

Phillips Plastics Corporation®

INTERFACE

How Safe is Your Power?



Breakthrough
Technology Makes
Your Lithium Ion
Batteries Safer

Rechargeable lithium ion batteries are fast becoming the power source of choice among makers of many consumer, automotive, medical and defense products. Lightweight and long lasting, they hold two to four times the energy of their rechargeable nickel- and lead-acid-based counterparts. They also have a lower self-discharge rate than other battery types, so they can be ready to use when you need them.

Lithium-ion Battery Risks

The high-energy density of lithium ion batteries is not without risk. Protections built in to lithium ion batteries help maintain their safety during normal use. It's when abnormalities occur—such as manufacturing defects, excessive temperature elevation, and penetration by outside materials—that lithium ion batteries can become hazardous.

In fact, if enough microscopic metal particles converge within the cell, an electrical short can develop, resulting in the elevation of the battery's temperature to dangerous levels. This can lead to thermal runaway, and cause the battery to ignite or explode.

As a precaution, the U.S. Department of Transportation has placed limitations on the types and sizes of lithium ion batteries allowed in checked and carry-on baggage.



FIGURE 1. Lithium ion battery explosion on aircraft.



FIGURE 2. Battery package damage without Phillips Plastics technology



FIGURE 3. Battery package after penetration testing using Phillips Plastics technology

Safety First Across Markets, Applications

Given the vast number of lithium-ion batteries in use worldwide, the energy storage system malfunctions only on rare occasion. Fortunately, lithium-ion battery safety remains a top priority for a number of applications across markets as listed above.

Built-in lithium-ion battery manufacturing precautions have proven to dramatically reduce risks to property and lives. Still, there is ample opportunity for manufacturers to enhance the overall safety of lithium-ion batteries when major short circuits occur.

| | |
|-------------------|--|
| AUTOMOTIVE | hybrid electric vehicles, electric vehicles |
| CONSUMER | cell phones, MP3 players, digital cameras, PCs, power tools, remote-control toys |
| DEFENSE | battlefield electronics used by dismounted soldiers |
| MEDICAL | portable monitoring devices, automated external defibrillator |
| AVIATION | aircraft power, drones |

Innovation Enhances Lithium Ion Battery Safety

Forward-thinking organizations have turned to Phillips Plastics to explore how to further enhance the safety of lithium ion cell technology. In partnership with its customers, Phillips Plastics closely researched, evaluated and tested the technology and determined how to minimize its combustibility under catastrophic cell failure.

The two-tiered solution consists of a casing that surrounds the lithium-ion battery cells and a fluid that surrounds the cells. When penetrated, the casing self-seals the opening where, for example, a high-speed projectile enters the energy-storage system. The seal limits oxygen to the cells, so resulting flames can't propagate. The fluid serves to help disperse the heat from the individual cell to a much larger surrounding area. As a result, it prevents the initially affected cell(s) from reaching a temperature capable of triggering thermal runaway and subsequent fire and explosion.

As a result of the Phillips Plastics innovation, short-circuited lithium-ion batteries smolder and extinguish, rather than ignite and explode. The solution has the potential to help minimize harm to property and lives, while significantly enhancing the safety of devices that run on rechargeable lithium-ion batteries.

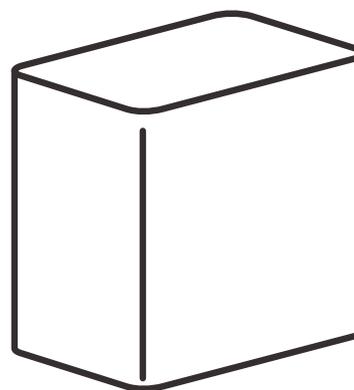


FIGURE 4.
Battery casing that self-seals when penetrated limiting oxygen to cells.

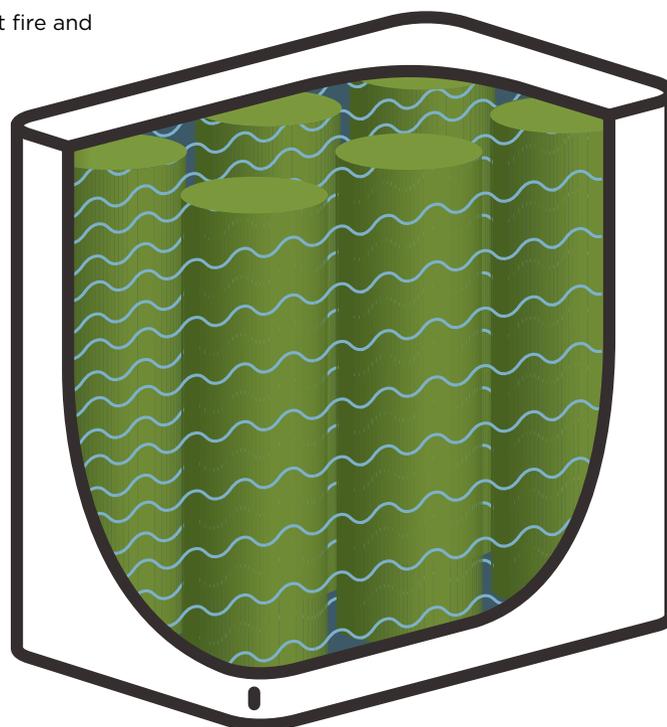


FIGURE 5.
Battery cells (green) are surrounded by a fluid (blue waves) that disperse heat preventing thermal runaway.

Partner with Phillips Plastics

When in place, innovative lithium-ion battery packaging from Phillips Plastics may dramatically enhance your manufacturing program. You can potentially benefit from increased safety and higher comfort levels and buy-in among your product consumers.

From design to distribution, you also benefit from single-source, expert support when you partner with Phillips Plastics. For more information on how you can enhance the safety of your rechargeable lithium-ion batteries and applications, contact:

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