Supplementary Information

A Portable Electrochemical Sensing Platform for Serotonin Detection Based on Surface-Modified Carbon Fiber Microelectrode

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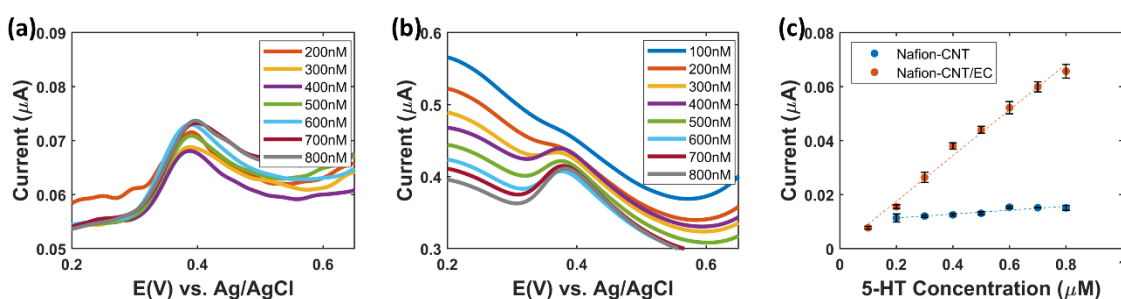* Corresponding Author. Email: ghodssi@umd.edu (R. Ghodssi)

Fig. S1 5-HT sensitivity at surface-modified CMFEs. (a) Representative Nafion-CNT CV curves within the linear range (200 nM – 800 nM). (b) Representative Nafion-CNT/EC CV curves within the linear range (100 nM – 800 nM). (c) Calibration curves of 5-HT for Nafion-CNT (200 nM – 800 nM) and Nafion-CNT/EC (100 nM – 800nM. Error bars denote standard error (n=3).
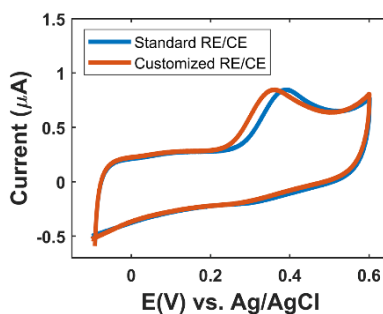

Fig. S2 Cyclic voltammogram comparing standard and customized CE/RE in 10 μM 5-HT. Potential range: -0.1 to 0.6 V. Scan rate: 200 mV/s. Nafion-CNT/EC as WE.
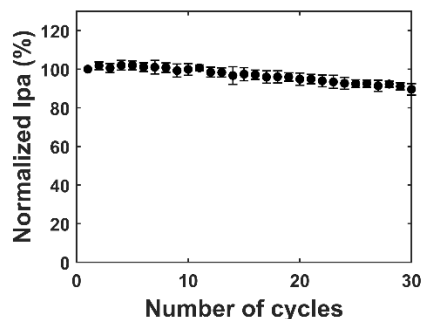
Fig. S3 Nafion-CNT/EC CFME repeatability in 1 µM 5-HT solution for 30 consecutive cycles. The Ipas are normalized to the initial cycles. Potential range: -0.1 to 0.6 V. Scan rate: 200 mV/s. Error bars denote standard error (n=3).
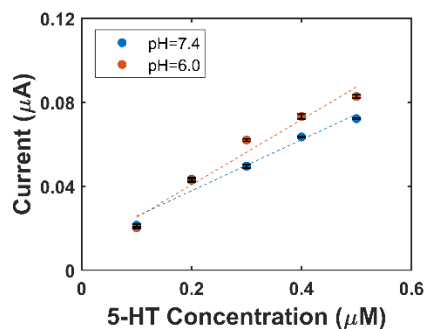

Fig. S4 Calibration curves of Nafion-CNT/EC CFME for 5-HT detection in pH 7.4 and pH 6.0 solution. The sensitivity is 121.7 nA/µM and the LOD is 14.5 nM for pH = 7.4, while the sensitivity is 155.5 nA/µM and the LOD is 7.8 nM for pH = 6.0. Potential range: -0.1 to 0.6 V. Scan rate: 200 mV/s. Error bars denote standard error (n=3).

Table S1 Composition of artificial urine for platform testing. Artificial urine was made using DI water

Chemical Component	Concentration
Peptone	1 g/L
Yeast Extract	5 mg/L
Lactic Acid	100 mg/L
Citric Acid	400 mg/L
Sodium Bicarbonate	2.1 g/L
Urea	10 g/L
Uric Acid	70 mg/L
Creatinine Hydrochloride	900 mg/L
Calcium Chloride Dihydrate	370 mg/L
Sodium Chloride	5.2 g/L
Iron (II) Sulfate	1 mg/L

Magnesium Sulfate Anhydrous	240 mg/L
Sodium Sulfate Decahydrate	3.2 g/L
Potassium Phosphate Monobasic	950 mg/L
Potassium Phosphate Dibasic	1.2 g/L
Ammonium Chloride	1.3 g/L

Table S2 Comparative table of electrochemical methods for 5-HT detection using benchtop or portable equipment

Electrode Material	Target	Method	Detection limit	Run Time	Portable	Refs
Nafion CFME	5-HT	FSCV	2.4 nM	0.1 s	N	[1]
Nafion CFME	5-HT	FSCAV	1.6 nM	10 s	N	[2]
MWCNT-CS GCE	5-HT	DPV	50 nM	1 s	N	[3]
PEDOT:PSS/CS-G SPE	DA	DPV	290 nM	20 s	Y	[4]
Gr-AV	5-HT	CV	390 nM	60 s	Y	[5]
AuNPs/CNTs SPE	5-HT	CV, DPV	300 nM	70 s	Y	[6]
CFME and CNF array	DA	FSCV	500 nM	0.1 s	Y	[7]
CFME	DA	FSCV	1 μM	0.1 s	Y	[8]
Nafion-CNT/EC CFME	5-HT	CV	140 nM	67 s	Y	This work

Abbreviations: MWCNT: multi-walled nanotube, CS: chitosan, GCE: glassy carbon electrode, PEDOT: poly(3,4-ethylenedioxythiophene), PSS: poly (styrene sulfonate), G: graphene, SPE: screen-printed electrode, Gr: graphite powder, AV: automotive varnish, AuNPs: gold nanoparticles, CNF: carbon nanofiber.

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