biosensors

MDPI

Article

Laser-Induced Graphene-Based Wearable Epidermal Ion-Selective Sensors for Noninvasive Multiplexed Sweat Analysis

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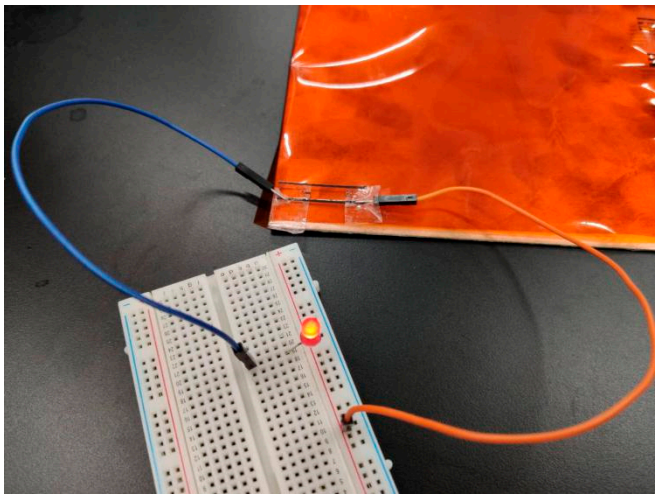


Figure S1. A LED bulb could be readily lighted through a LIG conductive wire, indicating good electrical conductivity of LIG.

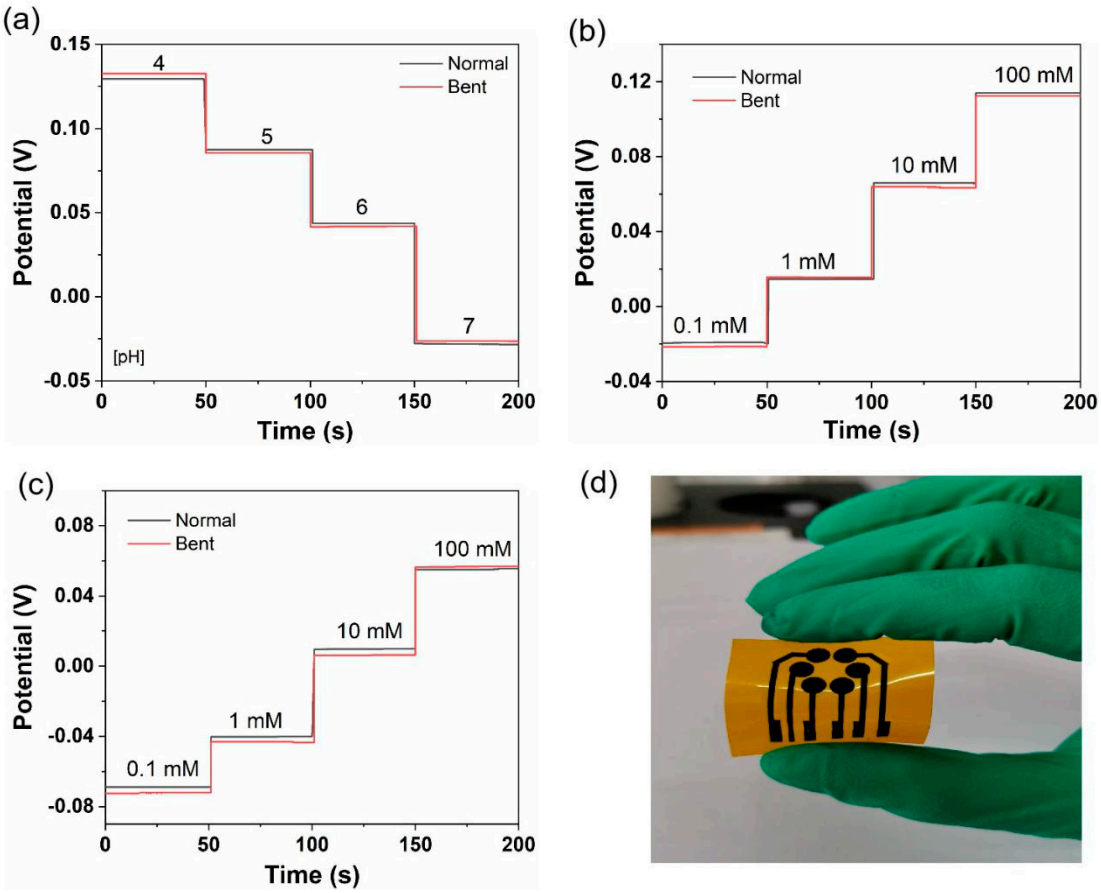


Figure S2. (a) pH, (b) Na^+, and (c) K^+ sensing performance of flexible LIG-based sensors under normal and bent states.

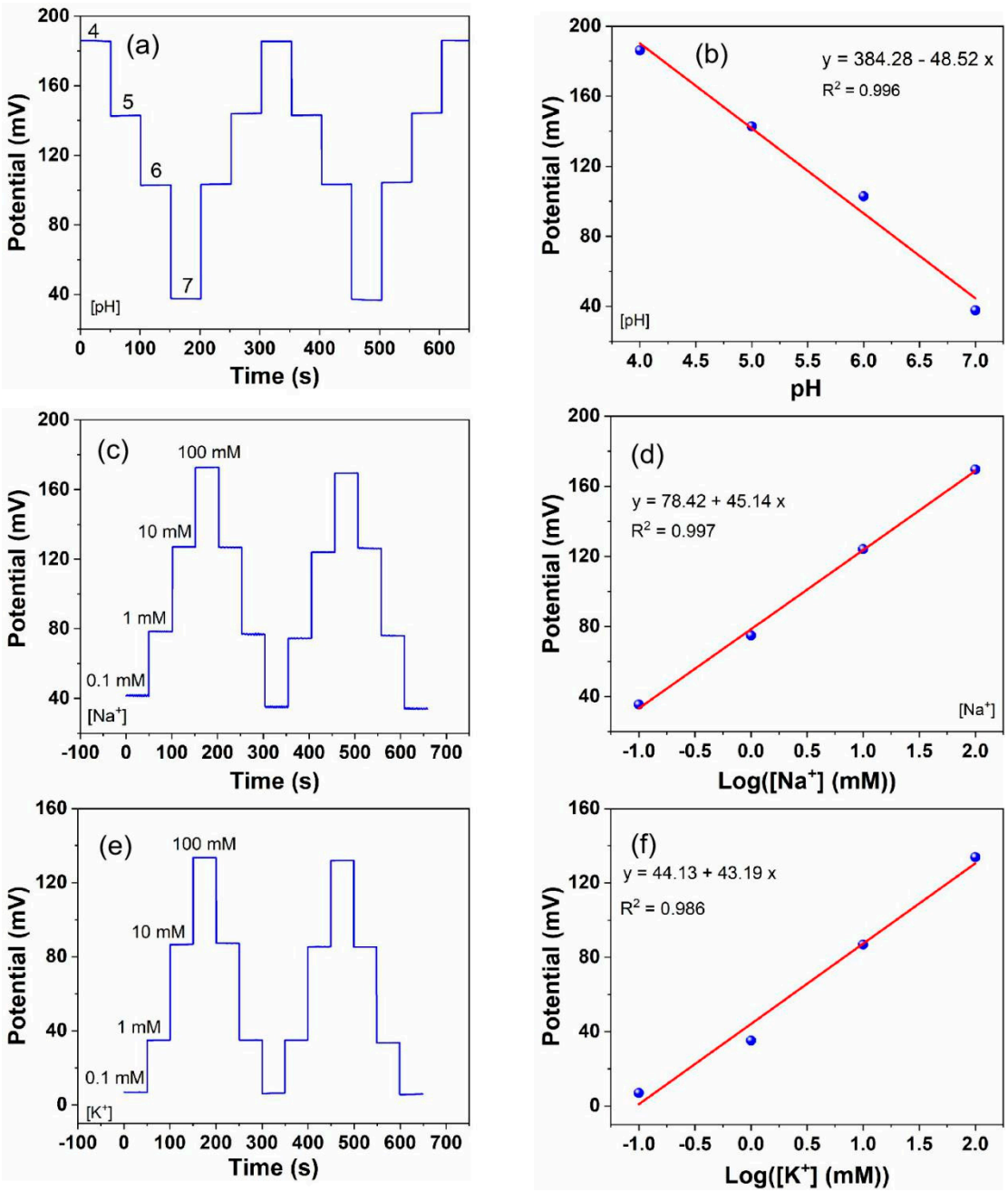
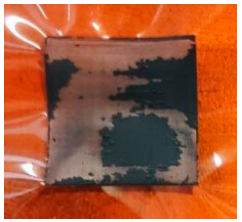
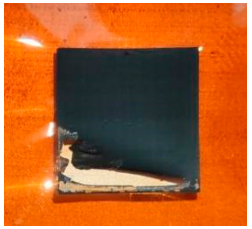
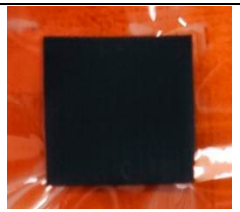
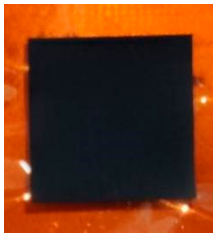
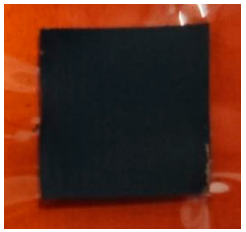
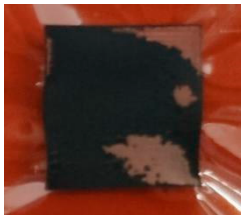


Figure S3. (a,b) pH, (c,d) Na^+, and (e,f) K^+ sensing performance of flexible LIG-based sensors tested on the custom-developed wearable multiplexed sensing system.

Table S1. The patterning of 2 × 2 cm squares on PI substrate was tested with different laser speed and power values.

Laser scribed graphene optimization		Max. Laser Power (12W)				
		50% (6W)	55% (6.6W)	60% (7.2W)	65% (7.8W)	70% (8.4W)
Laser speed (20 IPS)	10%					
	15%	 (22 Ω/square)	 (25 Ω/square)	 (23 Ω/square)		

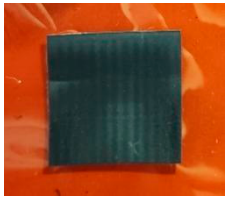
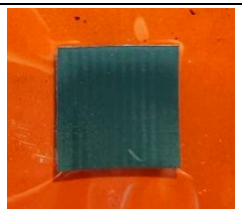
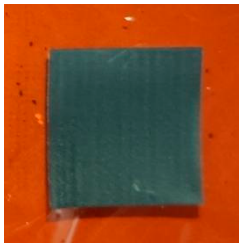
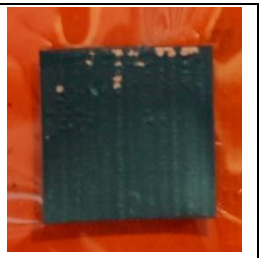
	20%	 (30 Ω/square)	 (28 Ω/square)	 (28 Ω/square)	 (27 Ω/square)	 (33 Ω/square)

Table S2. Comparison of the sensing performances of the recently reported sweat sensors with this work.

Year/Reference	Detection method	Sensitivity	Linear range	Skin wearability	Integration level	Communication mode
2021 [1]	OCP	pH: 62.5 mV/decade Na^+: 64.4 mV/decade K^+: 65.5 mV/decade	pH: 4-8 Na^+: 10-160 mM K^+: 2-32 mM	Yes	No	No
2018 [2]	OCP	pH: -- Na^+: 45.8 mV/decade K^+: 35.9 mV/decade	pH: 4-7 Na^+: 10-160 mM K^+: 2-32 mM	Yes	Yes ☑Circuit ☑Smartphone	Bluetooth
2021 [3]	OCP	Na^+: 50.3 mV/decade	Na^+: 0.1-10 mM	NO	NO	NO

		K^+: 53.5 mV/decade	K^+: 0.1-10 mM			
2018 [4]	OCP	pH: 71.44 mV/decade	pH: 4-8	Yes	Yes ☑Circuit ☑Smartphone	Bluetooth
2014 [5]	OCP	Na^+:63.75 mV/decade	Na^+: 0.1-100mM	Yes	Yes ☑Circuit ☑PC	Bluetooth
2016 [6]	OCP	Na^+:64.2 mV/decade K^+: 61.3 mV/decade	Na^+: 10-160mM K^+: 1-32mM	Yes	Yes ☑Circuit ☑Smartphone	Bluetooth
2020 [7]	OCP	Na^+: 56.4 mV/decade K^+: 54.3 mV/decade	Na^+: 0.0001-10mM K^+: 0.0001-10mM	Yes	Yes ☑Circuit ☑Laptop	Bluetooth
2021 [8]	OCP	pH: 79 mV/decade	pH: 3-8	NO	Yes	NO
2021 [9]	OCP	Na^+: 55.5 mV/decade	Na^+: 1-1000mM	Yes	Yes	Bluetooth

					☑Circuit ☑Smartphone	
This work	**OCP**	**pH: 51.5 mV/decade** **Na^+: 45.4 mV/decade** **K^+: 43.3 mV/decade**	**pH: 4-7** **Na^+: 0.1-100mM** **K^+: 0.1-100mM**	**Yes**	**Yes** **☑Circuit** **☑Smartphone**	**Bluetooth**

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