Sweat sensor wristwatch offers real time monitoring of body chemistry

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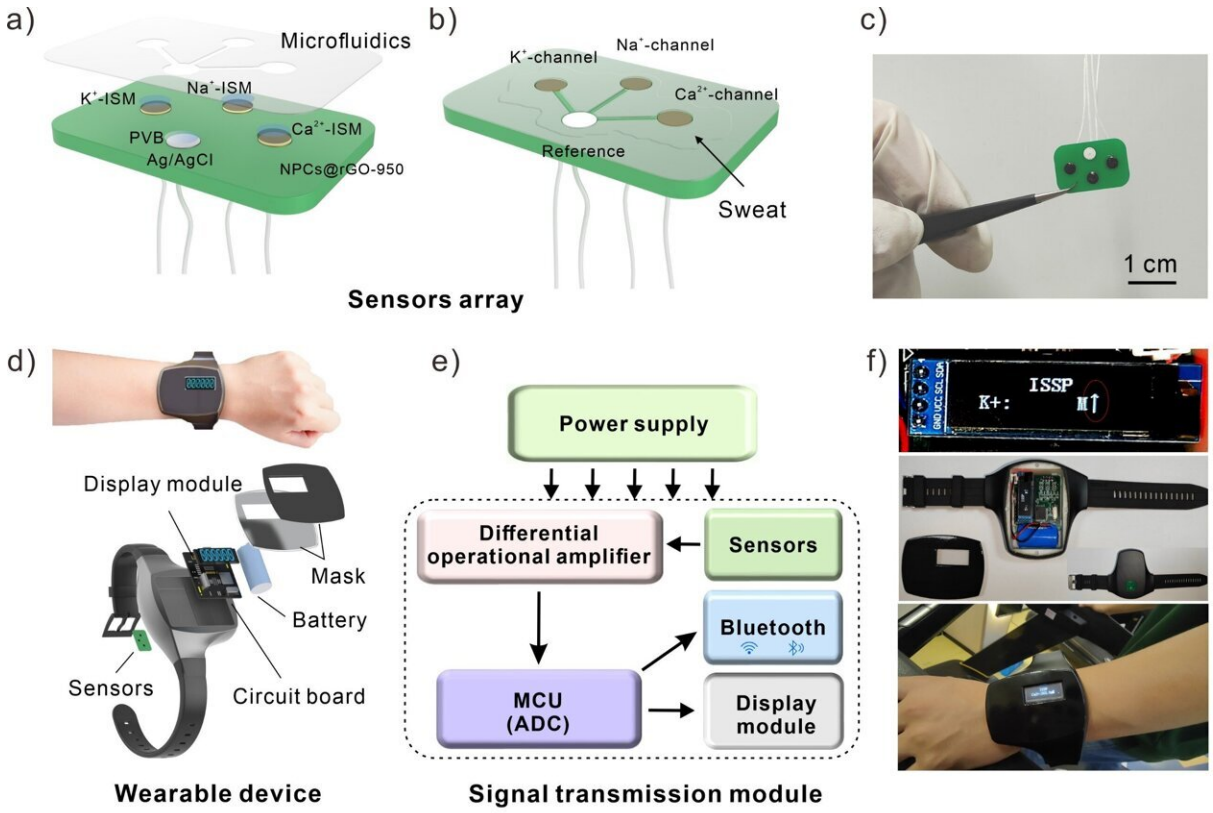


Sweat Sensor Wristwatch Offers Real Time Monitoring of Body Chemistry. Credit: Cai Xin

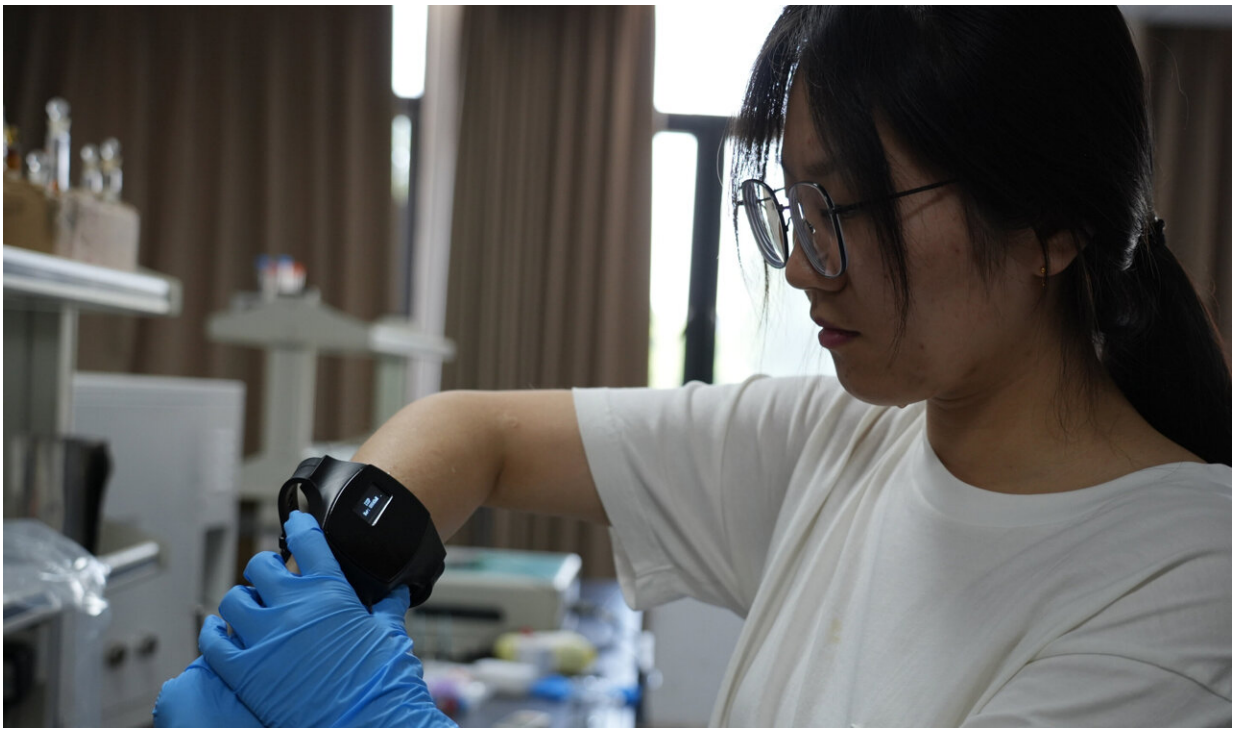
Researchers have created a unique wristwatch that contains multiple modules, including a sensor array, a microfluidic chip, signal processing, and a data display system to monitor chemicals in human sweat. Their study is published in the journal *ACS Nano*.

"It can continuously and accurately monitor the levels of potassium (K^+), sodium (Na^+), and calcium (Ca^{2+}) ions, offering both real-time and long-term tracking capabilities," said senior researcher Prof. Huang Xingjiu from the Institute of Solid State Physics at the Hefei Institutes of Physical Sciences of Chinese Academy of Sciences

Tremendous progress has been made in sweat sensors based on electrochemical methods, making it easier to track body changes. The stability of the sensor chip is crucial for its application effect and service life, which is the key to ensuring the long-term reliable operation of the sensor.

Therefore, researchers focused on designing a stable SC interface as core components, while fully integrating multiple modules of the sweat sensor to enable simultaneous and dependable monitoring of multiple target ions.

In this study, researchers developed mass-manufactured sensor arrays based on hierarchical multilayer-pore cross-linked N-doped porous carbon coated by reduced graphene oxide (NPCs@rGO-950) microspheres with high hydrophobicity as core SC. This enabled highly selective monitoring of K^+, Na^+, and Ca^{2+} ions in human sweat.



Dr. Cai is showing the wristwatch, which can monitor levels of several chemicals in sweat. Credit: Cai Xin

Using computed tomography and solid-solid interface potential diffusion simulation, they found that the diffusion of substances between solid interfaces is very low, and the ability to store electrical charge at these interfaces is high. This ensures the excellent potential stability, reversibility, repeatability, and selectivity of sensor arrays.

This watch's long-term reliability is promising. It can consistently monitor the three ions in human sweat for over 6 months, surpassing the stability of many other sensors that have been reported.

This study represents a comprehensive approach to material design, interface mechanism research, mass production of sensor chips, and

modular full integration, providing more possibilities for wearable electrochemical sweat sensors, according to the team.

More information: Xin Cai et al, Fully Integrated Multiplexed Wristwatch for Real-Time Monitoring of Electrolyte Ions in Sweat, *ACS Nano* (2024). DOI: 10.1021/acsnano.3c13035

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