

## Thermal and Moisture Protection

*This category outlines technologies that could be applied to thermal or moisture protection products to keep people more comfortable and protected from the elements. The technologies are from various industries and include NASA technology, which keeps people comfortable and protected in space.*

### Technology Scanning

One of PATH's major research support services is PATH Technology Scanning. *Technology Scanning* tells us about technology developments in other industries, from other nations, from federal laboratories, and from other building sectors. PATH looks for breakthroughs in other industries that could be transferred and applied to housing. *Technology Scanning*—published by the U.S. Department of Housing and Urban Development/PATH and prepared by the NAHB Research Center, Inc.—are updated as technology developments dictate. The Research Center works to unite technology developers from outside of residential construction with manufacturers in the residential housing sector.

This issue of *Technology Scanning* is one in a series. Each issue in the series falls into one of the following categories:

- Design and Internet Tools
- Safety
- Surfaces and Interior Finishes
- Building Envelope Technologies
- Electrical
- Plumbing
- Heating, Ventilating and Air Conditioning
- Energy/Power Systems Generation
- Basic Materials
- Information Technology
- Sustainable Design Strategies
- Materials Recycling and Reuse
- Thermal and Moisture Protection
- Indoor Environmental Quality

Call the ToolBase Hotline at 800-898-2842 for information about other available *Technology Scanning* issues. Or, log onto [pathnet.org](http://pathnet.org) and [www.toolbase.org](http://www.toolbase.org).

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## Thermal Technologies

### NASA Aerogels, Super Cryogenic Insulation

Aerogel, an aerosol-based super thin insulation technology, provides very high thermal properties with a very thin application. Aerogels can be applied in several forms. This technology holds potential in almost any building envelope application.

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### NASA Heat Shield Protective Coatings and Insulation

Ames Research Center has developed protective coatings for ceramic materials which lower the surface temperature of a thermal coating. They reduce the heat transfer through the surface preventing the degradation of the underlying substrate. They also have very good impact resistance. The estimated cost is \$5 /square foot. This technology, developed for heat shields, can be applied to many other materials besides ceramics to convey heat away from a substrate.

These are lightweight, flexible, easily formulated, and environmentally safe (water based, no solvents). Potential applications include roofing for homes, especially in high fire danger areas. They could also be used for fireproof insulation, or as a siding product or paint coating to reduce summer heat gain.

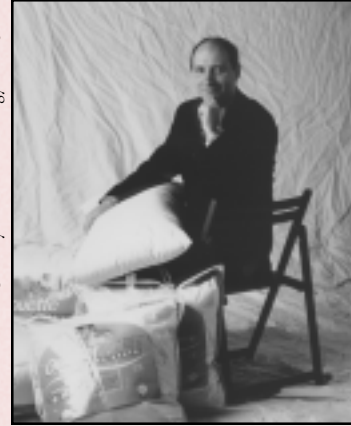
These technologies are also used to keep space travel comfortable and are transferable to solve insulation or thermal problems:

- Toughened uniPC fibrous insulation (TUFI)
- Composite flexible blanket insulation (CFBI)

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Courtesy: French Technology Press Office



Some examples of antibacterial, anti-dust mite and stain-resistant textiles for healthcare, such as covers and fillings for bedding (mattresses, duvets, pillows) from the French company Abeil.

### Super Therm Ceramic Paint Insulation

Developed in conjunction with a division of NASA, this technology contains several ceramic components. When applied as a coating to walls, roofs, etc., it will provide a non-toxic, non-flammable, durable coating that keeps heat out and conserves energy. The coating is water based and environmentally friendly. It is applied in spray or roller form. NASA is currently testing it on shuttle launch pads and external tanks.

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[www.new-technologies.org/ECT/Civil/supertherm.htm](http://www.new-technologies.org/ECT/Civil/supertherm.htm)

### NASA High-Tech, Low Temp Insulation

New lightweight metal alloy and ceramic insulation used for protection of the space craft during re-entry has been applied to mittens and gloves and emergency rescue blankets. A low density, honeycomb-like material was fabricated, capable of inhibiting convective and radiative heat transfer. This cloth-like honeycomb material can be fabricated to match the temperature range of the application it will face, so if you don't need it to withstand 2200°, like NASA, it can be fabricated to match more normal earthly temperature extremes.



**NASA High-Tech,  
Low Temp  
Insulation,**  
continued

Using the same honeycomb concept, NASA scientists and a private company, Thermolon, developed a lightweight, lower cost version of plastic insulation for blankets and clothing that has better properties than wool or polyester fleece. It is four times warmer; it dries faster; and the honeycomb structure doesn't trap moisture. The honeycomb insulation structure has even been made from recycled plastic or milk containers to demonstrate its environmental sense. Whirlpool Corporation is looking to use this moisture-tolerant alternative to replace CFC blown foam insulation that would make refrigerators even more energy efficient and environmentally responsible.

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**3M Thermal Barrier Nextel**

This application of technology in auto racing reduces heat transfer from the engine, exhaust, and track surface. Nextel delivers a flexible insulating barrier against high temperature. It can be made into tiles, textiles, or wraps. It is also used in the burners of high efficiency hot water tanks reducing nitrogen oxide emissions by as much as 85 percent.

**3M Metal Matrix Composites**

3M has developed a high performance, high strength, metal matrix composite material used to reinforce aluminum and its alloys. This non-magnetic, low-density material has the

strength of steel at a fraction of the weight and has excellent performance at high temperature.

**3M Thermal Insulation**

This application absorbs sound in high-noise areas and provides excellent thermal properties. The 3M Acoustic Composite Sheet Material (ACM) — a ceramic composite that is lightweight and can be cut, fabricated, shaped, or molded to nearly any configuration. It is also fire resistant and retains its physical properties up to 400 degrees F.

It comes in sheets 4'x4' and thickness from 1 inch to 3 inches.

**Contact:**

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www.3m.com

**Performance Technologies  
from the Textile Industry**

**High-Tech Fabrics for Clothes**

Developed by French technologists, several fabric technologies bring more function to clothes. One textile technology allows jackets to become warmer as temperatures drop. Another technology makes T-shirts with ceramic fibers to repel ultra-violet rays. A third technology impregnates clothing with a chemical that wards off insects. Any of these have application potential for protecting occupants of homes.

**Contact:**

French Technology Press Office  
Chicago, IL  
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www.consulfrance-chicago.org/french/english/sciencetechnology.htm

**Intelligent Textiles**

► Cambrelle Extreme is an exceptionally warm textile which keeps radiant heat in, while it wicks away moisture harmlessly. This superior thermal and moisture management system is found in footwear and other outerwear;

► Thermolite Extreme is unsurpassed in warmth per unit of weight, and it's extremely durable. It is applied most often in high performance outdoor gear;

► CoolMax and ThermoStat performance fibers are worn by Olympians and race car drivers to control moisture and regulate temperature; and

► NoMax Fibers are flame resistant fibers for race suits. They provide superior flame resistance in various locations.

These DuPont textile technologies hold potential for many building envelope products, components, and systems.

**Contact:**

DuPont Technology Transfer Office  
Phone: 877-881-9787  
www.dupont.com/insulations/product/thermoextreme.html

**Breathable Coating Technology**

Several companies, including W.L. Gore, employ the latest in breathable fibers and textiles. These textiles permit moisture to pass through one way and keep heat in. Gore Tex, well known in the outerwear business, could be applied to housing to solve similar moisture management problems that it did in outerwear.

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W.L. Gore & Associates  
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www.gore.com

A European Company with a textile called Breathe performs the same function— keeping heat in, keeping rain out, while allowing moisture to pass through from the inside.

**Contact:**

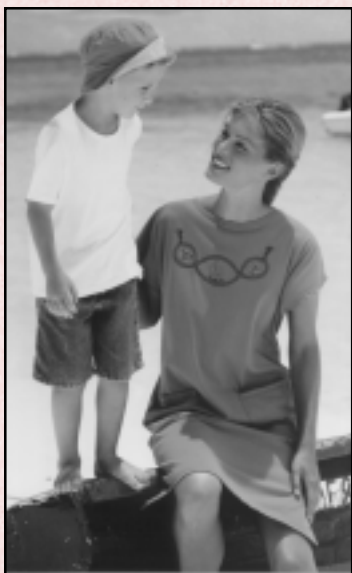
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A third company, StedFast, makes StedAir, a moisture barrier used by firefighters to keep them comfortable, letting moisture out, keeping heat away, and keeping them dry inside.

**Contact:**

StedFast Moisture Management Systems  
Phone: 888-673-8441  
www.stedfast.com

**Damart's  
anti-UV, heat-  
reflective tee  
shirts for men,  
women, and  
children.**



**A blanket  
made of  
Rhovyl AS+  
fiber with  
antibacterial  
and anti-dust  
mite  
properties  
(from Rhovyl).**