

'Sweating' paint keeps buildings cool even in hot, humid cities

An experimental cement-based paint cools buildings by combining sunlight reflection and water evaporation. This sweating paint could keep buildings cool in hot, humid cities.

A cement-based paint that cools buildings by combining sunlight reflection and water evaporation has been tested with surprising results. **This 'sweating' paint could keep buildings in hot and humid cities cool.**



Scientists in Singapore have developed a new paint that reflects sunlight and cools surfaces by slowing the evaporation of water. Unlike other commercial cooling paints that are designed to repel water to protect the material underneath, the new paint works even in hot and humid places, providing an energy-efficient way to stay cool.

'*The key is passive cooling*,' says materials scientist Li Hong, 'which requires no energy input.' In other words, it works without the use of electricity or mechanical systems. Currently, radiative cooling is the most common type of passive cooling used in materials, including some paints. It works by reflecting sunlight and thermal radiation from surfaces like walls or roofs back into the sky. But in humid places like Singapore, water vapor in the air traps heat near the surface, preventing it from escaping into the atmosphere and keeping the surface warm.



To combat this, Hong and two other materials scientists from Nanyang Technological University developed a **cement-based paint that combines three cooling strategies: radiative cooling, evaporative cooling, which our skin uses, and sunlight reflection.** In the study, the scientists painted three small houses: one with conventional white paint, one with a commercial cooling paint that only uses radiative cooling, and one with their new formula. After two years of sun and rain in Singapore, the first two paints turned yellow. But 'our paint stayed white,' said co-author Jipeng Fei. Unlike other colors, white helps the material maintain its high reflectivity and cooling efficiency.

The paint's porous structure holds water and slowly releases it, much like a body sweats. It reflects 88 to 92 percent of sunlight, even when wet, and radiates up to 95 percent of the heat it absorbs. Nanoparticles add reflectivity and durability, helping the paint stay white over time. Small amounts of polymers and salts help retain moisture and prevent cracking. Tests have shown that homes with new paint use 30 to 40 percent less electricity for air conditioning than others.

Another benefit of this highly reflective, water-retaining paint is that it reduces the urban heat island effect that makes cities hotter than their surrounding areas. While air conditioning consumes electricity and releases warm air directly into the surrounding air, paint emits heat as invisible infrared radiation, which escapes into the atmosphere instead of warming the local environment. The team says their paint could help alleviate the heat burden in dense urban environments.



The advent of this "sweating" paint is truly amazing, promising to bring many positive impacts to the environment in the future.

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