RELIABLE PROTECTION AGAINST THERMAL RUNAWAY - EVEN UNDER PRESSURE

GORE Battery Insulation is a thin, high-performance, flexible ceramic composite engineered to deliver robust protection against thermal runaway propagation in energy-dense battery modules like BESS, without sacrificing energy density.

Engineered for Demanding Battery Applications

With ultra-low thermal conductivity at high temperatures (~0.05 W/m·K at 500°C), this innovative material maintains thermal resistance under pressure, ensuring consistent performance throughout the battery's life, even during extreme events. Unlike compliant aerogel materials, GORE Battery Insulation resists compression and deformation, preserving its ability to block heat transfer and protect adjacent cells from heat transfer.

Low Compression Material for Better Thermal Performance

The low relative compressibility of the Gore material enables thermal resistance to be maintained under high compressive stress where other more compliant materials' thermal resistance may decrease under pressure, compromising performance.

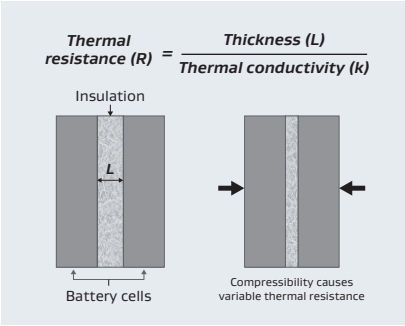

Figure 1. Thermal resistance is directly correlated to insulation thickness

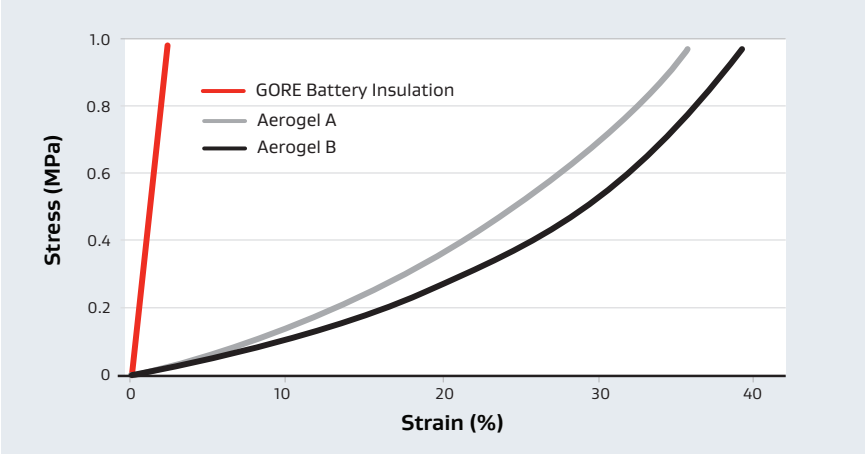

Figure 2. The Gore material shows little strain at up to 1MPa of compressive stress

Key Features and Benefits:

- **Maximize Energy Density:** Ultra-thin format enables compact, high-capacity battery designs without sacrificing safety.
- **Consistent Performance:** Maintains high thermal resistance under pressure, ensuring reliability when it's needed the most.
- **Reduce Risk:** Ultra-low thermal conductivity material delivers industry-leading performance, enabling predictable safety margins and bank-ability.
- **Made for Manufacturing:** Non-shedding, flexible, bondable—integrates seamlessly into your existing module design.

Thermal Runaway Simulation

To determine the comparative thermal barrier performance under compression, the insulation material is inserted between a heat source and cold sink, and placed under discrete and controlled applied pressure (Figure 3). Performance is measured by recording the peak cold side temperature over the duration of the experiment which is minimized by the thermal resistance of the material. The results demonstrate that compared to aerogel alternatives, GORE Battery Insulation material provides a more effective thermal barrier over the range of applied pressure (Figure 4).

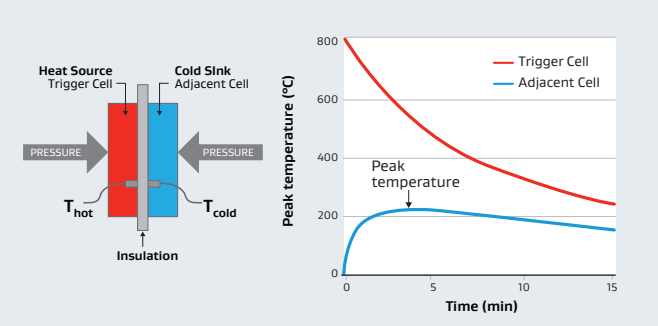

Figure 3. Thermal runaway simulation

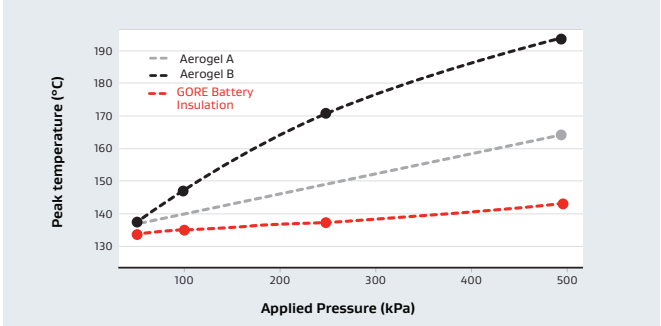

Figure 4. All materials tested at 2mm initial thickness.

Maximize Energy Density and Safety

The unique, thin format and incompressible nature of GORE Battery Insulation enables higher energy density at the module level (Figure 5). To accommodate cell swelling, low-cost compliant materials can be strategically placed at uninsulated junctions—alternating with GORE Battery Insulation after every third cell, as shown in Figure 6. This hybrid approach leverages Gore's superior thermal barrier performance and mechanical integrity to effectively limit thermal runaway propagation to a single block of cells while maximizing energy density within the module.

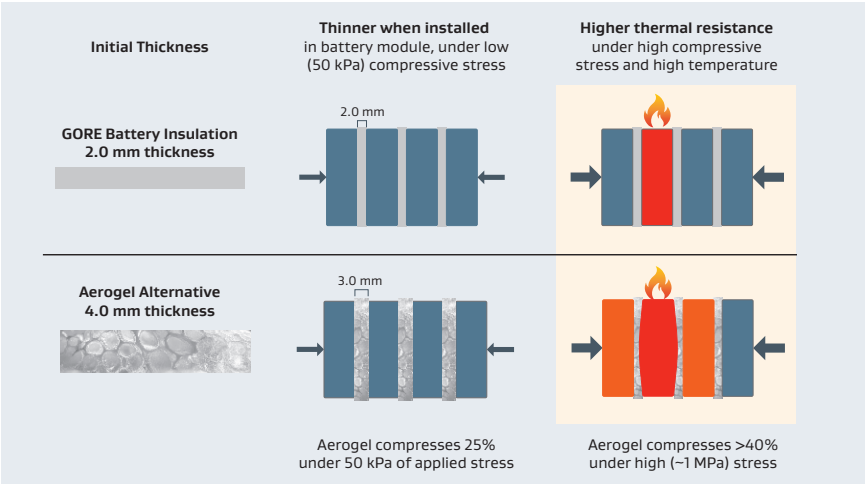

Figure 5. GORE Battery Insulation performs better than traditional aerogel materials under high stress and temperature.

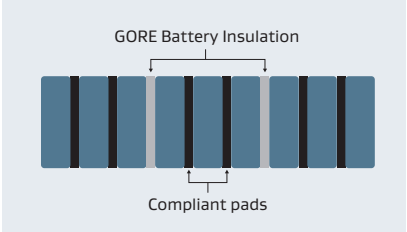

Figure 6. GORE Battery Insulation is designed to be used with traditional compliant pads in a hybrid configuration.

NOTE: GORE Battery Insulation is a developmental technology. All data is preliminary in nature and will vary with configuration, composition, or final part design.

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