

010225 Nano fabric

Smart fabric can heat up by 30°C after 10 minutes of sun exposure

A new type of cloth developed by researchers at the University of Waterloo can heat up when exposed to the sun thanks to innovative nanoparticles embedded in the fabric's fibres. This advance represents an innovative and environmentally friendly option for staying warm in the winter. Wearable heated clothing typically relies on metals or ceramic heating elements to heat up and an external power source, which could pose safety risks for users.

This new cloth incorporates conductive polymer nanoparticles that can heat up to 30°C when exposed to sunlight. The design requires no external power and can also change colour to visually monitor temperature fluctuations. The magic behind the temperature-sensitive colour change lies in the combination of nanoparticles embedded in the polymer fibres. The nanoparticles are activated by sunlight, enabling the fabric to absorb heat and convert it into warmth.

The fibre is created using a scalable wet-spinning process, combining polyaniline and polydopamine nanoparticles to enhance light absorption and improve photothermal conversion. Thermoplastic polyurethane serves as the spinning matrix, while thermochromic dyes enable the reversible colour-changing feature. The resultant fibre can be woven into fabric for wearable applications.

In addition to its temperature-changing capability, the Waterloo researchers' new fabric can stretch out by as much as five times its original shape and withstand as much as two-dozen washings while still maintaining its function and appearance. Its reversible colour-changing ability provides a built-in temperature monitoring feature to ensure the wearer's safety and convenience.

The Waterloo team is exploring more cost-effective alternatives to polydopamine to make the smart fabric technology more accessible. Future developments will focus on scaling the production process and reducing costs without compromising on the fabric's innovative properties. The fabric's potential applications include aiding in cold rescue situations and solar-powered pet clothing to help keep them comfortable when outside during the winter. (Source: Fangging Ge et al, *Advanced Composites and Hybrid Materials* (2024))