low voltage 7.2v-9.6v NMh battery pack (0.5v/ cell level)by shocking method?

If the voltage of NiMH battery is less than 1.0V/cell, It does not mean either the pack is a defective unit or the charger could not recognize the pack.
Please shock the cell or the pack by12v DC 0.5 Amp Ac adaptor for 1 minute. Then your charger will recognize the cell or the pack and could charge by nominal charging current.

How to take care of your Powerizer rechargeable battery:

All NiCd, NiMh & Li-Ion rechargeable battery (pack) that we send out is **not** fully charge. This is due to safety reason during shipping. To ensure the battery (pack) will last a long time for your enjoyment, you need to perform the following steps when you receive our battery (pack).

For NiCd or NiMh battery (pack):

1.Charge the battery (pack) fully before using.
2.Discharge the battery (pack) fully (down to 1.0V per cell) before charging it again or till it won't operate your device.
3.Repeat steps 1&2 four (4) times to condition the battery so it can reach its full capacity
4.We recommend recharge the battery (pack) at least once every 2 months to maintain the battery's capacity.

For Li-Ion battery (pack):

►We recommend recharge the battery (pack) at least ***once every 2 months*** to maintain the battery's capacity or
►When the battery is drop below 3.0V or If it is a pack when it reach the minimum voltage (# of cells x 3.0V) you should recharge the battery pack. Ex: for a 14.8V pack (4 cells x 3 = 12V). If your pack reaches 12V, you should recharge the battery pack.

Rechargeable battery for solar light:

Perform the above steps with an AC battery charger before inserting it into your solar light. If no AC charger is available, then make sure you insert the battery in the morning so it got plenty of sunlight to charge up these batteries. Otherwise, you might run the risk of over discharge the battery and the low current generated by the solar panel won't be able to charge these batteries.

What is the best battery?

Below is a summary of the strength and limitations of today's popular battery systems. Although energy density is paramount, other important attributes are service life, load characteristics, maintenance requirements, self-discharge costs and safety. Nickel-cadmium is the first rechargeable battery in small format and forms a standard against which other chemistry are commonly compared. The trend is towards lithium-based systems.

Nickel-cadmium- mature but has moderate energy density. Nickel-cadmium is used where long life, high discharge rate and extended temperature range is important. Main applications are two-way radios, biomedical equipment and power tools. Nickel-cadmium contains toxic metals.

Nickel-metal-hydride- has a higher energy density compared to nickel-cadmium at the expense of reduced cycle life. There are no toxic metals. Applications include mobile phones and laptop computers. NiMH is viewed as steppingstone to lithium-based systems.

Lead-acid- most economical for larger power applications where weight is of little concern. Lead-acid is the preferred choice for hospital equipment, wheelchairs, emergency lighting and UPS systems. Lead acid is inexpensive and rugged. It serves a unique niche that would be hard to replace with other systems.

Lithium-ion- fastest growing battery system; offers high-energy density and

low weight. Protection circuit are needed to limit voltage and current for safety reasons. Applications include notebook computers and cell phones. High current versions are available for power tools and medical devices.

Table 1 summarizes the characteristics of the common batteries. The figures are based on average ratings at time of publication. Lithium-ion is divided into three versions: The traditional cobalt that is commonly used in cell phones, cameras and laptops; the manganese (spinel) that power high-end power tools and the new phosphate that competes head-on with spinel. Lithium-ion polymer is not listed as a separate system. Its unique construction performs in a same way to cobalt-based lithium-ion.

	Nickel-cadmium	Nickel-metal-hydride	Lead-acid sealed	Lithium-ion cobalt	Lithium-ion manganese	Lithium-ion phosphate
Gravimetric Energy Density (Wh/kg)	45-80	60-120	30-50	**160-200**	**140-160**	**120-140**
Internal Resistance in mΩ	100 to 200[1] 6V pack	200 to 300[1] 6V pack	<100[1] 12V pack	150 - 300[1] pack 100 -130 per cell	25 – 75[2] per cell	25 – 50[2] per cell
Cycle Life (to 80% of initial capacity)	1500[2]	300 to 500[3,4]	200 to 300[3]	300 - 500[3]	Better than 300 – 500[4]	>1000 lab conditions
Fast Charge Time	1h typical	2 to 4h	8 to 16h	1.5 - 3h	1h or less	1h or less
Overcharge Tolerance	moderate	low	high	Low. Cannot tolerate trickle charge.		
Self-discharge / Month (room temperature)	20%[5]	30%[5]	5%	<10%[6]		
Cell Voltage Nominal Average	1.25V[7]	1.25V[7]	2V	3.6V 3.7V[8]	Nominal 3.6V Average 3.8V[8]	3.3V
Load Current peak best result	20C 1C	5C 0.5C or lower	5C[9] 0.2C	<3C 1C or lower	>30C 10C or lower	>30C 10C or lower
Operating Temperature[10] (discharge only)	-40 to 60°C	-20 to 60°C	-20 to 60°C	-20 to 60°C		
Maintenance Requirement	30 to 60 days	60 to 90 days	3 to 6 months[11]	not required		
Safety	Thermally stable, fuse recommended	Thermally stable, fuse recommended	Thermally stable	Protection circuit mandatory; stable to 150°C	Protection circuit recommended; stable to 250°C	Protection circuit recommended; stable to 250°C
Commercial use since	1950	1990	1970	1991	1996	2006
Toxicity	Highly toxic, harmful to environment	Relatively low toxicity, should be recycled	Toxic lead and acids, harmful to environment	Low toxicity, can be disposed in small quantities		

Table 1: Characteristics of commonly used rechargeable batteries.

1) Internal resistance of a battery pack varies with mAh rating, wiring and number of cells. Protection circuit of lithium-ion adds about 100mW.
2) Based on 18650 cell size. Cell size and design determines internal resistance. Larger cells can have an impedance of <15mOhms,
3) Cycle life is based on battery receiving regular maintenance. Failing to apply periodic full discharge cycles may reduce the cycle life by a factor of three.
4) Cycle life is based on the depth of discharge. Shallow discharges provide more cycles than deep discharges.

5) The self-discharge is highest immediately after charge, and then tapers off. The capacity loss of nickel-cadmium is 10% in the first 24h, then declines to about 10% every 30 days thereafter. High temperature increases self-discharge.
6) Internal protection circuits typically consume 3% of the stored energy per month.
7) The traditional nominal voltage is 1.25V; 1.2V is more commonly used to harmonize with lithium-ion (3 in series = 3.6V).
8) Lithium-ion is often rated higher than the nominal 3.6V. Based on average voltage under load.
9) Capable of high current pulses; needs time to recuperate.
10) Applies to discharge only; charge temperature range is more confined. Delivers lower capacity at lower temperatures.
11) Maintenance may be in the form of 'equalizing' or 'topping' charge to prevent sulphation.