

## Aerotherm Aerogel Insulation Product Information

Composed of over 90% air, aerogel is a highly effective insulator with the lowest thermal conductivity of any solid. Aspen Aerogels has turned aerogel into an extremely strong, durable, and flexible material that is two to eight times more effective than traditional insulation. Aerogel Technologies has created Aerotherm aerogel insulation from Aspen's product. Aerotherm is thin, compression-resistant and waterproof – the ideal choice for outdoor products.

- Highest thermal performance
- Minimum weight and thickness
- Loft not required to maintain R value
- Doesn't compress or lose performance under load
- Waterproof
- Durable in normal wash/dry cycle

Other insulation materials require loft to achieve their insulation value. Pressure causes these materials to compress dramatically and lose their loft along with their insulating capacity. Aerotherm aerogel insulation does not need loft to deliver its high insulation value and it barely compresses, even in a foot bed under adult weight. At 15 psi pressure, aerogel insulation retains over 95% of its original thickness and over 97% of its original thermal performance. No other insulation can match this performance.

Aerotherm aerogel insulation is a high performance insulation used in place of lofted insulations. Typically only 2mm of aerotherm aerogel insulation is required to increase the thermal performance of outerwear 2 to 3 times over typical down or lofted polyester, especially in compression areas. Aerotherm aerogel insulation's thermal performance is not affected by compression. Aerotherm aerogel insulation has the highest R value of any insulation, translating into the highest practical Clo value (thermal resistance of clothing as it relates to human comfort). This greatly reduces the relative weight of a garment required to meet a given Clo value.

**Uses:** Footwear, general outerwear including ski gloves to dress gloves, sportswear, accessories, extreme weather gear, water bottles, medical packaging, outdoor gear including; backpacks, sleeping pads, sleeping bags and tents; also applicable for personnel safety clothing, footwear and gloves.

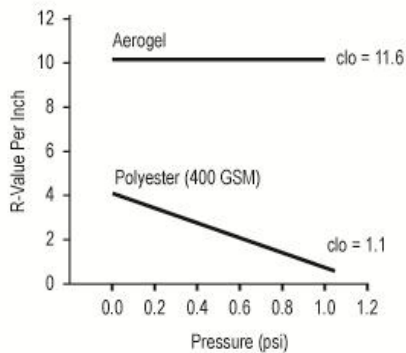
## Advantages of Aerotherm Aerogel Insulation

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|---------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Superior Thermal Performance:</b>  | 2 – 8 times better than competitive insulation products                                                                                                         |
| <b>Reduced Thickness and Profile:</b> | Equal thermal resistance at a fraction of the thickness                                                                                                         |
| <b>Physically Robust:</b>             | Soft and flexible but with excellent spring back, aerotherm aerogel insulation recovers its thermal performance even after compression events as high as 50 psi |
| <b>Hydrophobic:</b>                   | Aerotherm aerogel insulation repels liquid water.                                                                                                               |
| <b>Environmentally Safe:</b>          | Landfill disposable, shot-free, with no respirable fiber content.                                                                                               |

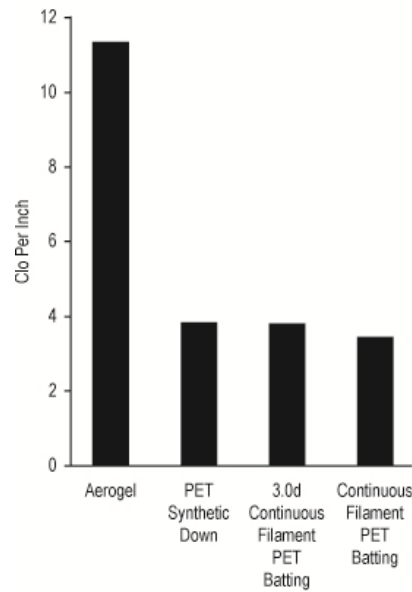
## R-Value per Inch

MATERIAL	R-VALUE
Aerogel	11
Styrene Foam	4.5
Microfibers	0.6 – 4.4
Fiberglass Bats	3.4
Blown Cellulose	3.2

## R-Value Change With Pressure



## Highest Clo-Value Per Inch



## Lowest Thermal Conductivity

$k$  (mW/m-K)

Aerogel	13
Polyurethane Foam	24-30
Polystyrene Foam	33-35
Fiberglass	38-42
Lofted Polyester Apparel Insulation	38-47

### Composition:

50-70% silica gel (Methylsilylated Silica), 30 – 50% Polyethylene terephthalate (PET or polyester) fiber.

### Water Absorbency:

Hydrophobic, repels water so will never feel damp.

### Breathability:

Design allows for spacing between arotherm pads without sacrificing insulation value.

## Ecological Information

Ecological information is based on literature review for synthetic amorphous silica (CAS No. 7631-86-9)

### Synthetic Amorphous Silica:

Fish: LC50 > 10,000 mg/L (Brachydanio rerio: 96 hour), Method OECD 203.

Daphnia magna: EC50 > 10,000 mg/l (24 hours), Method OECD 202.

### Mobility:

None expected due to insoluble nature of product.

### Persistence and Biodegradability:

Not applicable for inorganic material.

### Bioaccumulative Potential:

None expected due to insoluble nature of product.

### Other Adverse Effects:

None expected.