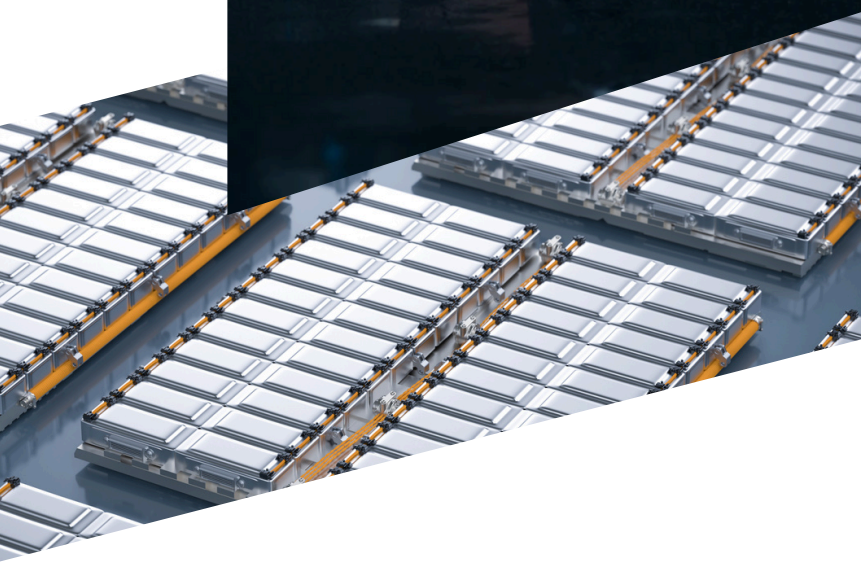


Wedge

"Delivering High Performance at Lower Cost"

EV Battery Thermal Barriers



Features & Benefits

- Higher Insulation Performance
- Thin & Light Weight Ready to Use Designs
- Fire Resistant & Flame Retardant
- Wide Application Range - 50 to 700 °C
- Lower Installation Cost
- Zero Maintenance Cost
- Excellent After Sales Service

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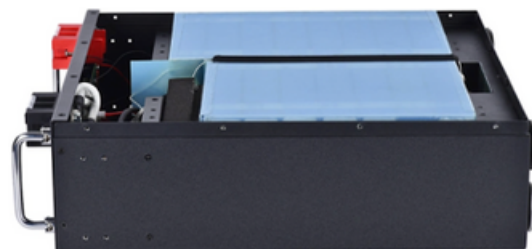
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WedGel | Wedge Thermal Insulation & Fire Barriers

Thermal insulation of batteries is a critical aspect in the design and operation of battery systems, especially for applications such as electric vehicles (EVs), energy storage systems, and portable electronics. Effective thermal management ensures battery performance, safety, longevity, and efficiency.

Battery Thermal Management

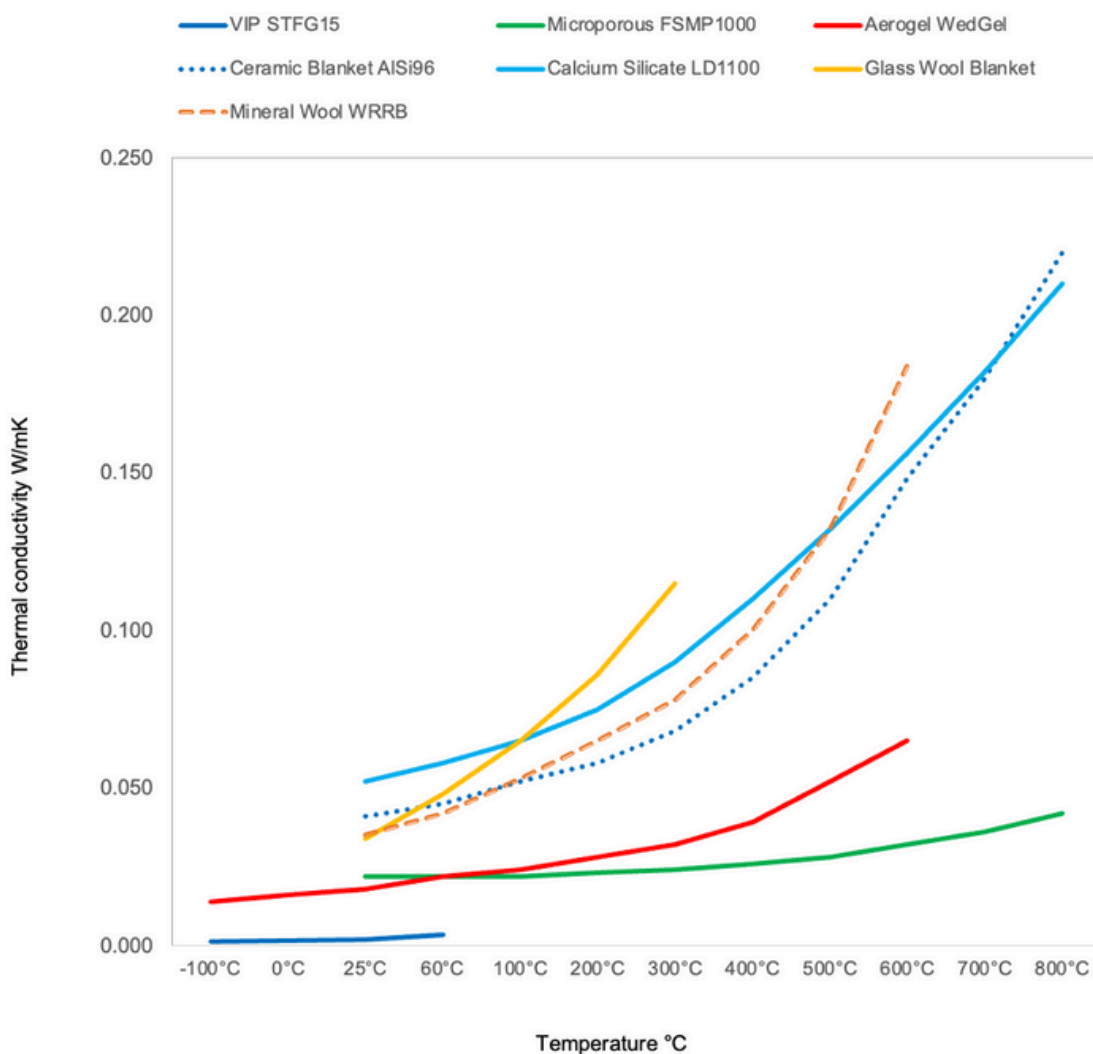
- Thermal Barriers: Materials with low thermal conductivity are used to create barriers that slow down heat transfer.
- Heat Sinks: Components that absorb and dissipate heat away from the battery cells.
- Phase Change Materials (PCMs): Substances that absorb or release large amounts of heat during phase transitions (e.g., solid to liquid) to stabilize temperature.



Importance of Battery Thermal Insulation

- Temperature Regulation: Batteries operate efficiently within a specific temperature range. Thermal insulation helps maintain this optimal temperature, preventing overheating or excessive cooling.
- Fire Safety: Overheating can lead to thermal runaway, which can cause fires or explosions. Proper insulation mitigates this risk by dissipating excess heat.
- Battery Efficiency Performance: Battery performance can degrade at extreme temperatures. Insulation helps maintain consistent performance by stabilizing the temperature.
- Battery Life Enhancement: Repeated exposure to high temperatures can reduce battery life. Thermal insulation prolongs the lifespan by protecting against thermal stress.

Aerogel Thermal Conductivity Comparison



WedGel | Wedge Insulation for EV Batteries

WedGel Aerogel insulation are most suitable thermal barrier in electric vehicle (EV) batteries to improve thermal management and performance. EV batteries generate heat during operation, especially during charging and discharging cycles. Effective thermal management is crucial for maintaining battery performance, extending battery life, and ensuring safety. WedGel Aerogel insulation can contribute to enhanced thermal management, improved energy efficiency, and increased safety in EV batteries, ultimately helping to optimize battery performance and prolong battery life.

WedGel Applications in EV Battery Packs

- Cell-to-Cell Insulation: WedGel pads can be wrapped around battery cells to prevent heat transfer from one cell to another.
- Module-to-Module & Battery Pack Insulation: Larger pads can be used to insulate entire battery modules.
- Thermal Barriers: Aerogel pads serve as heat shields within the battery pack to protect sensitive components from heat.
- Gap Fillers: They can be used to fill gaps between cells or modules, enhancing overall thermal management.



Key Features of WedGel Insulation Pads

- Lowest Thermal Conductivity: WedGel pads have one of the lowest thermal conductivities.
- Heat Containment: Prevent heat transfer between individual battery cells and modules.
- High Temperature Resistance: Aerogel insulation pads withstand very high temperatures without degrading.
- Fire Resistance, Non-Flammable: Aerogels are non-flammable, enhancing the safety of the battery pack.
- Lower Weight Impact: Aerogel pads are lightweight, maintain the efficiency and range of electric vehicles.
- High Durability: Despite their light weight, aerogel pads are durable and can endure mechanical stresses.
- Flexibility: They are flexible enough to conform to the shapes and contours of battery cells and modules.

Technical Properties of WedGel Insulation

Battery Insulation Thermal Barriers are Lightweight, Ultrathin, thermally insulating, electrically insulating, and Flame retardant.

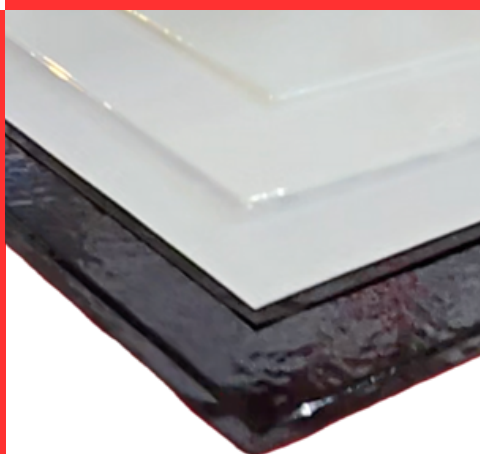
Quality ASTM C1728	WedGel 650EV	AISI 250EV	FSMP 1000EV	WedGel OXF
Aerogel Fumed Silica Gel SiO2 %	≥ 90	>50	>75	≥ 90
Thickness, mm	0.24 to 10	0.8 to 10	2 to 10	0.3 to 10
Service Temperature °C ASTM C411, 477	-50 to 700	-10 to 1300	6 to 1000	-50 to 700
Short Term Temperature °C	1400	≥ 1500	≥ 1400	1400
Density, Kg/M3	210± 42	240 to 300	260 to 320	210± 42
Flexibility	Low to Medium	High	Low	Very High
Thermal Conductivity, ASTM C177				
W/m.K at 25 °C	0.018	0.04	0.021	0.023
W/m.K at 100 °C	0.023	0.05	0.022	0.028
W/m.K at 200 °C	0.028	0.06	0.023	0.031
W/m.K at 300 °C	0.032	NA	NA	0.036
W/m.K at 400 °C	0.047	0.08	0.024	0.047
W/m.K at 600 °C	0.068	0.11	0.028	0.068
W/m.K at 800 °C	NA	0.15	0.032	NA
W/m.K at 1000 °C	NA	0.20	NA	NA
Hydrophobicity GB/T 10299-2011, %	99	NA	NA	99
Compression Strength, ASTM C165; Kpa	85 (10%)	35 (10%)	330	38 (10%)
Compression Rebound rate, 100kPa, %	≥ 90	≥ 60	NA	≥ 98
Tensile Strength, GB/T17911-2006, Mpa	≥ 1.0	1.0	≥ 1.0	≥ 1.0
Complies with ROHS regulation	Complies	NA	Complies	Complies
Size Tolerances, ASTM C1728	Pass	Pass	Pass	Pass
Reaction to fire, ISO1182, EN 13501-1	A1	A1	A1	A1
Flame spread index (ASTM E84), max FSI	≤ 25	NA	≤ 25	≤ 25
Smoke developed index ASTM E84	≤ 50	NA	NA	≤ 50
Breakdown Voltage, kV/mm	≥ 10	2 to 8	≥ 10	≥ 10
Volume Resistivity, Ω-cm	≥ 1 x 10 ¹³	NA	NA	≥ 1 x 10 ¹³
Material Flame Retardant UL 94 V-0	Pass	Pass	Pass	Pass
LOI, %	NA	14 to 18	NA	NA
Insulation for Stainless Steel ASTM C795	Passed	NA	NA	Passed
Self-Adhesive	The Peel strength of the adhesive is ≥ 50 N/100mm			
Material Flame retardant	Horizontal Combustion meets the HB Level & Vertical Combustion meets V0 Level			
Short term Temperature Range (5Min)	≥ 1200 °C; No melting, decomposition, or sintering of the material			

WedGel | Encapsulation & Coverings Options

At Wedge we produce Thermal Insulation pads with wide range of Encapsulation & Coverings Options including HT Glass Cloth, Silica Cloth, PET, PE, Ceramic Cloth, Mica, Etc.

Installation of Thermal Barriers

- Encapsulation & Coverings Options: HT Glass Cloth, Silica Cloth, PET, PE, Ceramic Cloth, Mica, Etc.
- Cutting and Shaping: Aerogel pads can be easily cut and shaped to fit specific battery pack designs.
- Layering: Multiple layers can be used to enhance thermal protection.
- High-Temperature Adhesives: To ensure the aerogel pads remain securely in place.
- Proper Fitting: Ensuring a proper fit is crucial for maximizing the effectiveness of the thermal barrier.



WedGel | Benefits of Thermal Barriers

Lithium batteries must be insulated because it produces high heat amounts while charging or in use.

- **Enhanced Safety:** Aerogel pads significantly reduce the risk of thermal runaway by preventing chain heat spread, thereby enhancing the overall safety of the battery pack.
- **Higher Efficiency:** WedGel thermal insulation pads are Lightweight, Ultra-Thin, thermally insulating, electrically insulating, and Flame retardant.
- **Improved Performance:** Effective thermal management helps maintain optimal battery performance and efficiency.
- **Extended Battery Life:** By reducing thermal stress on battery cells, aerogel pads can prolong their lifespan.
- **Robust Protection:** They offer additional protection against mechanical and chemical damage.





Wedge Group

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