Supplementary Material for

"Smartphone-based portable photoelectrochemical biosensing system for point-of-care detection of urine creatinine and albumin"

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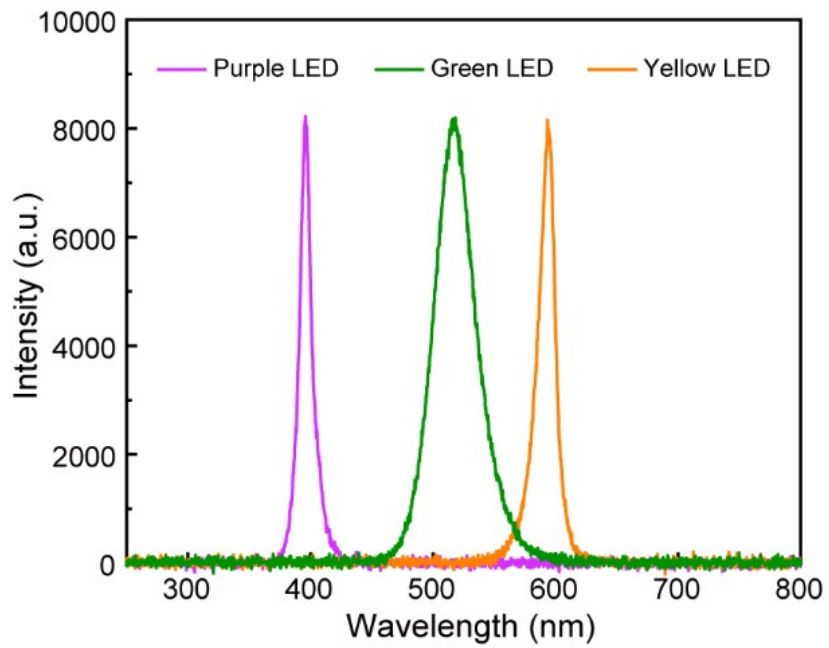
Figure S1. Emission spectra of different LEDs (purple, blue, and green).
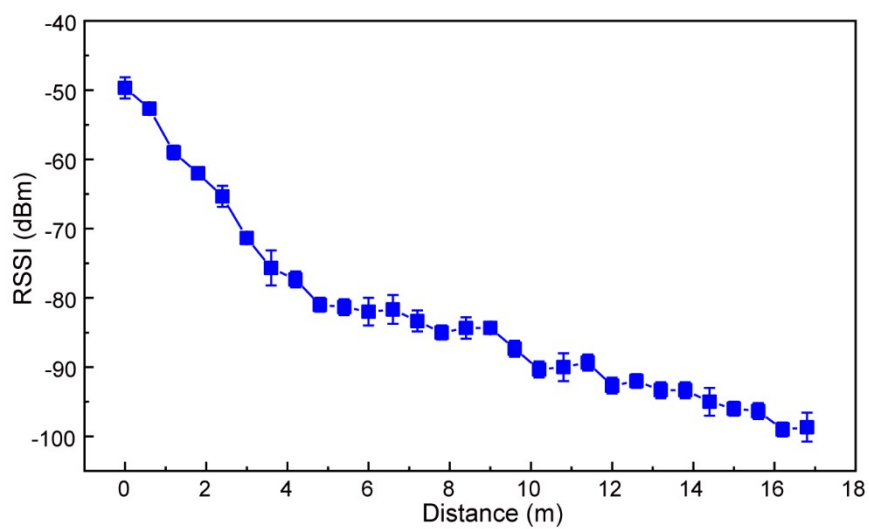
Figure S2. The Received Signal Strength Indicator (RSSI) of Bluetooth connection under sequentially increased distance between the portable photoelectrochemical (PEC) biosensing system and the smartphone.
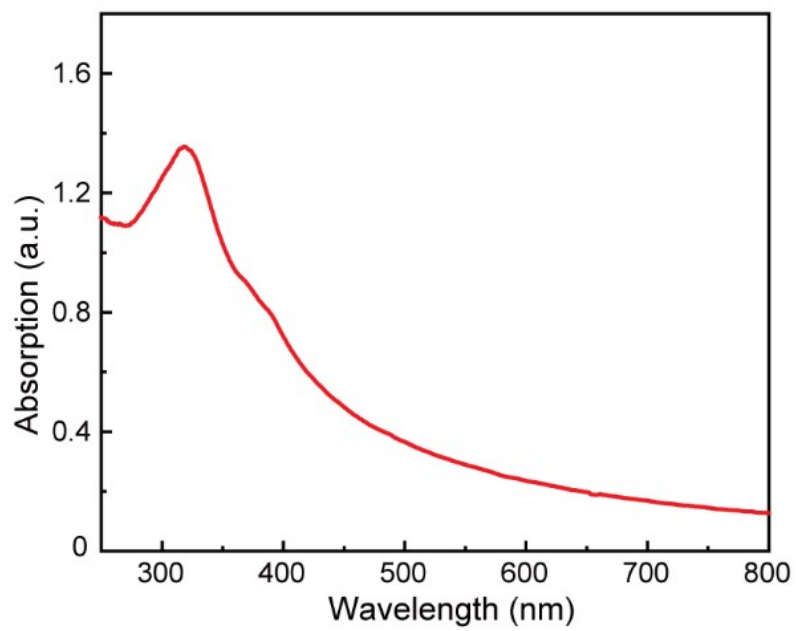
Figure S3. UV–vis absorption spectroscopy of the prepared graphitic carbon nitride.

Table S1. Performances of the developed PEC biosensing system compared with previously reported methods for creatinine and albumin detection.

Target	LOD	Detection range	Detection method	Device	Refs.
Creatinine	0.001 µg/mL	0.001-2 µg/mL	LC-MS/MS	Triple quadrupole tandem mass spectrometer	[1]
	2.5 µg/mL	2.1-378.5 µg/mL	Colorimetry	Clinical chemistry analyzer	[2]
	0.085 µg/mL	0.085–56.55 µg/mL	Capillary electrophoresis	Capillary electrophoresis system	[3]
	0.068 µg/mL	0.25-15 µg/mL	Electrochemistry	Electrochemical workstation	[4]
Albumin	2.72 µg/mL	8.4-3465 µg/mL	HPLC	High performance liquid chromatograph	[5]
	3 µg/mL	3-30 µg/mL	SERS spectroscopy	Raman spectrometer	[6]
	0.014 µg/mL	0-230 µg/mL	Fluorescence	Spectrofluorometer	[7]
	9.7 µg/mL	10-300 µg/mL	Electrochemistry	Electrochemical workstation	[8]
Creatinine & Albumin	1.47 µg/mL (Creatinine); 0.10 µg/mL (Albumin)	3.39-113.12 µg/mL (Creatinine); 0.33-9.97 µg/mL (Albumin)	Fluorescence	Spectrofluorometer	[9]
	-	94-2537 µg/mL (Creatinine); 10-100 µg/mL (Albumin)	Electrochemistry	Portable wireless urine detection system	[10]
	93 µg/mL (Creatinine); 63 µg/mL (Albumin)	100-2000 µg/mL (Creatinine); 10-300 µg/mL (Albumin)	Electrochemistry	Battery-free and wireless tag	[11]
	27.9 µg/mL (Creatinine); 1.5 µg/mL (Albumin)	100-1500 µg/mL (Creatinine); 9.9-500 µg/mL (Albumin)	Photoelectrochemistry	Portable photoelectrochemical biosensing system	**This work**

Abbreviations: PEC, photoelectrochemical. LOD, limit of detection. LC-MS/MS, Liquid chromatography tandem mass spectrometry. HPLC, High performance liquid chromatograph. SERS, surface-enhanced Raman scatting.

Table S2. Performances of the developed PEC biosensing system compared with the reported POC devices for creatinine and albumin detection.

Target	LOD	Detection range	Detection method	Device	Refs.
Creatinine	30.54 µg/mL	92.76-1131.2 µg/mL	Colorimetry	Paper-based sensors and smartphone	[12]
	233.59 µg/mL	0–3393.6 µg/mL	Electrochemistry	NFC-based potentiostat	[13]
	4.22 µg/mL	56.56–3959.2 µg/mL	Electrochemistry	3D-printed sensors and a portable potentiostat	[14]
Albumin	1.78 µg/mL	5-100 µg/mL	Electrochemistry	Hand-held EIS detector	[15]
	78.125 µg/mL	78.125-40000 µg/mL	Colorimetry	Urine test strips and smartphone	[16]
	4.1 µg/mL	0-66.48 µg/mL	Fluorescence	UV lamp, a dark box and smartphone	[17]
Creatinine & Albumin	41.2 µg/mL (Creatinine); 13.5 µg/mL (Albumin)	500-3500 µg/mL (Creatinine); 200-5000 µg/mL (Albumin)	Colorimetry	Paper-based sensor and opto-electrochemical unit	[18]
	-	94-2537 µg/mL (Creatinine); 10-100 µg/mL (Albumin)	Electrochemistry	Portable wireless urine detection system	[10]
	93 µg/mL (Creatinine); 63 µg/mL (Albumin)	100-2000 µg/mL (Creatinine); 10-300 µg/mL (Albumin)	Electrochemistry	Battery-free and wireless tag	[11]
	27.9 µg/mL (Creatinine); 1.5 µg/mL (Albumin)	100-1500 µg/mL (Creatinine); 9.9-500 µg/mL (Albumin)	Photoelectrochemistry	Portable photoelectrochemical biosensing system	**This work**

Abbreviations: PEC, photoelectrochemical. POC, point-of-care. LOD, limit of detection. NFC, near-field communication. EIS, electrochemical impedance spectroscopy. UV, ultraviolet.

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