



Integrated smart wearable microgrids for autonomous healthcare

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Hosted by Prof. SONG Yu



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TIME

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VENUE

G4-302, 4/F Yeung Kin Man Academic Building

ABSTRACT

Flexible integrated electronics promise to transform personalized healthcare by enabling real-time, on-body monitoring of physiological signals. However, the integration of hybrid multimodal sensing significantly increases energy demands, posing a challenge for long-term, autonomous operations. Here, we present a fully integrated self-powered wearable platform that combines multimodal biochemical and biophysical sensing with hybrid energy harvesting, on-device power regulation, and flexible energy storage. The system simultaneously harvests energy from sweat, biomechanical motion, and ambient humidity using biofuel cells, triboelectric generators, and moisture-driven engines. This harvested energy is stored in flexible batteries and regulated to continuously power an array of electrochemical sensors targeting glucose, lactate, uric acid, and levodopa, alongside temperature and motion sensors. An embedded inertial measurement unit and machine learning algorithms enable real-time motion analysis and prediction of incoherent movements such as falls and tremors. The system demonstrates continuous extended operation time under real-life conditions, establishing a practical and autonomous solution for next-generation self-powered wearable systems for personalized healthcare monitoring.

BIOGRAPHY

Shichao Ding received his PhD degree from Washington State University, USA in May 2022, where he studied under Prof. Yuehe Lin. He was a Postdoctoral Scholar at University of California San Diego with Prof. Joseph Wang from June 2022 to January 2026, focusing on wearable microgrids and flexible bioelectronic devices. In 2025, he was recognized by Stanford University and Elsevier as one of the top 2% of scientists worldwide. He joined the School of Engineering of Westlake University as Assistant Professor in January 2026, research on wearable multimodal sensors and flexible bioelectronic devices. Until now, he has published over 100 SCI papers, among which 45 were published as the first/corresponding author on *Nature Medicine*, *Nature Electronics*, *Nature Reviews Materials*, *Nature Reviews Electrical Engineering*, *Advanced Materials*, etc. His work has been cited nearly 7,000 times, with an H-index of 45. His research have been featured in by multiple Nature sister journals, and reported by more than 100 media outlets whole world including CNN and Fox News. Relevant achievements were also invited to be presented at the United States Congress. Currently, he serves as an Editorial Board Member of *Iontronics*, an Academic Editorial Board Member and Deputy Director of the Overseas Editorial Management Committee for Exploration, a Young Editorial Board Member for more than 10 journals including *The Innovation*, *Soft Science*, etc.