Superwhite paint can cool buildings even in hot sunlight

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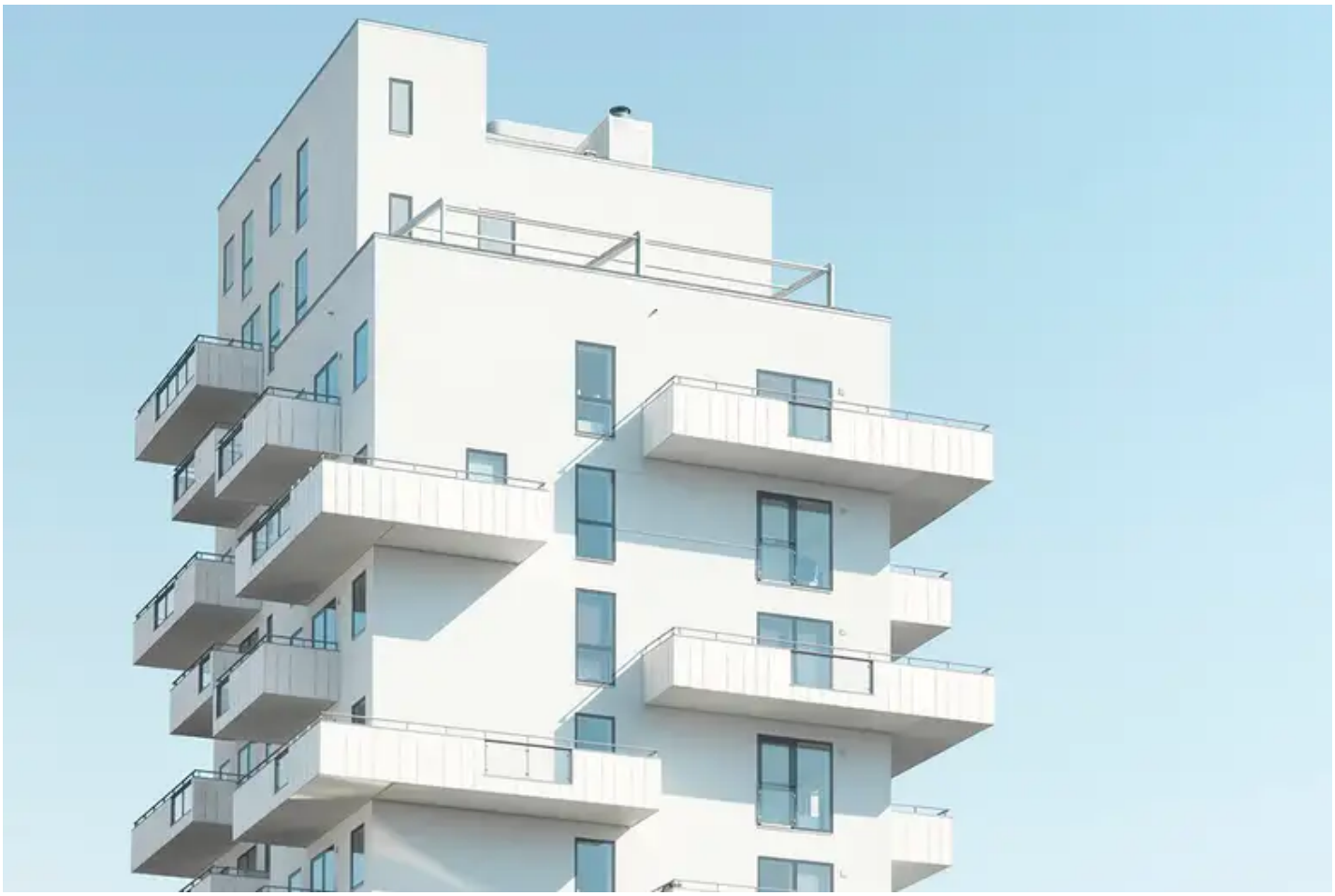

Some buildings are already painted white to help with cooling
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A new superwhite paint is so reflective that it can cool a surface to below the surrounding air temperature, even under sunlight. It could help reduce the use of energy-intensive air conditioning in hot countries.

With global energy use expected to grow 90 per cent by 2050, ways to passively keep cool without using energy will be vital in coming decades. While "cool roofs" painted white are a common sight in hot climates, materials experts think they can do one better.

Xiulin Ruan at Purdue University and his colleagues developed a white paint that was so reflective and good at radiating heat that it cooled a surface to 1.7°C below the surrounding noon air temperature during tests in Indiana. Compared with existing, commercial heat-reflective paints that reflect about 80-90 per cent of solar energy, the new one managed 95.5 per cent.

Although it sounds counter-intuitive, the surface can be cooled below the surrounding temperature because it emits enough heat through radiative sky cooling, the natural process of a body under the sky – such as a roof – radiating heat out to space. Light-coloured surfaces regularly do this on cloudless nights, but it wasn't until 2014 that we found a material that managed the feat in daylight, when our cooling needs are greatest.

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Compared with that breakthrough, Ruan says his team's paint is thinner, cheaper and could be easily scaled up. The acrylic paint is made with calcium carbonate, and partly achieves its qualities by containing particles of many different sizes, which help to scatter different wavelengths in the solar spectrum. Ruan estimates a typical US home of 200 square metres would save about $50 per month on cooling costs, compared with using an existing heat-resistant paint.

"This is a very nice result," says Aaswath Raman at the University of California, Los Angeles. "It demonstrates a paintable solution that employs materials commonly used by the paint industry, and gets reasonably good cooling performance. One potential limitation could be its use of organic solvents, but that could be addressed in the future."

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