Extraction of physiological and physical signals from human skin for health monitoring, disease prevention, and treatment is critical to sustain the wellbeing of humans. Recent advances in wearable bioelectronics which attach directly to the epidermal surface have suggested certain pathways. However, the existing wearable bioelectronics are susceptible to motion artifacts as they lack proper adhesion and conformal interfacing with the skin during motion.

Here, we present the ultra-conformal, customizable, and deformable drawn-on-skin (DoS) bioelectronics platform, which is robust to motion and can provide point-of-care therapy. Compared to existing wearable and/or printed bioelectronics fabricated based on dedicated equipment, DoS electronics has numerous advantages including: simple fabrication without dedicated equipment, capability to construct active electronics, multifunctionality of devices and sensors, immunity to motion artifacts without the need for additional hardware or computation, which offers an unprecedented solution to the long-standing challenge in the bioelectronics field, and customizability for personalized point-of-care treatment.

As a versatile platform, DoS electronics devices such as thin-film transistors, strain sensors, temperature sensors, heaters, hydration sensors, and electrophysiological (EP) sensors have been developed. By comparing the DoS EP sensors with conventional electrodes and other wearable bioelectronics, we found that DoS electronics has multiple advantages, such as stable performance in the presence of sweat, reliable capture of EP signals over a long duration, strong adherence to the skin, and immunity to motion artifacts during sensing. In a rat wound model, electrical stimulation applied through DoS electrodes customized to the shape of the skin wound demonstrated accelerated healing.