

A flexible electrochemical sensor based on Fe-doped polydopamine derived carbon for simultaneous detection of dopamine and uric acid

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1. Materials

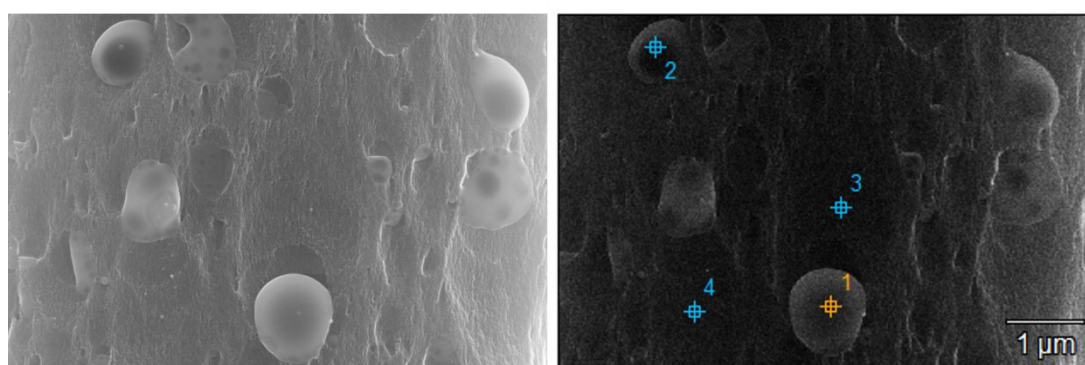
Carbon cloth (CC) was purchased from Suzhou Sinero Technology Co., Ltd (Suzhou, China). Potassium chloride (KCl), sodium chloride (NaCl), sodium sulfite (Na₂SO₃), potassium ferricyanide (K₃[Fe(CN)₆]), ferric chloride hexahydrate (FeCl₃·6H₂O), cobalt chloride hexahydrate (CoCl₂·6H₂O), nickel chloride hexahydrate (NiCl₂·6H₂O), manganese chloride tetrahydrate (MnCl₂·4H₂O) were purchased from Sinopharm Chemical Reagent Co., Ltd (Shanghai, China). Dopamine (DA), uric acid (UA), urea (CH₄N₂O), glucose (C₆H₁₂O₆), l-tryptophan (C₁₁H₁₂N₂O₂) and sucrose (C₁₂H₂₂O₁₁) were acquired from Aladdin Chemical Reagent Co., Ltd (Shanghai, China). All chemicals were analytical grade. All human urine samples were collected by laboratory personnel.

2. Characterization and electrochemical measurement

The microscopic morphologies of the materials were observed by scanning electron microscopy (SEM, FEI Apreo S) and energy dispersive spectrometer (EDS, X-Max, X-stream2). X-ray photoelectron spectroscopy (XPS, ESCALAB XI+) was used to study the valence states of the elements. In this experiment, all electrochemical performance tests were carried out on CHI-760E electrochemical workstation (Chenhua, Shanghai) at room temperature. A three-electrode system was used for all the measurements. The Fe/PDA-C/CC was used as the working electrode, a platinum sheet as the auxiliary electrode and a saturated calomel electrode (SCE) as the reference electrode. The cyclic voltammogram (CV) was performed from 0 V to 0.5 V with the scan rate of 50 mV s⁻¹ in a solution containing 0.1 M KCl and 5 mM K₃[Fe(CN)₆]. Differential pulse

voltammetry (DPV) was carried out from 0 to 0.7 V, with amplitude of 50 mV, pulse width of 0.05 s, sampling width of 0.016 s and pulse period of 0.5 s. Electrochemical impedance spectroscopy (EIS) was recorded in 0.1 M KCl containing 5 mM $K_3[Fe(CN)_6]$ with the frequency range of 0.01-10⁵ Hz.

Base(10)



Weight %

	<i>C</i>	<i>N</i>	<i>O</i>	<i>Fe</i>
<i>Base(10)_pt1</i>	48.32	17.76	31.93	2.00
<i>Base(10)_pt2</i>	58.15	23.14	18.11	0.60
<i>Base(10)_pt3</i>	66.17	23.42	10.41	0.00
<i>Base(10)_pt4</i>	66.42	23.84	9.68	0.06

Atom %

	<i>C</i>	<i>N</i>	<i>O</i>	<i>Fe</i>
<i>Base(10)_pt1</i>	54.94	17.31	27.25	0.49
<i>Base(10)_pt2</i>	63.40	21.63	14.83	0.14
<i>Base(10)_pt3</i>	70.34	21.35	8.31	0.00
<i>Base(10)_pt4</i>	70.55	21.71	7.72	0.01

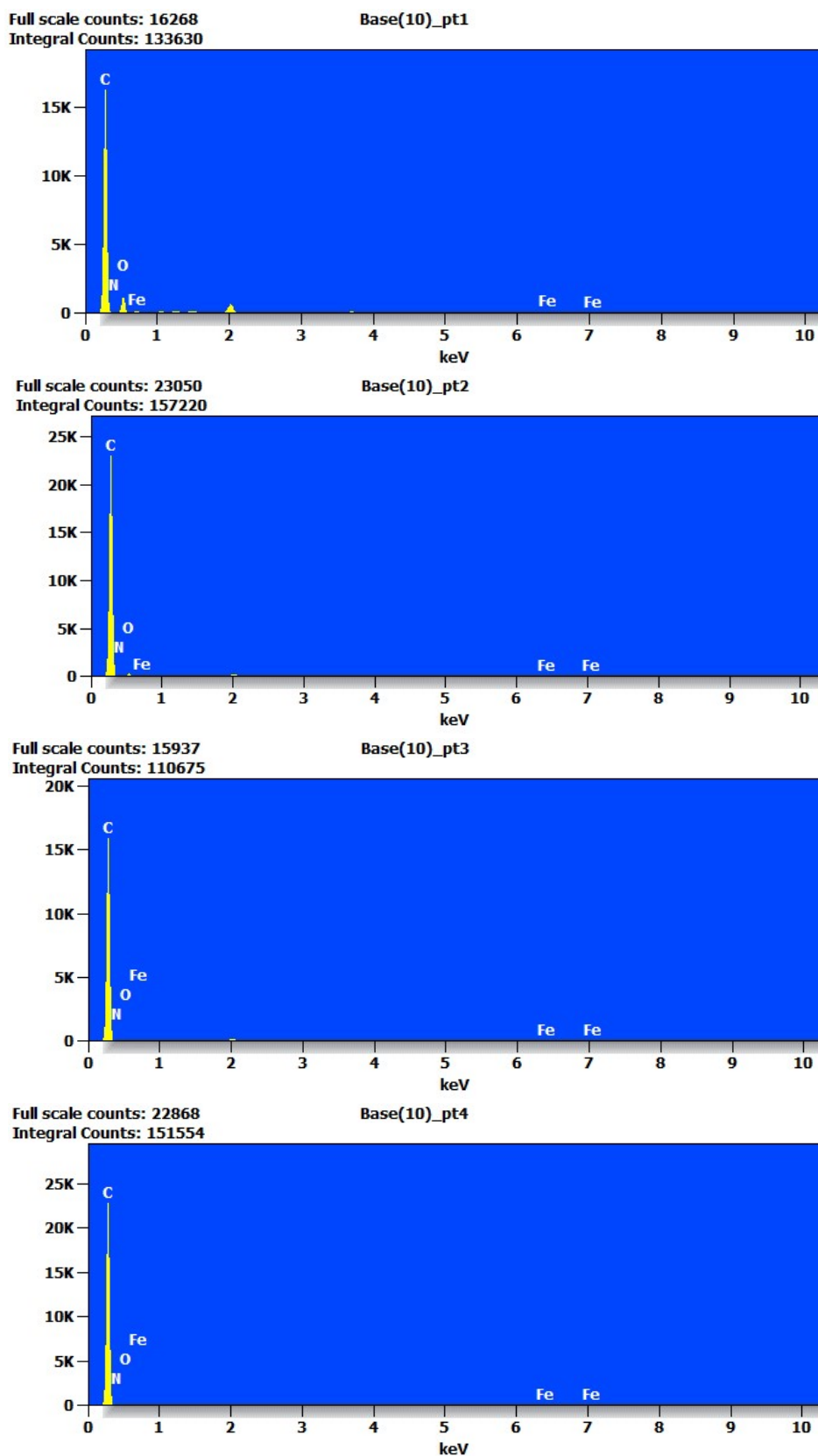


Fig S1. The EDS point scan images and elemental content of Fe/PDA-C/CC.

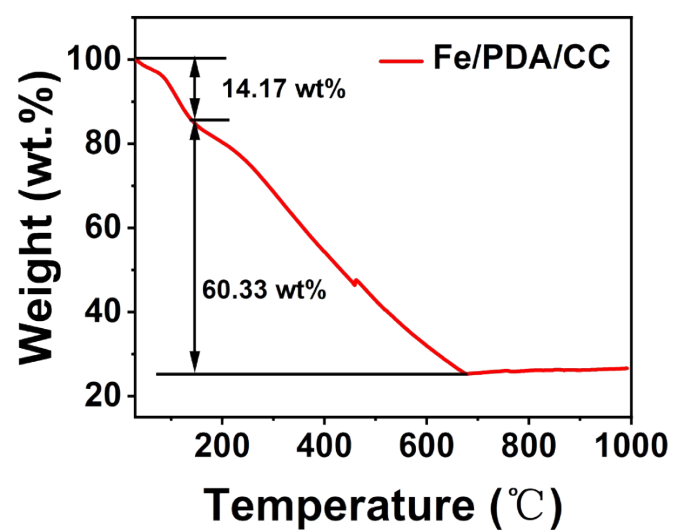


Fig. S2. TGA curve of Fe/PDA/CC under N₂ atmosphere.