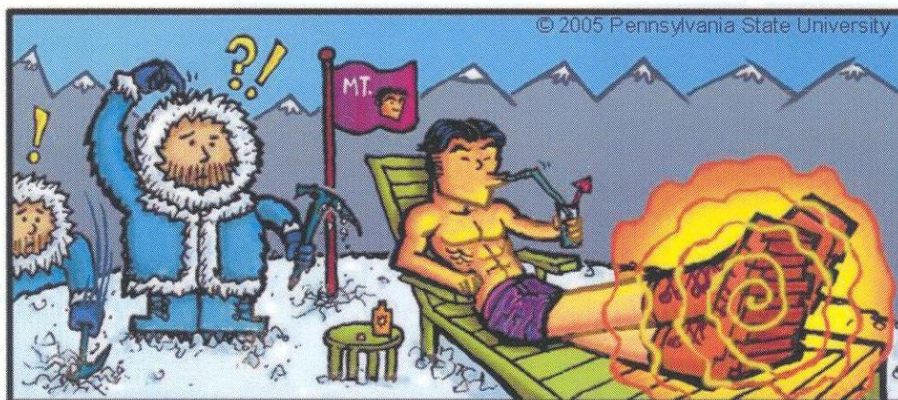


## What is the product?

### Toasty Feet Insoles



## What is it used for?

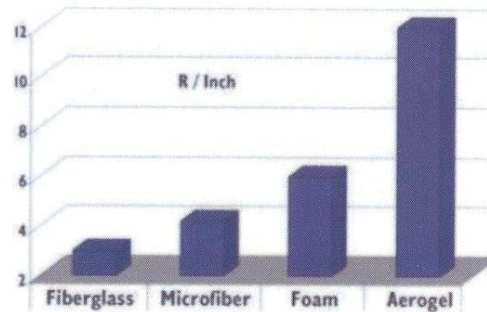
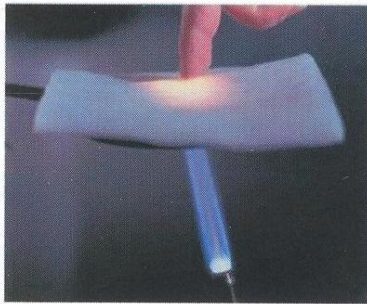
These shoe inserts retain warmth in cold conditions and insulate from heat in hot conditions.

## What is “Nano” about it?

- “Aerogel” is a silicon (Si) based solid that is 99.8% air and 1000 times less dense than glass.
- This technology uses “pyrogel” a material similar to aerogel which has a large surface area caused by the presence of pores of around 10nm in diameter.
- The insulating properties of the aerogel based fabric or “pyrogel” can protect against extreme temperatures using a limited thickness of material.
- A block of aerogel as large as a human weighs less than 1 pound but can support 1000 pounds.

## How does it work?

- The aerogel material is very porous and has a very large surface area. These pores trap air and give the material excellent insulating properties. The trapped air stops the conduction of heat to and from your body.
- The inserts offer lightweight support for your feet and are rated to be twice as effective as other more traditional insulators of the same thickness.
- The chart that follows shows the R-factor\* rating per inch of aerogel compared to these other materials.
- An inch of aerogel is more than 4 times more efficient as an inch of fiberglass and 2 times better than foam (which doesn’t have nano-sized pores) as an insulator.
- Pyrogel AR5401 is used for the shoe insoles. Pyrogel AR5401 is aerogel that is infused with carbon. The carbon helps to absorb odor.



Courtesy of Aspen Aerogel

### Does it have other applications?

Yes.

- Jackets and gloves can be made thinner but still keep you as warm in the winter.
- NASA uses this technology to keep astronauts safe in harsh conditions in outer space.
- Planes can use aerogel as an insulating material to lower the overall weight and increase fuel efficiency.
- Due to its heat insulating properties, this material can be used for fire protective clothing.

### What is the price?

The price is around \$13.00 for a pair of insoles.

### This information was obtained from:

The Jet Propulsion Laboratory at the California Institute for Technology  
Aspen Aerogels Inc.