Scientists develop high-sensitivity strain-temperature dual-mode sensor

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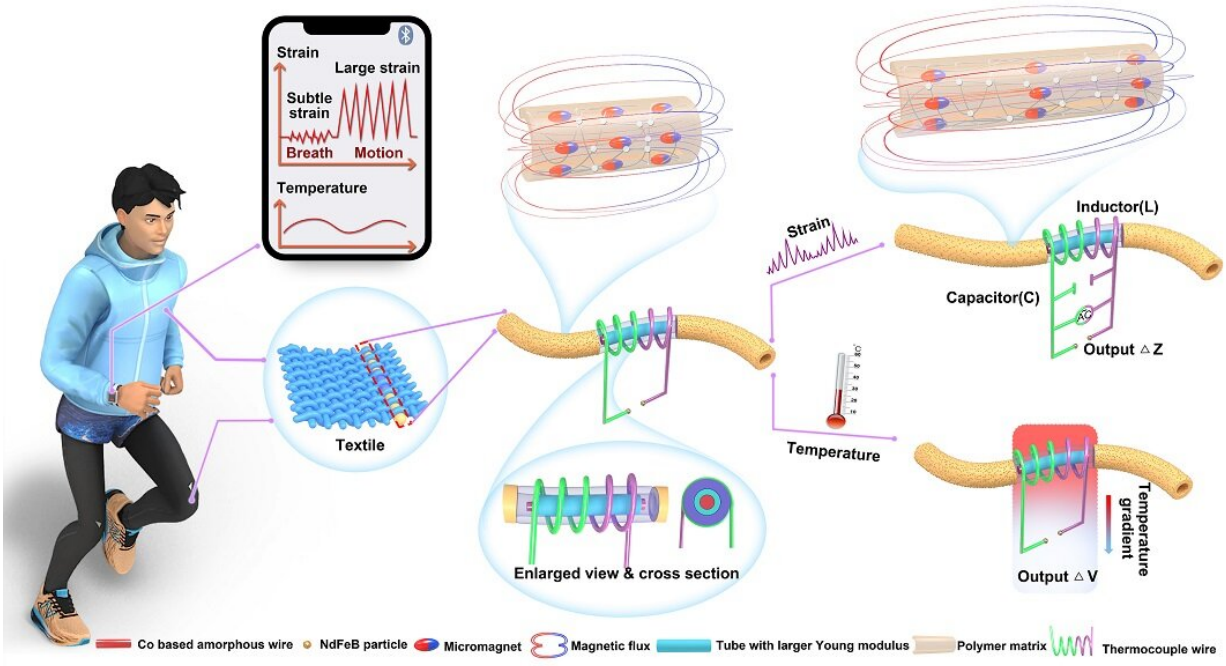

The strain-temperature dual-mode sensor with high stimuli resolution and discrimination. Credit: NIMTE

Researchers led by Prof. Li Runwei at the Ningbo Institute of Materials Technology and Engineering (NIMTE) of the Chinese Academy of Sciences (CAS) have developed a strain-temperature dual-mode sensor with high stimuli discriminability and resolution, enabling real-time

sensing of strain and temperature stimuli without cross-talk by a single sensor.

This work was published in *Advanced Functional Materials*.

As important physiological parameters generated by human activities, strain and temperature play a crucial role in health and motion monitoring.

A flexible sensor is the core component of smart wearable devices, following the development trend of integration and multi-function in recent years. However, the detection and discrimination of strain and temperature stimuli still remain challenging for a single sensor.

Co-based amorphous wire has excellent soft magnetic properties and giant magnetic impedance effect, which can realize highly sensitive detection of magnetic fields, and thus has been recognized as an ideal material for the development of flexible multifunctional sensors.

Based on the Co-based amorphous wire as a sensitive material, the researchers designed a dual-mode sensor with a tubular heterogeneous structure, realizing the monitoring and real-time discrimination of strain and temperature.

The sensor developed consists of a thermocouple coiled wound around a strain-to-magnetic induction conversion unit, and a Co-based amorphous wire with a high permeability. By tailoring the mechanical modulus of the components of the strain-to-magnetic induction conversion unit, the strain sensitivity of the sensor can be adjusted.

The dual-mode sensor showed high strain sensitivity, high temperature sensitivity and good cycling stability. It also achieved a low strain detection limit of 0.05% with a resolution of 0.1%, and a temperature

sensing accuracy of 0.1°C.

Furthermore, the dual-mode sensor was integrated into smart textile to continuously and independently monitor respiration, body movement and temperature, showing bright and broad application prospects in early disease diagnosis, health monitoring, and human-machine interaction.

More information: Huiyun Xiao et al, Dual Mode Strain–Temperature Sensor with High Stimuli Discriminability and Resolution for Smart Wearables, *Advanced Functional Materials* (2023). DOI: 10.1002/adfm.202214907

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