




# TECH BRIEFS

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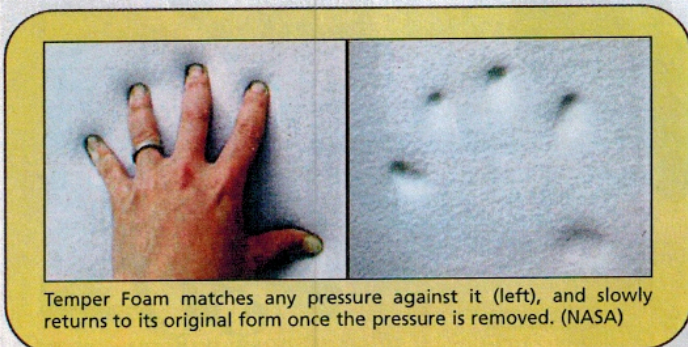


# 30 Years of Materials & Coatings Technology

In celebration of the 30th Anniversary of *NASA Tech Briefs*, our features in 2006 highlight a different technology category each month, tracing the past 30 years of the technology, and continuing with a glimpse into the future of where the technology is headed. Along the way, we include insights from industry leaders on the past, present, and future of each technology. This month, we take a look at the past 30 years of Materials and Coatings.

## Temper Foam

One of the most successful spinoffs of NASA-developed technology to the commercial marketplace was a material. In the 1970s, NASA was developing a material for use in astronauts' spacecraft seats and needed a material that would conform to the astronaut's body weight and shape, and one that could relieve the G-forces experienced during liftoff and descent.



Temper Foam matches any pressure against it (left), and slowly returns to its original form once the pressure is removed. (NASA)

The material NASA developed was difficult to manufacture. Called Temper Foam, it conformed to the body, but would return to its original form even after 90% compression. The foam retained its form in its natural state, but when it came under pressure such as when someone sat on it, it contoured to

the natural curves of the person without causing any pressure points. Invented by Charles Kubokawa and Charles Yost at NASA's Ames Research Center in California, the foam material was also earmarked for airline pilots' seats.

In the 1980s, NASA licensed the raw material to Fagerdala World Foams of Sweden, a technical foam manufacturer. After almost a decade, they perfected the composition and durability of the material, and in 1991, released Tempur-Pedic material. Today, Tempur-Pedic International is headquartered in Lexington, KY. The open-celled, viscoelastic, temperature-sensitive material was made into pillows, earplugs, orthopedic supports, operating table pads, and most notably, mattresses. Temper Foam was inducted into the Space Technology Hall of Fame in 1998.

## Plastics and Coatings

According to the American Plastics Council (APC), since 1976, plastic has

been the most widely used material in the United States. And polyethylene, which became the first plastic in the United States to sell more than one billion pounds a year, is currently the largest-volume plastic in the world.

Over those past 30 years, plastics have been morphed and combined with other polymers to create higher-strength, more flexible, durable, lightweight, and colorful products. In fact, new bioplastics — biodegradable polymers derived from starches and proteins — are improving environmentalists' views of the eco-friendliness of plastic.

Some of the most important plastics innovations developed decades — or even centuries — ago, continue to find new uses and more diverse applications than their inventors could have imagined. When Ralph Wiley of Dow Chemical discovered polyvinylidene chloride, he could not have known that what he called Saran would today be used not only to protect food, but its ability to cling to almost any material would make it useful in protecting military equipment from harsh environments.

In the 1970s, GE Plastics introduced LEXAN® polycarbonate resin, a durable, heat-resistant plastic that was recognized as a potential substitute for glass. Today, LEXAN is used in computers, electron-

### 1976

DuPont introduces SilverStone®, a non-stick, scratch-resistant fluoropolymer cookware coating based on Teflon® polytetrafluoroethylene. W.L. Gore receives their first commercial order for GORE-TEX® fabric, the first waterproof, windproof, breathable fabric.

1976

### 1979

3M introduces Thinsulate™ thermal insulation for clothing and outdoor recreation apparel.

### 1980

3M introduces Post-it® Notes that use a non-sticking, non-permanent adhesive to create "temporarily permanent" bookmarks.

### 1983

A "plastic car" is manufactured by General Motors with exterior parts made from Bayer's Bayflex®.