

Lithium-Ion Technology In The Spotlight



Aug. 25 - Lithium-ion batteries are ideal for mobile electronics because they are lightweight, extremely energy-dense, and have a unique chemistry allowing them to be recharged.

Their foundation is the lithium ion. Lightweight, highly reactive and tiny, the metal can generate high voltage while taking up little space, making it ideal for use in energy-sucking portable electronics. Its chemical makeup also makes it easy to recharge.

But the batteries are also delicate. Manufacturing contamination caused the overheating that prompted the recall of nearly 6 million Sony Corp.-made batteries in the past two weeks from Apple Computer Inc. and Dell Inc. laptops.

The chemical reaction that occurs in lithium-ion batteries is complicated. But the basic reaction involves coupling a lithium-carbon compound (which serves as the negative electrode) with cobalt oxide (which serves as the positive electrode), according to K.M. Abraham, a lithium battery consultant and visiting chemistry research professor at Northeastern University in Boston.

Normally this reaction is controlled and safe. But if uncontrolled, the lithium can stoke a huge reaction, he said.

Because consumers are demanding more of ever-smaller devices, engineers are boosting the power generated from lithium-ion batteries while grappling with managing the extreme energy contained in the small package.

Recharging is made easy because the ions can be easily inserted and extracted without major structural changes in the electrode material, Abraham said.

But there are dangers. If the battery isn't made well, energy can be released very quickly in an uncontrolled fashion.

Abraham said the biggest threat is the possible penetration of the thin barrier made of synthetic material about as thick as a sheet of paper that separates the two electrodes and prevents the quick release of energy.

If a particle such as a speck of metal breaches the protective membrane during manufacturing, the particles worm through the opening and collide with the electrode, causing the device to short-circuit.

"There is still room to grow in terms of the amount of energy we can squeeze from a lithium-ion battery," he said. "The technology can be improved, but we're so much in a hurry to come out with these consumer products, shortcomings can occur in the finer details of the battery construction."

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