

Product Information Sheet

FyreWrap® LiB Boards, Blankets and Felts

INTRODUCTION

FyreWrap® LiB (Lithium-ion Battery) Boards, Blankets and Felts are a family of high-temperature, lightweight insulating materials that are designed to help prevent thermal runaway propagation in lithium-ion battery applications. Alkegen combines material science with industry knowledge to tackle one of the most important safety issues in today's large format lithium-ion battery applications. From cell-to-cell isolating thermal barriers to whole pack solutions, Alkegen delivers an engineered platform with unparalleled designs to offer the ultimate fire protection in lithium-ion battery containment.

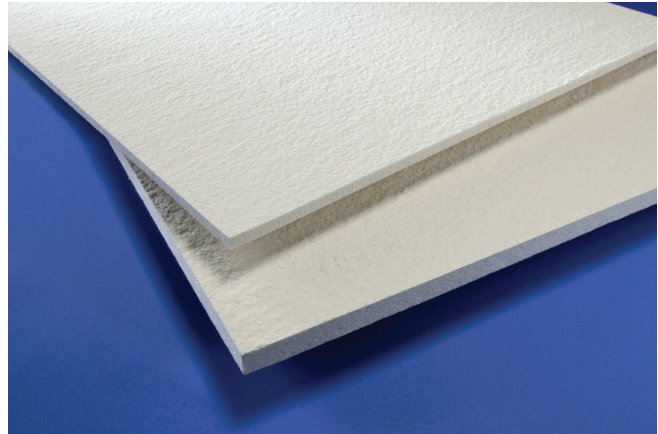
Building on Alkegen's thermal management expertise and manufacturing excellence, combined with extensive experience in aerospace, automotive, and fire protection applications, Alkegen offers customized solutions for lithium-ion thermal runaway propagation prevention. The base of its technology starts with its fiber manufacturing techniques. Alkegen produces multiple fiber chemistries such as alkaline earth silicate fibers, refractory ceramic fibers, micro-fine glass fibers and polycrystalline fibers. Dependent upon the desired characteristics of the finished product, Alkegen converts the fibers into different product forms with varying options for additional enhancements.

CAPABILITIES

- Thermal runaway propagation prevention
- Short circuit prevention and electrical protection
- Cascading fire prevention
- Thermal isolation and containment

MARKETS

- E-Mobility
- Energy Storage Systems (ESS)
- Aerospace
- Consumer Electronics
- Medical
- Transportation packaging



FyreWrap LiB Boards

APPLICATIONS

- Cells (external to cell)
- Battery modules
- Battery packs
- Packaging for transportation

COMMON PROPERTIES

- Fire resistant, flame barrier
- Electrically insulating
- Low thermal conductivity/thermal insulating
- Suitable for temperatures up to 1200°C
- Excellent chemical stability
- Exceptionally resistant to thermal shock

BOARD PROPERTIES

- Easy to cut with standard tools
- Uniform, lightweight option available
- Non-woven compressible fiber matrix forms available

FELT PROPERTIES

- Easy to wrap, shape, or cut
- Uniform, lightweight, easy-to-cut sheets
- Non-woven compressible fiber matrix

BLANKET PROPERTIES

- Flexible, strong, and lightweight
- Low thermal conductivity
- Excellent thermal shock resistance

FyreWrap® LiB Boards, Blankets and Felts

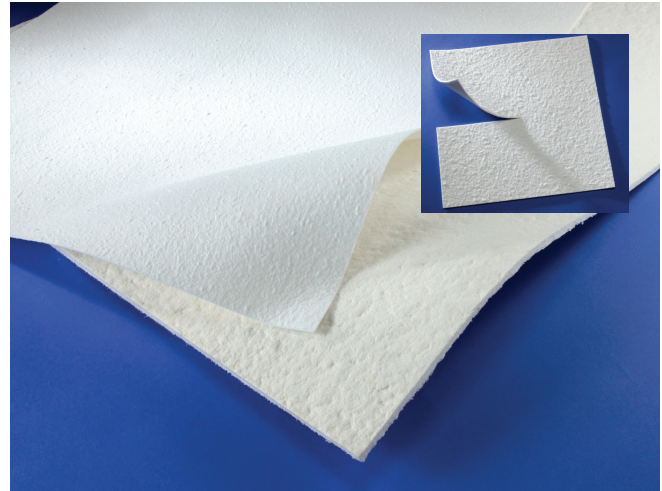


ADDITIONAL CAPABILITIES

Customer requirements are unique and Alkegen offers solutions that cater to each application's performance criteria, cost structure, and product handling needs. The information presented refers to our core products and their typical characteristics. Alkegen offers application support for many specifications and/or enhancements, such as:

- Adhesive and foil backings
- Encapsulation and lamination
- Hybrid fiber systems
- Rigidization of components

Please contact the LiB team to discuss additional enhancement requirements at +01-716-768-6472.



FyreWrap LiB Felt

FyreWrap LiB Boards, Blankets and Felts Typical Product Properties

| Product Grade | Physical Properties | | | | | | |
|---|--|--------------------|------|-----------------------------|-------|--------------------|-------------------|
| | Color | Temperature Grade | | Melting Point | | Density | |
| | | °F | °C | °F | °C | lb/ft ³ | kg/m ³ |
| IN70 Blanket | White | 2300 | 1260 | 2390 | 1310 | 4 - 8 | 64 - 128 |
| IN70 Felt | White | 2300 | 1260 | 2390 | 1310 | 10 - 17 | 160 - 275 |
| IN70 Board | White | 2300 | 1260 | 2390 | 1310 | 17 | 275 |
| IN70 XT-Board | White | 2300 | 1260 | 2390 | 1310 | 22 | 360 |
| | LOI ² | Modulus of Rupture | | Thermal Conductivity (W/mK) | | | |
| | Including Binder, % Wt | PSI | kPa | 400°C | 600°C | 800°C | 1000°C |
| IN70 Blanket | 0 | — | — | 0.08 | 0.12 | 0.18 | 0.25 |
| IN70 Felt | 7 | — | — | 0.08 | 0.1 | 0.15 | 0.2 |
| IN70 Board | <9 | >100 | >700 | 0.07 | 0.1 | 0.14 | — |
| IN70 XT-Board | <7 | >100 | >700 | 0.1 | 0.12 | 0.15 | — |
| Available Thickness, mm (other material sizes available upon request) | | | | | | | |
| | 3 | 5 | 6 | 9 | 10 | 12 | 15 |
| IN70 Blanket | Available in 13mm and 25mm Thicknesses | | | | | | |
| IN70 Felt | | | X | X | | X | |
| IN70 Board | X | X | X | | X | X | X |
| IN70 XT-Board | | X | X | | X | X | X |

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The test data shown are average results of tests conducted under standard procedures and are subject to variation. Results should not be used for specification purposes. Product Information Sheets are periodically updated by Alkegen. Before relying on any data or other information in this Product Information Sheet, you should confirm that it is still current and has not been superseded. A Product Information Sheet that has been superseded may contain incorrect, obsolete and/or irrelevant data and other information.

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