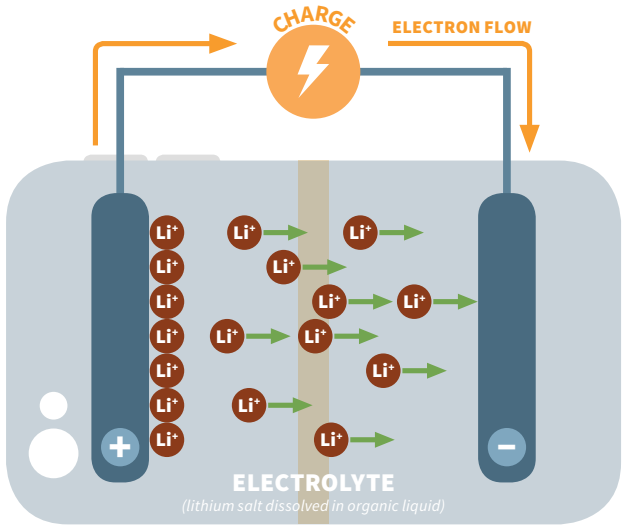
DEVELOPING ADVANCED LITHIUM ION BATTERIES

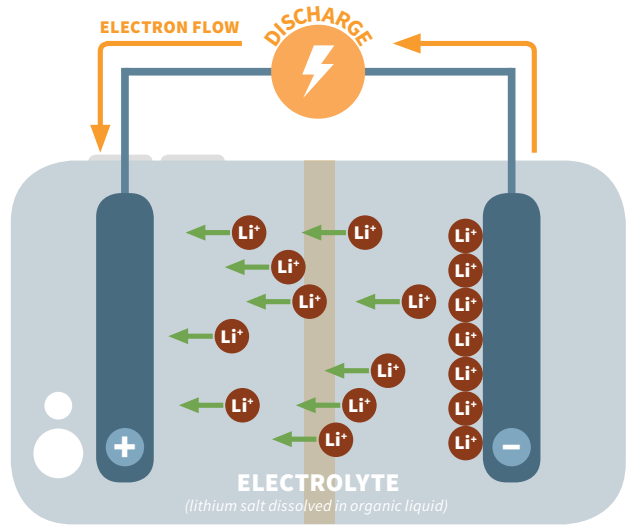
HOW DO LITHIUM BATTERIES WORK?

Lithium ion batteries usually use lithium cobalt oxide ($LiCoO_2$) for the positive electrode and graphite for the negative electrode.

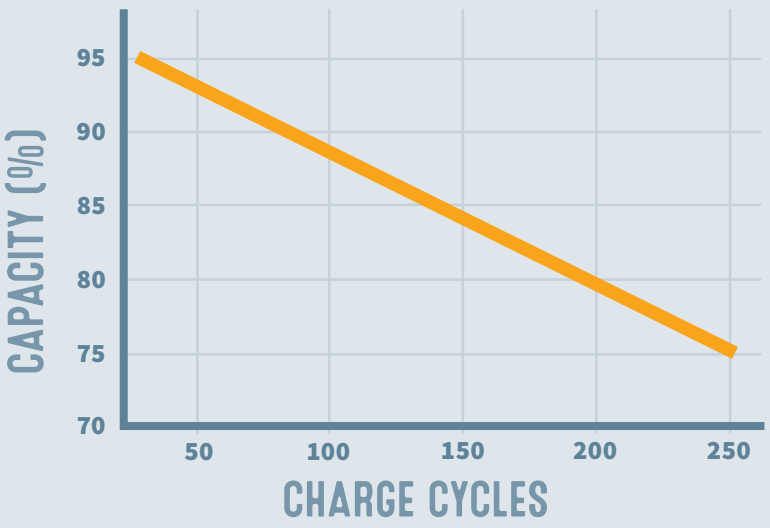
When you charge the battery, lithium ions and electrons move from the positive electrode to the negative electrode. When the battery is discharging, the opposite happens and the flow of electrons powers the device.



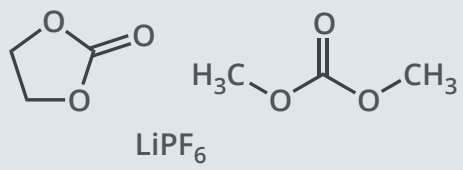
CHARGING BATTERY



DISCHARGING BATTERY



SIDE REACTIONS



$LiPF_6$

ELECTROLYTE COMPOUNDS

↓ ↓ ↓

DEGRADATION PRODUCTS

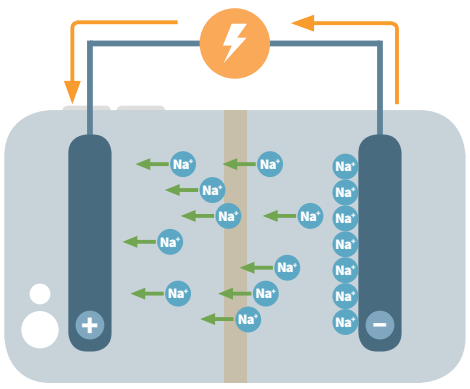
A downside to lithium ion batteries is the amount of time they take to charge. Also, other chemistry can occur inside the battery, impacting performance.

The electrodes and the electrolyte can take part in "side reactions", and can lead to older batteries not lasting as long as they did when they were new.

TITANIUM TiO_2

NIOBIUM Nb_2O_5

MIXTURES $TiNb_2O_7$



ALTERNATIVE OXIDES

Titanium and niobium oxides take in and give out lithium ions much quicker, which could lead to fast charging or high power capabilities.

SODIUM ION BATTERIES

Operate on the same principles as lithium ion batteries, but are much cheaper; however, they require different electrode materials.

NEW ANODE MATERIALS

Silicon or phosphorus can be used instead of graphite. They store more energy for their size, and could give longer-lasting batteries.

WHY DOES THIS RESEARCH MATTER?

Improving battery technology can provide us with faster-charging, longer-lasting batteries. It could also lead to new applications as higher power batteries become possible.

Based on research and materials provided by Kent J Griffith, PhD candidate at the University of Cambridge.

CHEMUNICATE

© Andy Brunning 2016 – www.compoundchem.com/chemunicate
Shared under a CC Attribution-NonCommercial-NoDerivatives licence.