

EST™ Guard

Product Data Sheet



Product Description

EST Guard is a ceramic phase change material which has been engineered to provide a customizable shape tailored to prevent or delay thermal runaway propagation at the cell-cell or module-module level within a lithium ion module or pack.

EST Guard manages heat during thermal runaway through three separate mechanisms:

1. A non-reversible single endothermic phase change absorbs energy in the system reducing the amount of thermal energy available.
2. The endothermic phase change releases water vapor which assists in evacuating hot gases out of the engineered venting systems in place thus reducing the thermal energy around the system.
3. The resulting material after an event is thermally resistive thus slowing the transfer of heat to other cells allowing for the endotherm to activate fully and the hot gases to be evacuated.

This material's thermal conductivity at normal operating temperatures helps in providing more uniform distribution of cell temperature during the lifetime of the cells yet will transform into an insulative material after its phase change in reaction to a thermal event.

Its excellent MOR strength allows for ultra-thin spacing between cells while maintaining structural support.

Benefits

- Multiple mechanisms for addressing thermal runaway:
 - Thermal energy absorption
 - Hot gas evacuation
 - Thermal resistance
- High MOR strength
- Non-combustible
- No post-form machining required
- Hydrophobic
- Dust free

Applications

- Cell-cell thermal runaway propagation management for energy storage applications
- Module-module thermal runaway propagation management for energy storage applications

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Density, kg/m ³ (pcf)	1570 - 1680 (98 - 105)
Classification Temperature, °C (°F)	1300 (2370)
Modulus of Rupture, N/cm ² (psi)	>450 (>650)
Specific Heat, J/g•k	
-40°C (-40°F)	0.90
0°C (32°F)	1.07
40°C (104°F)	1.23
85°C (185°F)	1.33
Thermogravimetric Mass Change, %	
200°C (392°F)	26.75
400°C (752°F)	7.26
Thermal Energy Absorption	
DSC Peak Temperature, °C (°F)	200 (392)
DSC Area, J/g	1224
Volumetric Area, J/CC	1961
Chemical Analysis, % weight basis after firing	
Alumina, Al ₂ O ₃	>97
Silica, SiO ₂	<1
Alkalis, as Na ₂ O	<1
Others	<1
Thermal Conductivity, W/m•K (BTU•in/hr•ft²•°F), ASTM E 1461	
-40°C (-40°F)	2.61 (18.11)
0°C (32°F)	2.43 (16.86)
40°C (104°F)	2.28 (15.82)
85°C (185°F)	2.10 (14.57)

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