

Chinese scientists develop fabric they say can cool the body

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Posted at Jul 13 2021 11:46 AM

Chinese researchers have designed a fabric they say can cool the body by nearly 5 degrees Celsius and could help people cope with rising temperatures.

The “metafabric” – designed by a team of scientists from across the country – looks like ordinary T-shirt material and uses technology that causes it to emit mid-infrared radiation (MIR) to reduce the temperature of the wearer, according to their paper published in the journal *Science* on Thursday.

“Tests showed that a person wearing our metafabric could be cooled down 4.8 degrees [40.6 degrees Fahrenheit] lower than when wearing commercial cotton,” the researchers said. “The cost-effectiveness and high-performance of our metafabrics present great advantages for intelligent garments, smart textiles, and passive radiative cooling applications.”

Human skin naturally emits MIR, which – like other infrared radiation – is invisible to the eye but can be felt as heat. While normal skin temperature is around 37 degrees, the scientists said wearing the metafabric could cool the skin to 31-32 degrees.

They designed the fabric, which can be dyed different colours, to keep people cool in a world that is increasingly feeling the effects of climate change. Last year was on par with 2016 as the hottest on record, with average global temperatures 1.02 degrees higher than for the 1951-80 baseline mean, according to Nasa’s Goddard Institute for Space Studies. North America is currently experiencing a deadly heatwave, with Las Vegas, Nevada reporting an all-time high of 47.2 degrees on Saturday, while Death Valley in California hit 54 degrees on Sunday.

The Chinese scientists say clothing could be a way to keep cool during sweltering heat.

“As the dominant medium that protects the skin from the external environment, clothing might be the perfect candidate to be implemented with daytime radiative cooling functionality,” the paper said.

The project is a collaboration between researchers from the Huazhong University of Science and Technology, Wuhan Textile University, the Intelligent Wearable Engineering Research Centre of Qingdao and the China Textile Academy in Beijing.

Clothing to beat the heat usually means light-coloured fabric to reflect visible light, or fabric that reflects other electromagnetic radiation from the sun like ultraviolet (UV) and near-infrared radiation (NIR). When emitted from an object, NIR is often absorbed by nearby water molecules,

heating up the surrounding air, which makes it less effective at cooling. But MIR can cool off both an object and its surroundings as the energy goes directly into space.

When the 550-micrometre metafabric comes into close contact with skin, it uses chemical bonds to absorb body heat and re-emit its energy into space as MIR. It has been engineered to reflect both UV and NIR. Titanium dioxide powder, a substance also found in sunscreen, was added to the fabric's polymer fibres to make them reflective, and it has polylactic acid to allow the material to emit MIR.

The scientists said the fabric was created using a weaving technique that allows air to circulate, and they estimate it would cost 10 per cent more to manufacture than traditional cotton – they are reportedly looking into mass production of the fabric.

They are not the first to try using MIR-emitting technology for clothing to cool down the wearer. Stanford University researchers came up with a fabric in 2017 that reduced body temperature by about 3 degrees, but the 45-micrometre fabric was extremely thin – about a third the thickness of a lightweight linen shirt.

Yi Cui, a materials scientist with Stanford who led the 2017 study, told Science in a separate report that the MIR-emitting technology had only been used on stationary surfaces so the Chinese team should also look at how effective it was when a person is standing or moving, and he noted that it was not clear whether it would work as well for loose-fitting clothing.