Benefits of lithium ion batteries

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Li-ion batteries are able to be recharged hundreds of times and are more stable. They tend to have a higher energy density, voltage capacity and lower self-discharge rate than other rechargeable batteries. This...

The main advantage of lithium-ion battery over other rechargeable batteries is energy efficiency. This advantage stems from more specific advantageous characteristics to include having a higher energy density...

Powering today"s technology Many consumer products on the market today tout their lithium batteries as a selling feature. Is this an actual selling point? Are lithium-powered products really better than those that run on other battery types? The short answer to both questions is, yes, lithium batteries offer major advantages over other battery types with […]

Many consumer products on the market today tout their lithium batteries as a selling feature. Is this an actual selling point? Are lithium-powered products really better than those that run on other battery types? The short answer to both questions is, yes, lithium batteries offer major advantages over other battery types with very few drawbacks. Here, we"ll look at the advantages and disadvantages of lithium batteries, as well as examine a few types of products that have been improved by incorporating lithium technology.

Basically, a lithium battery is one that uses lithium ions as a key component of its electrochemistry. In a lithium battery, lithium atoms are ionized and separated from their electrons. The lithium ions then move from the anode through an electrolyte until they reach a cathode, where they reassemble with their electrons.

Due to their higher energy density, lithium ion batteries are lighter and more compact than other battery types. In fact, they make much of today"s technology feasible. Imagine if smartphones weighed 10 lbs. (4.5 kg) instead of the 6.07 oz. (172 g) weight of the iPhone 14.[4] Would they be as ubiquitous as they are now? Without small, lightweight lithium batteries everyone"s life would look very different. So, if you"ve ever slipped a battery-powered device into a pocket, purse, backpack, or glove box, this was largely made possible by the development of lithium ion batteries.

Lithium ion battery technology is also advantageous for high-power applications, where a battery needs to deliver large amounts of current, such as jump starting a vehicle. Lithium ion batteries deliver up to 3.6 volts, which in comparison is three times higher than the voltage delivered by Ni-Cd or Ni-MH batteries.[5]

If you want a device that will recharge quickly and hold a charge for months or years, then look for one powered by a lithium battery. The chemistry of lithium ion batteries allows them to accept current at a faster rate, allowing them to charge much faster than other battery types.[6] For example, charging a lead acid battery might take more than 10 hours where, depending on the battery"s size, a lithium battery can recharge in three hours or even a few minutes.

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All battery types will lose charge or self-discharge over time. However, lithium ion batteries have an extremely low discharge rate of only 1.5% to 2% a month. In comparison, lead acid batteries lose about 5% of their charge in a month and nickel-based batteries will lose 10% to 15% of their charge in the first 24 hours and then 10% to 15% a month after that.[7] Practically, this means that if you charge a lithium battery pack and then store it in a drawer for the next year, at the end of the year the battery pack will retain between 76% and 82% of its full charge.

Also extending the lifespan in lithium batteries is the lack of memory effect. Nickel-based rechargeable batteries, for example, will gradually lose their capacity to store energy if they are only partially discharged. The "memory" of the partial discharge reduces the capacity of future chargers and thus negatively impacts battery lifespan.

Lithium batteries also hold the advantage for depth of discharge, which is the percentage of the battery charge that can be safely drained without causing damage to the battery.[11] Lithium batteries can be safely discharged of 85% of their total capacity, while lead acid batteries can"t be discharged past 50% without negatively impacting the battery"s lifespan.[12]

One of the largest risks of lithium ion batteries is their susceptibility to thermal runaway. In thermal runaway the lithium battery begins an uncontrollable self-heating state, which can result in extremely high temperatures, fire, and even explosion.[14] Depending on a lithium battery"s chemistry, some are more dangerous than others. For example, lithium iron phosphate (LiFePO4) batteries are less likely to overheat than other lithium battery chemistries.[15]