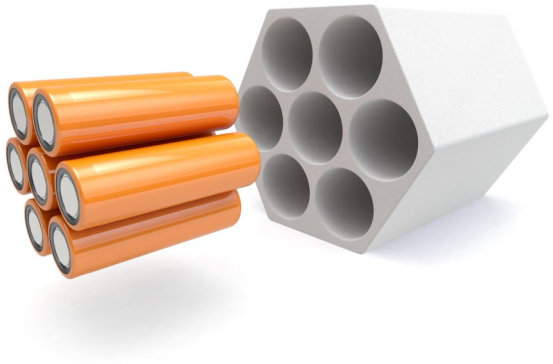
EST™ Block

Product Data Sheet



Product Description

The EST Block has been specifically designed to manage heat during battery thermal runaway via three separate mechanisms:

1. Thermal Energy Absorption: Heat absorption to reduce the amount of thermal energy.
2. Hot Gas Evacuation: Decomposition products continue to propel hot gases out of the housing after the event, thereby reducing energy available for heating.
3. Thermal Resistance: Slows the rate of heat transfer from the event area. This allows time for heat to conduct to entire apparatus, and gives time for heat to be evacuated by decomposition of gases (above).

This material can be customized to meet customer needs and allows for ultra-thin spacing between cells.

Benefits

- Multiple mechanisms for addressing thermal runaway:
  - Thermal energy absorption
  - Hot gas evacuation
  - Thermal resistance
- Lightweight
- Non-combustible
- Safe to be machined

Applications

- Cell-Cell thermal runaway propagation for energy storage applications

Environmental & Health Safety

Superwool low biopersistent fibres manufactured by Morgan Advanced Materials are not classified as carcinogenic by IARC or under any national regulations on a global basis. They have no requirements for warning labels under GHS (Globally Harmonised System for the classification and labelling of chemicals).

In Europe, Superwool fibres meet the requirements specified under Note Q of European Regulation EC/1272/2008 (on Classification, Labelling and Packaging of substances and mixtures). All Morgan Advanced Materials Superwool low biopersistent fibre products are therefore exonerated from classification and labelling as hazardous in Europe.

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Thermal Ceramics is a business of Morgan Advanced Materials

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	EST Block
Density, kg/m^3 (pcf)	730 (46)
Classification Temperature, °C (°F)	1300 (2370)
Modulus of Rupture, N/cm^2 (psi)	210 (300)
Specific Heat, J/g•k	
50°C (122°F)	1.15
150°C (302°F)	1.33
200°C (392°F)	1.46
250°C (482°F)	1.4
300°C (572°F)	1.34
400°C (752°F)	1.23
500°C (932°F)	1.12
600°C (1112°F)	1.13
700°C (1292°F)	1.13
Thermogravimetric Mass Change, %	
200°C (392°F)	0.09
250°C (482°F)	2.58
400°C (752°F)	21.89
600°C (1112°F)	25.90
800°C (1472°F)	26.74
Thermal Energy Absorption	
DSC Peak temperature, °C (°F)	230 (446)
DSC Area, J/g	700.2
Chemical Analysis, % weight basis after firing	
Alumina, Al_2O_3	84
Silica, SiO_2	11
Calcium Oxide, CaO	3
Magnesium Oxide, MgO	1
Alkalis, as Na_2O	>1
Thermal Conductivity, W/m•K (BTU•in/hr•ft^2•°F), ASTM C 177, Descending	
100°C (212°F)	0.06 (0.39)
200°C (392°F)	0.08 (0.53)
300°C (572°F)	0.09 (0.66)
400°C (752°F)	0.11 (0.77)
500°C (932°F)	0.12 (0.86)

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