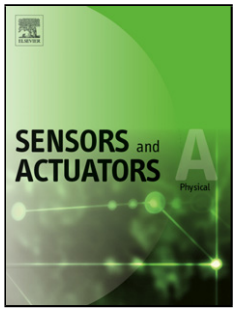

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A novel large-area embroidered temperature sensor based on an innovative hybrid resistive thread

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Highlights

- A novel large-area (24 cm^2) embroidered temperature sensor was developed.
- The sensor is intended mainly for use in smart protective clothing for firefighters.
- The sensor is based on a new hybrid resistive thread that is fully washable.
- The sensor allows for the measurement of the temperature over a large area.
- The sensor has a fast time response to sudden changes in the temperature.

Abstract

This study introduces a novel large-area embroidered temperature sensor based on an innovative hybrid resistive thread. The hybrid thread is composed of strands containing polyester fibers and one resistive stainless steel microwire. The sensor itself is embroidered as a helical meander-shaped structure into the carrier fabric and is intended mainly for smart protective clothing used by firefighters or other professionals to provide them protection against thermal risk, such as heat, fire or burn injury. The capabilities of the hybrid resistive thread are demonstrated through tests on the thread's resistance to the washing/drying process. The properties of the sensor element are verified through the results of temperature calibration performed in the temperature range from 40°C to 120°C and the results of measurements performed in a thermal shock chamber, where sensor