Lithium battery chemistry explained

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Picture a world without lithium-ion batteries (often called Li-ion batteries or LIBs). Need help? Mobile devices wouldn"t look the way they do now. Picture huge, heavy cell phones and laptops. Also picture that both of these things are so expensive that only very rich people can afford them. What you are picturing is the 1980s. Scary, isn"t it?

A battery is made up of several individual cells that are connected to one another. Each cell contains three main parts: a positive electrode (a cathode), a negative electrode (an anode) and a liquid electrolyte.

When the lithium-ion battery in your mobile phone is powering it, positively charged lithium ions (Li+) move from the negative anode to the positive cathode. They do this by moving through the electrolyte until they reach the positive electrode. There, they are deposited. The electrons, on the other hand, move from the anode to the cathode.

When you charge a lithium-ion battery, the exact opposite process happens. The lithium ions move back from the cathode to the anode. The electrons move from the anode to the cathode.

As long as lithium ions are making the trek from one electrode to another, there is a constant flow of electrons. This provides the energy to keep your device running. Since this cycle can be repeated hundreds of times, this type of battery is rechargeable.

It"s simple. lithium-ion batteries have the highest charge density of any comparable system. This means they can give you a ton of energy without being very heavy.

This is for two reasons. First, lithium is the most electropositive element. Electropositivity is a measure of how easily an element can donate electrons to produce positive ions. In other words, it"s a measure of how easily an element can produce energy. Lithium loses electrons very easily. This means it can easily produce a lot of energy.

Lithium is also the lightest of all metals. As you"ve learned, intercalation materials are used as electrodes in lithium-ion batteries instead of actual lithium metal. Still, these batteries weigh much less than other types of batteries that use metals like lead or nickel.

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