

NTU Scientists Create Energy-Efficient 'Fungi Tiles' For Cooling Buildings

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A team of scientists from Nanyang Technological University (NTU) Singapore has unveiled an innovative new solution to reduce heat in buildings without consuming energy. Their groundbreaking creation, called “fungi tiles,” combines the root network of fungi with organic waste to create an eco-friendly material that could revolutionise building insulation.

These mycelium-based tiles are designed with a textured surface that mimics the heat-regulating properties of an elephant’s skin. Elephants, which lack sweat glands, have wrinkled skin that helps them cool down by trapping air and increasing surface area for evaporative cooling. The NTU team, in collaboration with local biomimicry design firm bioSEA, has replicated this natural design, enhancing the mycelium tiles’ cooling properties.



NTU scientists, in collaboration with local ecology and biomimicry design firm bioSEA, have developed ‘fungi tiles’ that could help cool buildings down without consuming energy.

A Game-Changer for Sustainable Building Materials

Research has already shown that mycelium-bound composites outperform conventional insulation materials in terms of energy efficiency. The NTU team's latest tests reveal that their elephant skin-inspired tiles are 25% more effective at cooling than flat mycelium tiles. Additionally, the cooling effect improves by a further 70% under simulated rain conditions, making the tiles particularly well-suited to tropical climates.

"The construction industry accounts for nearly 40% of global energy-related emissions, and finding sustainable insulation materials is crucial," said Associate Professor Hortense Le Ferrand, who led the study. "Mycelium-based composites offer a biodegradable, porous material that rivals synthetic alternatives in thermal conductivity while helping to reduce environmental impact."



Building on this proven insulating property, the NTU team worked with bioSEA to add a bumpy, wrinkly texture to the tile, mimicking an elephant's ability to regulate heat from its skin. Elephants do not have sweat glands and rely on these wrinkles and crevices on their skin to regulate heat.

A Natural Cooling Solution for Hot, Humid Climates

To test the tiles' effectiveness, the team used a hot plate to heat the tiles and measured their temperature changes using infrared cameras. The elephant skin-inspired texture helped the tiles absorb heat more slowly, improving their thermal performance by 25%. When exposed to humid conditions, the tiles showed an even more dramatic cooling effect, offering a 70% improvement in efficiency when misted with water.

"This design is inspired by how elephants regulate their body temperature in hot and humid climates without sweating," explained Dr. Anuj Jain, Founding Director of bioSEA. "By incorporating this natural cooling mechanism, we've created a material that mimics nature's strategies for heat regulation."

The Path Ahead

While the mycelium tiles show great promise, scaling up their production poses challenges. The growth process for these tiles takes three to four weeks, and there may be resistance to adopting them due to the entrenched infrastructure of synthetic building materials. Nonetheless, the team is working to improve the tiles' mechanical stability and durability, as well as exploring different mycelium strains.

“Through these tiles, we’re not just creating a more sustainable product but rethinking the way we approach thermal management in buildings,” concluded Assoc Prof Le Ferrand. “This innovation opens up the possibility for more nature-inspired designs and solutions in the construction industry.”

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