# Are lithium polymer batteries rechargeable

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A lithium polymer battery is a rechargeable battery with a polymer electrolyte instead of a liquid electrolyte. Often abbreviated as LiPo, LIP, Li-poly or lithium-poly, a lithium polymer battery is rechargeable, lightweight and provides higher specific energy than many other types of batteries.

Polymers, a term originating from Greek words meaning "many parts," are natural and synthetic substances made from very large molecules that themselves consist of simpler chemical units. For example, DNA is a polymer of nucleotides.

True LiPo batteries use a highly conductive semisolid (gel) or solid polymer for the electrolyte and lithium for one of the electrodes. Commercially available LiPo batteries are hybrids: gel polymer or liquid electrolyte in a pouch format.

The battery includes a polymer barrier that also contains the electrolyte, a substance that allows lithium ions to move between the battery"s electrodes, also known as its anode and cathode. This barrier also serves to separate the electrodes and can be used to shut down the battery if it becomes too hot, for example, during charging or discharging.

When the barrier is designed to perform the shutdown function, it contains at least one polyethylene layer and at least one polypropylene layer. The polyethylene layer stops the current flow when the temperature rises beyond a certain threshold, and the polypropylene layer provides mechanical support for the barrier.

The structure of the polymer layers in these different chemistries varies, resulting in different energy densities watt-hours per kilogram (Wh/kg), power densities watt per kilogram (W/kg), battery weight and safety levels. As a result, LiPos have more potential applications than many other types of rechargeable batteries.

LiPos for commercial use offer reduced thickness, flexibility and weight. These qualities make LiPos suitable for applications where a lightweight battery is desirable, including smartphones, tablets and wearables. LiPos are also used in some drones and electric vehicles. They are also commonly used in radio-controlled hobby devices.

More broadly, however, lithium ion (Li-ion) batteries remain more popular than LiPo due to their better discharge abilities. That said, pouch-type standard Li-ion batteries require external casing to prevent expansion that would otherwise become a performance and safety issue.

Another difference is in the battery packaging. Li-ion batteries usually come in a stainless steel or aluminum case, often cylindrical in shape and sealed using a laser welding process, to protect the battery from damage.

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In contrast, LiPo batteries are packaged in an aluminum foil pouch, which is why these batteries are known as pouch (or soft) cells.

The LiPo pouch is easier to fabricate and lighter than Li-ion cases. Also, the battery includes wafer-thin layers. Due to these features, LiPo batteries cost less than Li-ion batteries. These features also allow for the mass production of LiPo batteries in many different configurations and make LiPos more suitable than Li-ions for lightweight systems. The chief drawback of LiPo pouches is that they are more susceptible to physical damage such as ruptures, which may cause the battery to stop working. Electrolyte leaks and fires are also a possibility with LiPos.

There are benefits and drawbacks to both LiPos and Li-ions. It is also worth noting that, due to advancements in technology over the years, the current generation of LiPo batteries are no longer drastically different from Li-ion batteries. This is because they don"t use a true lithium polymer solid, as the original Bell Laboratory designs of the 1970s did, because the solid polymers don"t perform well at room temperature.

However, LiPos still have worse low-temperature discharge (zero degrees Celsius to 60 degrees Celsius) than traditional Li-ions, so discharging LiPo batteries to ultra-low voltages can be dangerous. Deep, fast discharges may cause expansion, combustion or even explosion. They are also more expensive than Li-ion batteries and have a shorter lifespan. Li-ion cells have better performance for very high-drain uses. Also, they have a high discharge rate, making them suitable for applications where a lot of power is needed very quickly.