Lithium ion battery simple diagram

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3.7 V lithium-ion battery (AlexLMX, iStockphoto)

Learn about the electrochemistry in the batteries that power many of the devices you use every day.

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?

Lithium-ion batteries were first manufactured and produced by SONY in 1991.

Lithium-ion batteries have become a huge part of our mobile culture. They provide power to much of the technology that our society uses.

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.

Just like alkaline dry cell batteries, such as the ones used in clocks and TV remote controls, lithium-ion batteries provide power through the movement of ions. Lithium is extremely reactive in its elemental form. That"s why lithium-ion batteries don"t use elemental lithium. Instead, lithium-ion batteries typically contain a lithium-metal oxide, such as lithium-cobalt oxide (LiCoO2). This supplies the lithium-ions. Lithium-metal oxides are used in the cathode and lithium-carbon compounds are used in the anode. These materials are used because they allow for intercalation. Intercalation means that the molecules are able to insert something into them. In this case, the electrodes are able to have lithium-ions move easily in and out of their structures.

Inside a lithium-ion battery, oxidation-reduction (Redox) reactions take place.

Reduction takes place at the cathode. There, cobalt oxide combines with lithium ions to form lithium-cobalt oxide (LiCoO2). The half-reaction is:

Oxidation takes place at the anode. There, the graphite intercalation compound LiC6 forms graphite (C6) and lithium ions. The half-reaction is:

Here is the full reaction (left to right = discharging, right to left = charging):

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.

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