Application Note

PORON® Polyurethane Battery Pad Technology

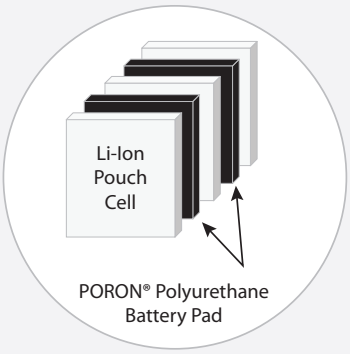
Lithium-Ion Battery Technology

Lithium-Ion batteries are one of the most common battery technologies on the market today. Many Li-Ion batteries leverage a pouch cell design rather than a cylindrical design (similar to everyday AA batteries), or a prismatic cell design (similar in size and shape to a pouch cell design but with an associated higher manufacturing cost due to the incorporation of a hard metal casing).

In addition to less expensive manufacturing costs, a pouch cell design allows for increased packing efficiency and greater energy density compared to other cell technologies. One major drawback of the design, however, is the repetitive swelling of the pouch's cells over the life of the battery.

To maintain the integrity of the cells and extend battery life by minimizing the occurrence of capacity fade, pouch cells are designed with ideal constant pushback forces (or stack up pressures), which can unfortunately be difficult to maintain during expansion and contraction cycles.

Failure to maintain these pressures on the internal components of the battery will result in suboptimal electrochemical performance and increased heat generation.



Battery Pads

Whether the battery leverages a single pouch cell or several cells in a series, it is important to maintain a constant stack up pressure on all cells to ensure an optimized electrochemical reaction during the swelling of the battery. But how is constant force maintained on a system that is constantly expanding and contracting?

The answer lies in the use of battery pads (also known as pressure pads). Pouch cell battery pads are typically soft, compressible materials that address changes in compression without becoming overly firm or soft during cell expansion, thereby maintaining a constant pressure on each pouch cell.

PORON® polyurethane battery pads are routinely specified by engineers because they are uniquely formulated to provide stable, long-term elastic properties due to their superior heat-aged compression set resistance (C-Set), which is the material's ability to rebound after being compressed under high heat.

Key Properties of PORON® Polyurethane Battery Pads

Compression Force Deflection (CFD)	Beginning of life - initial pushback to maintain contact between cells End of life - compressible enough to withstand swelling of the battery
Reliability	Stable, long-term elastomeric properties for consistent performance over the lifespan of the battery
Battery Efficiency	Battery pads help increase efficiencies and lifespan of the battery cells by minimizing capacity fade
Thickness Control	+/-10% or less
Vibration Management	Protects battery cells from shock and vibration during assembly process and pack usage
Flammability Resistance	HBF and FMVSS 302 certified products
Thermal Insulation	Insulation properties to reduce heat transfer between cells

Competitive Advantage

Long Term Aging / Reliability	Compression Set and CFD properties do not change significantly after long-term heat aging. Thickness and pushback forces will remain more stable over a longer period of time.
Energy Density Increase	Rogers leads the market in innovative product development that assists with the optimization of battery design. The combination of our extensive product portfolio and battery pad design tool empowers designers with the ability to select the proper material that both achieves desired pressures and minimizes uncompressed battery pad thickness at end of life conditions. Doing so results in precious space saving which can used to increase the number of cells per module.

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