Lithium Polymer Batteries

Lithium-ion polymer batteries, **polymer lithium ion** or more commonly **lithium polymer batteries** (abbreviated Li-poly, Li-Pol, LiPo, LIP, PLI or LiP) are rechargeable batteries. LiPo batteries are usually composed of several identical secondary cells in parallel to increase the discharge current capability, and are often available in series "packs" to increase the total available voltage.

They are not to be confused with Lithium-ion batteries. They are not the same thing!

This type has technologically evolved from lithium-ion batteries. The primary difference is that the lithium-salt electrolyte is not held in an organic solvent but in a solid polymer composite such as polyethylene oxide or polyacrylonitrile. The polymer electrolyte replaces the traditional porous separator, which is soaked with electrolyte.

The advantages of Li-ion polymer over the lithium-ion design include ″potentially″ lower cost of manufacture, adaptability to a wide variety of packaging shapes, reliability, and ruggedness, with the disadvantage of holding less charge. Lithium-ion polymer batteries started appearing in consumer electronics around 1995.

Some advantages to lithium polymer batteries are:

- Lithium Polymer batteries are become more popular in devices that would have normally housed lithium-ion batteries. Such as some cell phones (depending on manufacture of said cell phone) and even cordless telephones. Most cordless headsets use them as well as most GPS devices. Even some of the new technologies such as e-readers are using lithium polymer batteries.
- Because of their light weight and design, they appeal to a lot of cell phone manufactures. Especially when working with really small devices. Also a lot of airsoft guns are converting to this technology because of the lightweight but also because of the increased rate of fire they provide. RC cars manufactures are also becoming increasingly interested in these batteries for the power and capability they provide.
- In recent years, manufacturers such as Sanyo have been declaring upwards of 500 charge-discharge cycles before the capacity drops to 80%. Another variant of Li-poly cells, the "thin film rechargeable lithium battery", has been shown to provide more than 10,000 cycles

Li-Po also has some disadvantages as well:

- Overcharging a Li-poly battery can cause an explosion or fire
- A dry lithium polymer suffers from poor conductivity. Internal resistance is too high and cannot deliver the current bursts needed for modern communication devices and spinning up the hard drives of mobile computing equipment.
- In most cases, the capacity of a lithium polymer battery is less than what it would be in a lithium-ion battery.
- Costs for manufactures is high, once produced the battery has potential for lower cost. Reduced control circuit offsets higher manufacturing costs.

Inside a Li-Poly Battery Pack or Cell

Lithium polymer cells have a flexible, foil-type (polymer laminate) case, but they still contain organic solvent. Since no metal battery cell casing is needed, the battery can be lighter and it can be specifically shaped to fit the device it will power. Because of the denser packaging without the holes between cylindrical cells and the lack of metal casing, the energy density of Li-Poly batteries is over 20% higher than that of a classical Li-Ion battery and approximately three times better than Ni-Cd and NiMH batteries.

It uses a solid polymer composite such as polyacrylonitrile (hence the "poly" for the electrolyte) as a physical separator, which reduces, but does not eliminate, the opportunity for internal shorting that can cause fires and explosions. Lithium, at atomic number 3, is a silvery white/gray metal that is highly reactive. Having an atomic number of 3 also accounts for its light weight. It is first in the series of alkali metals, and is the first solid element. Lithium reacts with and can catch fire in water and water vapor in the presence of oxygen. It also reacts with nitrogen, and since our air is 79% nitrogen, there is ample opportunity for a reaction in everyday use if the packaging is breeched either by puncturing or overheating.