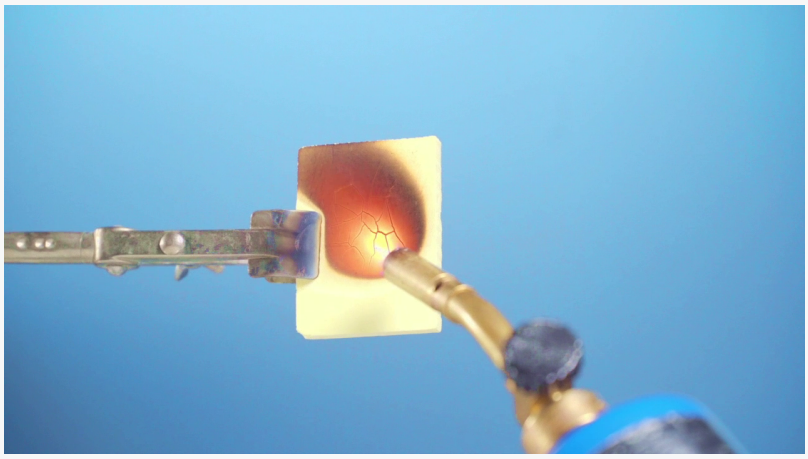
Ultralight "Dream Material" Makes Safer Batteries, Better Bulletproof Vests, and Lighter Airplanes

Newly patented aerogel material that is simultaneously ultralight, waterproof, fireproof, dust-free, and durable represents technology game-changer



New 'dream material' is simultaneously nonflammable, waterproof, ultralight, durable, and 2x better insulating than fiberglass, all without environmentally harmful components.

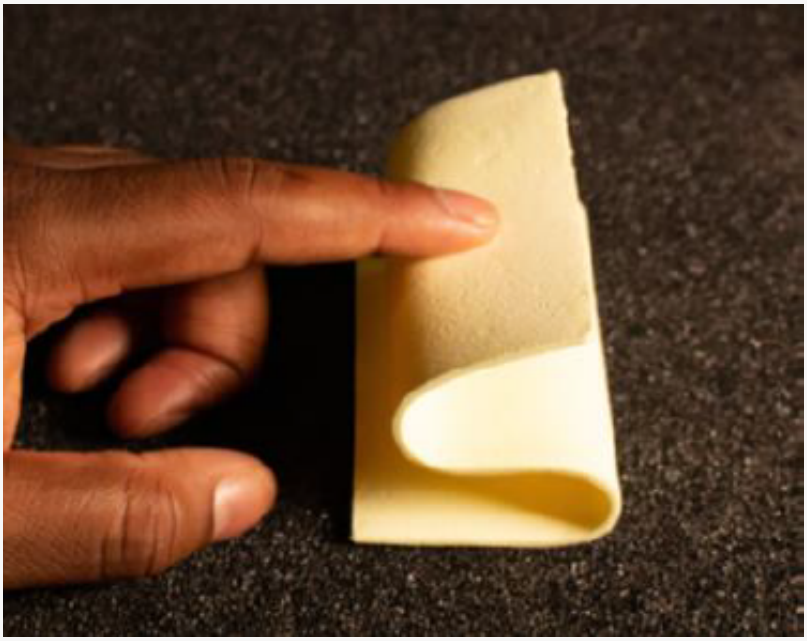
BOSTON, MA, MA, UNITED STATES, November 27, 2024 / EINPresswire.com/ -- Boston-based Aerogel Technologies, LLC has been awarded a patent for a revolutionary new type of ultralight aerogel material that, for the first time, is simultaneously waterproof, fireproof, and mechanically durable, all without relying on environmentally harmful components.

Made of up to 99+% air by volume, aerogels are the world's lightest solids—effectively nanoporous open-celled foams with air pockets so small that heat cannot pass through them via convection. This makes aerogels not only the world's lowest-density materials but also the world's best thermal and acoustic insulators.

> We estimate there are over $500 billion in market opportunities for our new 'dream material', ranging from batteries and airplanes to bulletproof vests and footwear."
>
> *Dr. Stephen Steiner, CEO, Aerogel Technologies, LLC*

Most forms of aerogel to date have been based on silica, the same substance that makes up window glass. Aside from their high R-value, silica aerogels exhibit a wide range of useful materials properties, including hydrophobicity and nonflammability. But like glass, silica aerogels are incredibly brittle, and products based on them are thus extremely dusty. Although industrial insulation products such as fiberglass blankets infused with silica aerogel have seen limited traction in markets such as energy infrastructure and high-end construction, it is

estimated that over $500 billion in market opportunities for aerogels remains unaddressed because of the impracticality of existing silica-based aerogel products. To address this, non-dusty aerogels based on organic polymers have been developed, however have been much more susceptible to moisture and fire than their inorganic counterparts.



The new material can be produced as flexible foams, durable sheets, 3D shaped forms, coherent thin films, and conformal coatings for different market applications.

The newly patented aerogel is highly waterproof, reversibly absorbing only 9% its weight in water after being submerged for 24 h vs. 900% for previous materials. The new material can also be formulated to withstand laundering.

Now, aerogel manufacturer Aerogel Technologies has developed a new type of aerogel based on a novel waterproof, nonflammable polymer that is 10x lighter than plastics yet still durable and machinable, all while being 2x more insulating than fiberglass and stable to over 600°F. Sold under the trade name Airloy® H116, the new aerogel is made of a specially engineered polyimide polymer and can be produced as shaped 3D forms, coherent thin films, or conformal coatings, and can be composited with other materials such as foams, textiles, and felts to produce a multitude of useful market-ready products. The company states that the new "dream material" is also 100x better at resisting moisture than previous polyimide aerogels, reversibly absorbing just 9% its weight in water after being submerged for 24 h, compared to the over 900% water uptake typically seen with polyimides. And, unlike many other waterproof polymers, Airloy H116 is free of fluorine, chlorine, and other halogens—a game-changer amidst growing concerns surrounding the environmental impacts of fluorinated substances such as PFCs, PFAS, and CFCs.

The newly issued patent for the material, US patent number 12,146,031, also describes the world's first launderable aerogel, which reportedly can be washed in a commercial washing machine with detergent and dried in a clothes dryer without its nanoporous structure collapsing

or materials properties degrading.

"This stuff is truly amazing," said Aerogel Technologies CEO Dr. Stephen Steiner. "This new material finally fulfills so many of the promises of aerogel where previous materials fell short." Steiner sees huge potential for the new aerogel in applications including thermal barriers for electric vehicle battery packs, urban air taxis, airline interior components, bulletproof vests, 5G/6G communications, and footwear.

The new material is already attracting the attention of some pretty big names. NASA has reportedly developed a new advanced acoustic insulation for its Artemis moon rocket using the new formulation, along with Boeing, Blue Origin, the US Department of Defense, and dozens of other companies who are developing products around it. To address demand, Aerogel Technologies is producing the material using the world's first roll-to-roll manufacturing process for polymer aerogels based on the company's proprietary ambient-pressure drying technology. The company says samples of products based on Airloy H116 including flexible sheets, compliant foams, and machinable panels are now commercially available through its ecommerce site BuyAerogel.com, with larger volumes available on a business-to-business basis as well.

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