How it works

Our apias safe cable is like your regular charging cable, except one very important difference. We do not allow overcharging.

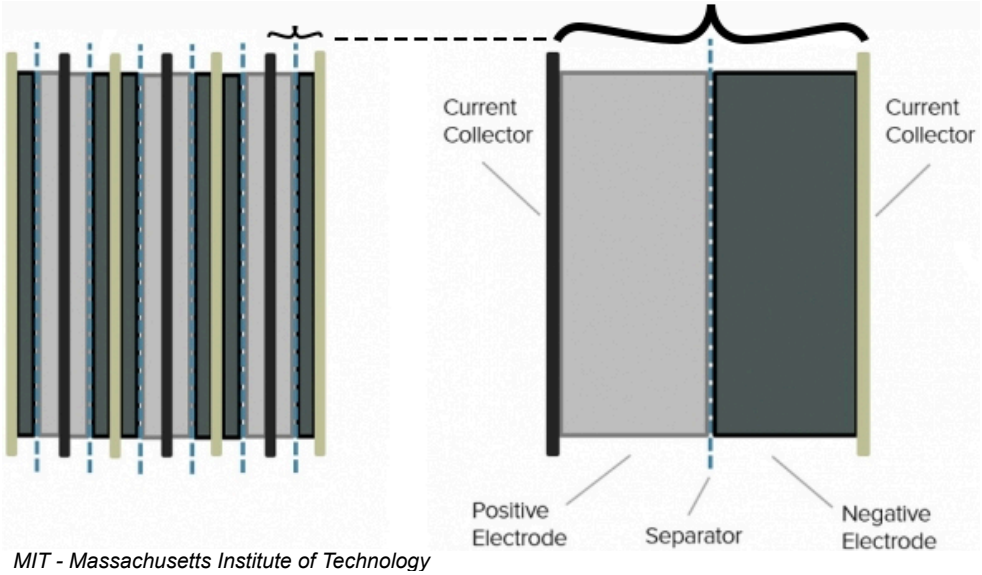
1. Plug it in.

2. Actually, thats it. You dont need a box, an app or pairing something over bluetooth. Plug it in, and you are done.

It's quite simple. We detect when the battery is fully charged, and then stop the charging by physically breaking the circuit using a relay. Its like you are unplugging your phone, without having to unplug it.

We are battery nerds. Just in case you are as well, here is some more information about how it works.

Your typical cell phone battery uses graphite (made of Carbon) packed with lots of Lithium ions (when charged) for the negative electrode and a Lithium Manganese Oxide compound for the positive one. In between these two pieces is a thin membrane as a separator to keep things from shorting out (discharging all at once) while allowing the ions to flow. While being constructed, these pieces are thin flat sheets that are stacked on top of each other and then rolled up (called a jelly or Swiss roll.) As a final step a water based electrolyte solution (containing lithium ions) is injected.



MIT - Massachusetts Institute of Technology

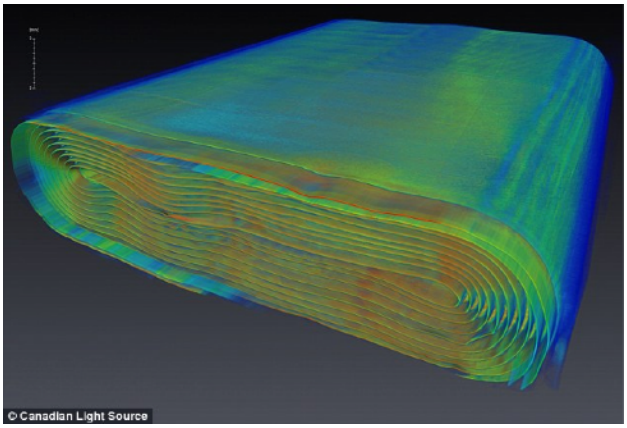
Where The Problems Occurs

When the positive and negative layers come in directly contact, the charged electrons all discharge at the same time, causing intense heat. This is what causes batteries to burst into flame, sometimes explode.

The batteries are packed together in thin layers, sort of a “Swiss roll”. When the battery is overcharged, meaning that there is an electric current “knocking” on the cells after they are fully charged, the Electrode separator is being stretched. This is what we refer to as the Pillowing effect.

Think of a balloon that you inflate to the limit. When you deflate it, the rubber is thinner and softer compared to when it was new. This is a good way of looking at the separator that keeps the positive and negative electrodes from getting into contact, and causing mayhem inside your device.

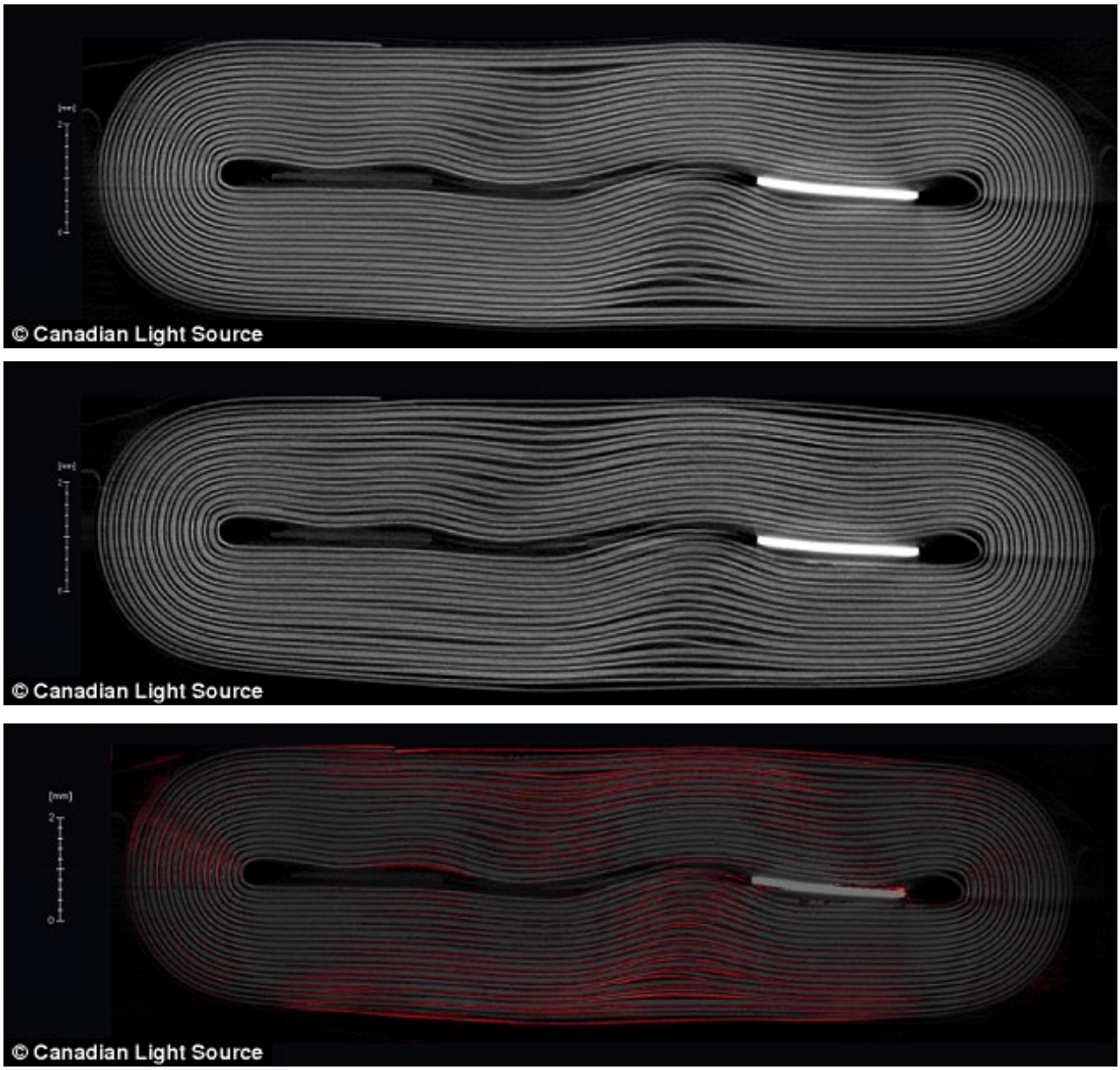
Scientists in Canada have used x-rays to peer inside lithium batteries to find out why some of them swell like a pillow. They used CT scans to show what happens in a typical jelly roll style battery



The pillowing effect is the main reason for batteries failing, and in extreme cases can lead to fire.

The producers claim that they have a software that controls this, stopping the battery for being charged when its full. And in a way they are right. When the battery is full, its full. The problem is that the cells are not disconnected from the current, even though the electricity is not getting in. Our smart chip prevents that by completely cutting the circuit, just like unplugging the charger.

Below you can see the effects of pillowing on a battery’s internal structure. The CT scans show that distortions in the roll becomes much more prominent after pillowing, causing a higher tension on the internal structure. [2]



A battery pouch cell (top) before and after (middle) pillowing. In the third image (bottom), the differences between the two states are highlighted in red, where it is clear that most of the change occurs in the flat portion of the battery jellyroll.

Sources

Paper 995 presented at the Chicago, Illinois, Meeting of the IMLB, June 19–24, 2016. This paper is part of the Focus Issue of Selected Papers from IMLB 2016 with Invited Papers Celebrating 25 Years of Lithium Ion Batteries. Published by ECS.

Canadian Light Source study on blown-up batteries -
http://www.lightsource.ca/news/details/inside_your_battery.html