MATERIALS

Switchable window material stays clear while blocking the sun's heat

By Ben Coxworth
November 09, 2021

Listen To This Article

Powered by Gyst Audio

The NTU Singapore team with a sample of window glass incorporating the material NTU Singapore

As sunlight passes through a building's windows it can cause indoor temperatures to rise, to the point that the structure's power-hungry air conditioning system has to be used. A new switchable window material, however, blocks incoming heat while remaining mostly transparent.

First of all, there *are* already windows with electrochromic glass, that electronically tints on demand. As the glass gets darker, though, it gets harder to see through. Additionally,

although such windows do partially block the visible spectrum of sunlight, they don't necessarily block the infrared spectrum, which produces the heat.

That's where the new material comes in.

Developed by scientists at Singapore's Nanyang Technological University and Israel's Hebrew University of Jerusalem, it consists of an inexpensive mixture of titanium dioxide, tungsten trioxide, neodymium-Niobium and tin oxide. This is applied as a coating to ordinary window pane glass, and connected to an electrical circuit.

When the extra heat provided by the sunlight is wanted, such as during the winter months, the material is left switched off. This allows all of the sunlight's infrared radiation to pass through. During warmer months, however, the power is switched on – simulations have indicated that the material will then block up to 70 percent of the incoming infrared radiation, while still allowing up to 90 percent of the sun's visible light to pass through.

Additionally, whereas existing electrochromic windows reportedly start losing their functionality after three to ve years of use, tests involving repeated on/off cycles have shown that the new material should last much longer.

What's more, windows incorporating the technology could also be coated with an electronically switchable lm created by the same team, which uses carbon nanoparticles to either conduct or block the passage of ambient heat from the outdoor environment.

"With the ability to control both infrared radiated heat from the sun and conducted heat passing through the window, we expect this technology to be particularly useful in temperate climates, as building occupants can use it to regulate heat loss or gain according to the needs of the changing seasons, while still enjoying much of the view," says Nanyang's Dr. Ronn Goei, rst author of a paper on the research.

That paper was recently published in the journal*ACS Omega* .

Source: Nanyang Technological University