Supporting Information

Cu-functionalized MOF and multi-walled carbon nanotube composite modified electrode for the simultaneous determination of hydroquinone and catechol

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Method and Apparatus

The experiments employed ultra-pure water.

Mixing 0.100 M NaH_2PO_4 and 0.100 M Na_2HPO_4 with the proper ratio prepared the phosphate-buffered solutions (PBS) at various pH values.

The chemicals Powder X-ray diffraction (PXRD) was performed on a Bruker D8 ADVANCE. FT-IR spectroscopy (Nicolet NEXUS670 spectrometer), inductively coupled plasma optical emission spectrometer (ICP-OES, Thermo Fisher ICAP-7200), scanning electron microscopy (SEM, Hitachi S-4800), transmission electron microscopy (TEM, JEOL-2100F), thermogravimetric analysis (TGA, Mettler Toledo TGA/SDTA851 e/5FL1100), and X-ray photoelectron spectrometer (XPS, Thermo Fisher 250 XI) were used to characterize the materials. Perform electrochemical experiments, including CV, EIS, and DPV, were measured using CHI 660E

electrochemical workstation (Shanghai Chen-Hua instrument Co., LTD).

Synthesis of UiO-bpydc

Based on the literature report[1], direct assembly of $ZrCl_4$ and H_2bpydc synthesized UiO-bpydc under a solvothermal procedure. Briefly, 70 mg $ZrCl_4$ and 61.9 mg H_2bpydc were mixed in DMF and acetic acid (10 ml, v/v = 5:1) solution; after vigorous stirring for 30 mins and sonication for 20 mins, transfer the mixture into a 20 ml Teflon lined stainless steel autoclave and heat to 120°C for 24 hours. The cooled product was separated and washed with DMF, filtered and dried in a vacuum oven (150 °C, five hours), and finally obtained white flake crystals (yield: 75.1%).

Synthesis of UiO-bpydc-Cu

UiO-bpydc-Cu was synthesized according to the literature[2]. UiO-bpydc (100 mg, 0.047 mmol) and $Cu(OAc)_2 \cdot H_2O$ (126 mg, 0.564 mmol) were mixed in 5.0 ml acetonitrile, dissolved under sonication for 30 mins, then heated in a 65 ºC oil bath, refluxed for 24 hours. After filtration, wash the product with acetonitrile a few times until the last filtrate is clear and limpid. Dry the separated solid product in a 60°C vacuum oven overnight to obtain a light blue powder. ICP measured the copper site incorporation as about 10.43 wt%.

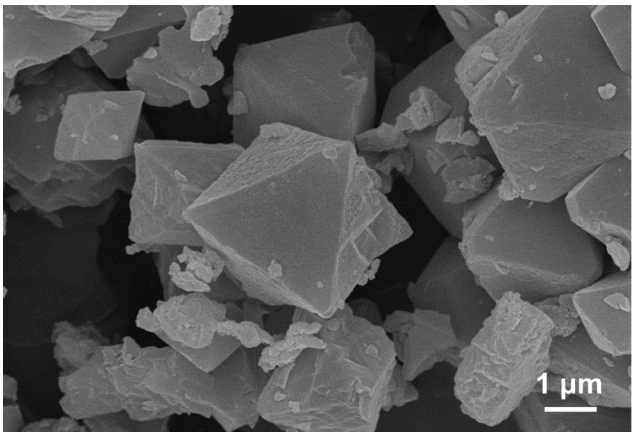

Figure S1 (a) TEM images of UiO-bpydc-Cu/MWCNTs.

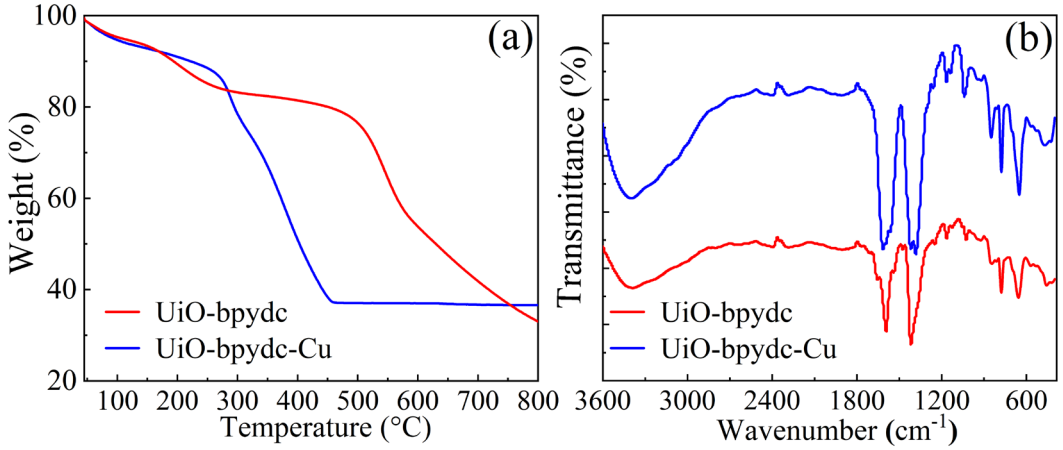

Figure S2 (a) TGA images and (b) FT-IR spectra of UiO-bpydc (red line) and UiO-bpydc-Cu (blue line)

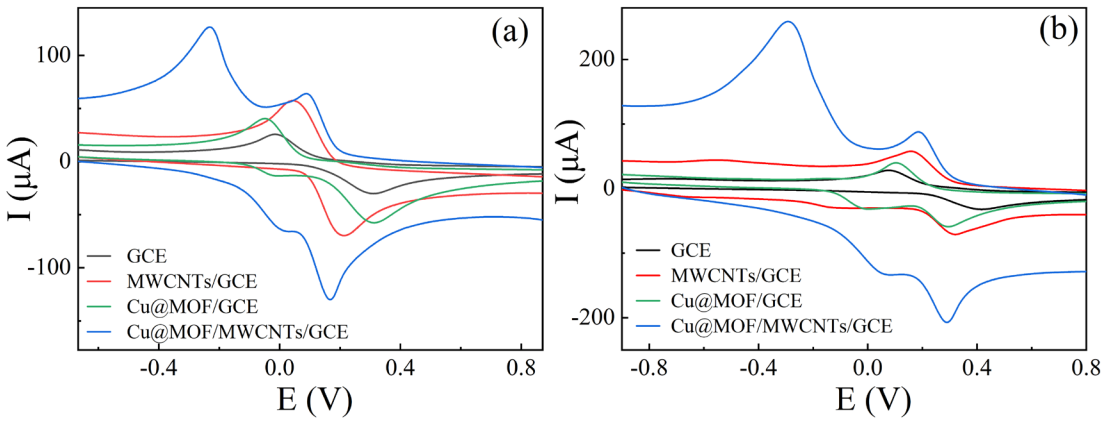

Figure S3. CV curves on various electrodes in PBS solution (pH 6.0) containing 2 mM μM HQ (a) or 2 mM CT (b).

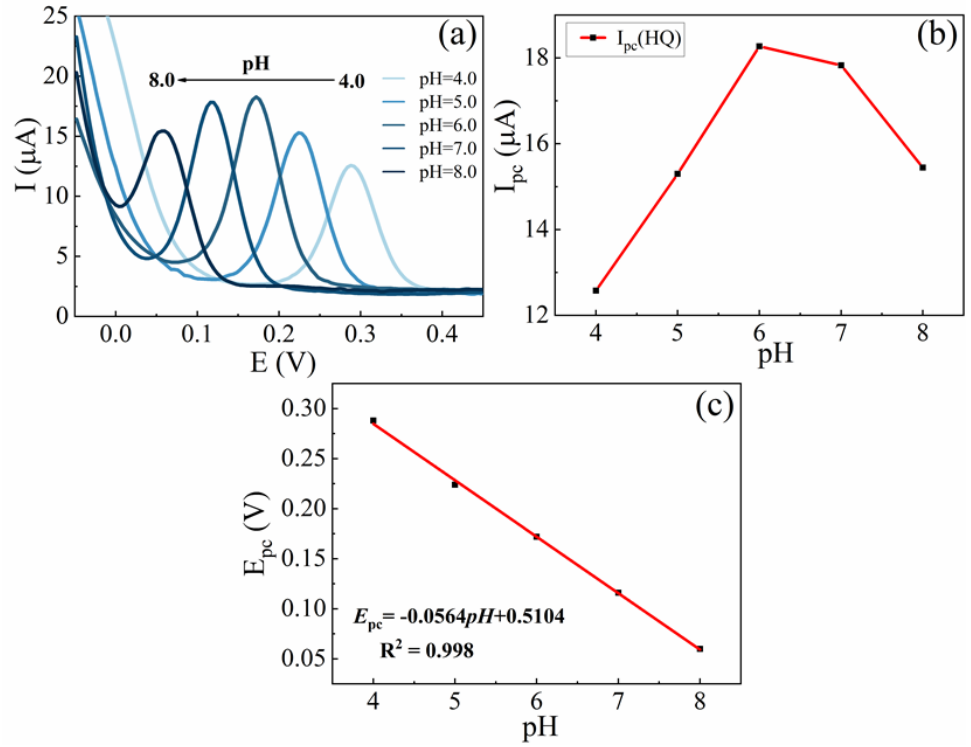

Figure S4. (a) The influence of PBS electrolyte solutions with different pH values on the DPV curve signal of 300 μM HQ; (b) I_{pa} vs. pH; (c) E_{pa} vs. pH.

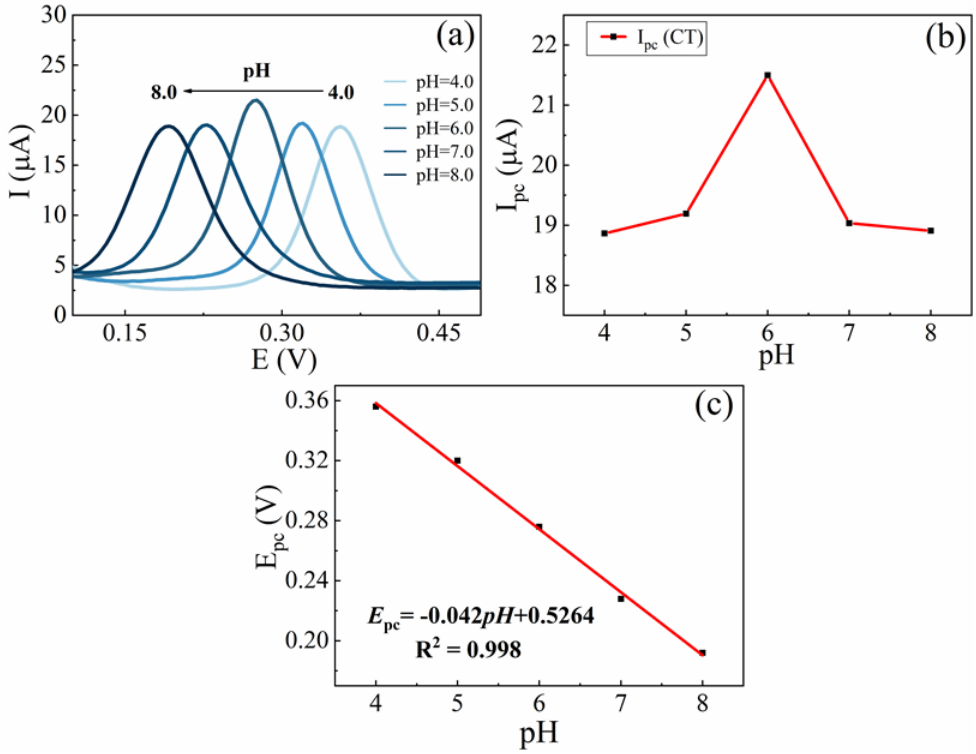

Figure S5. (a) The influence of PBS electrolyte solutions with different pH values on the DPV curve signal of 300 μM CT; (b) I_{pa} vs. pH; (c) E_{pa} vs. pH.

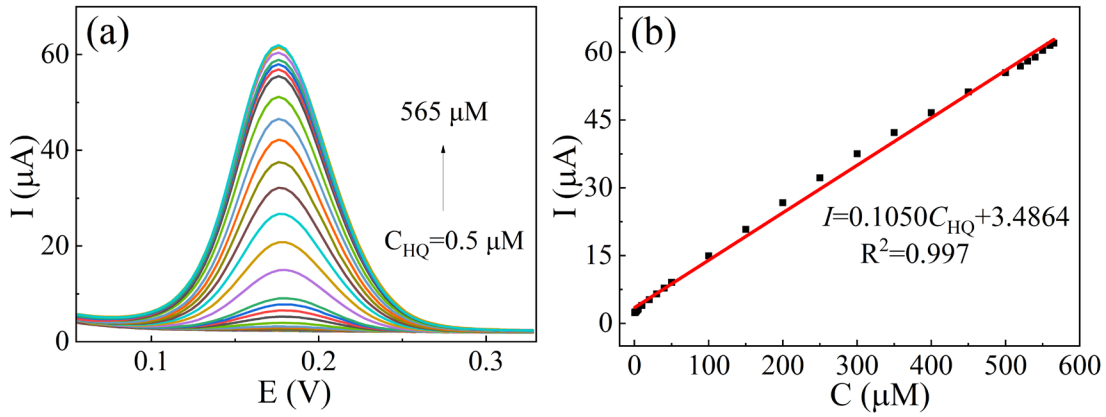

Figure S6. (a) DPV curves of HQ over a concentration scope 0–565 μM on UiO-bpydc-Cu/MWCNTs/GCE (PBS pH 6.0). (b) The linear variation of I_p with the concentration of HQ.

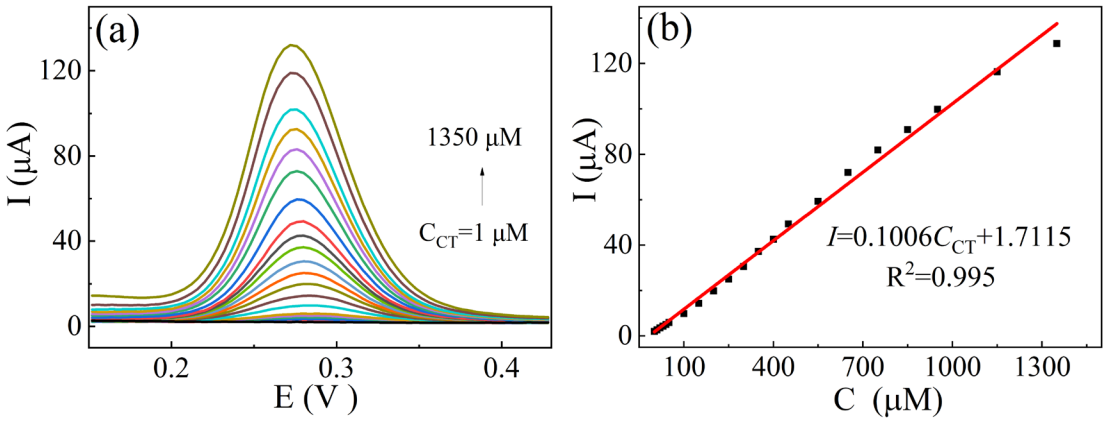

Figure S7. (a) DPV curves of CT over a concentration scope 0–1350 μM on UiO-bpydc-Cu/MWCNTs/GCE (PBS pH 6.0). (b) The linear variation of *I*p with the concentration of CT (PBS pH 6.0).

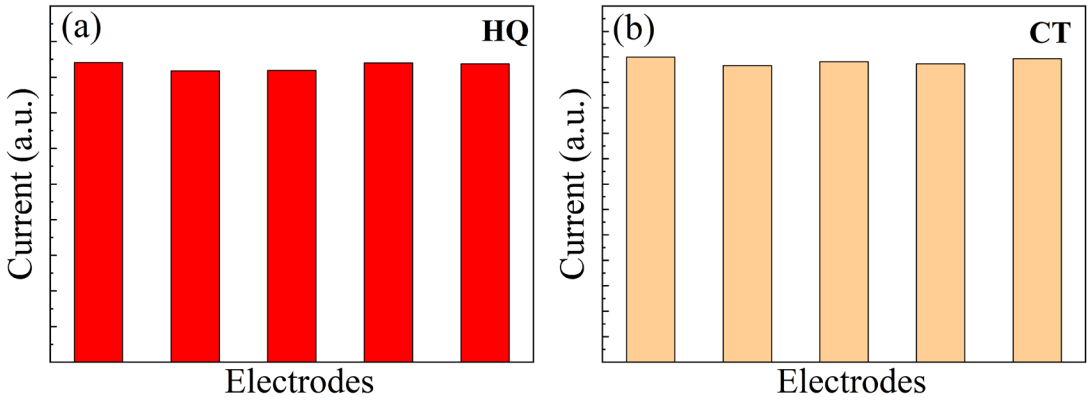

Figure S8. Histogram of the peak current of five UiO-bpydc-Cu/MWCNTs/GCE electrodes on (a) 300 μM HQ and (b) 300 μM CT by DPV.

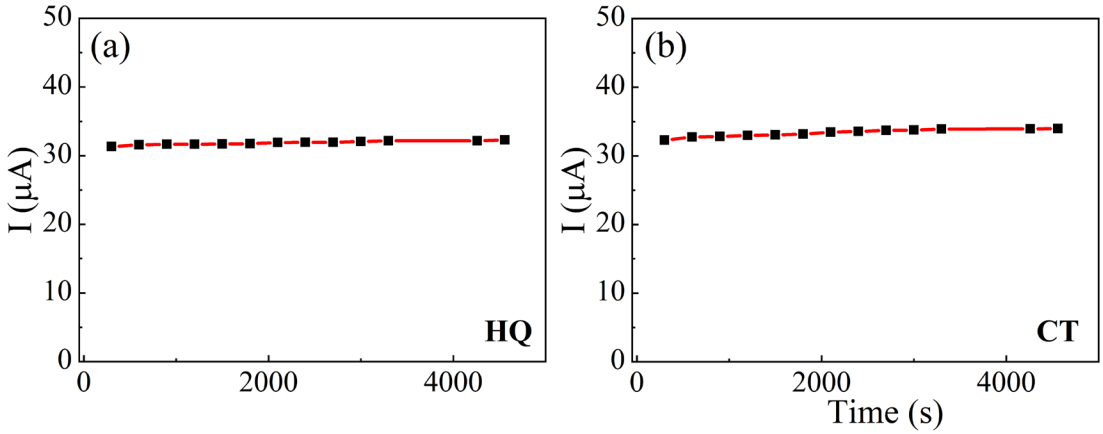

Figure S9. The peak current change of UiO-bpydc-Cu/MWCNTs/GCE electrode continuously tested 4500s in 300 μM (a)HQ or (b) CT.

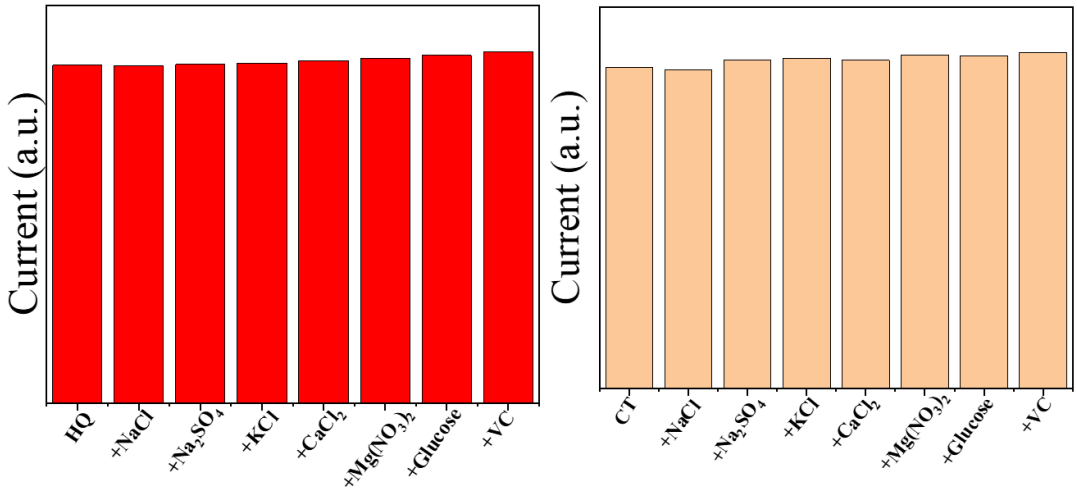

Figure S10. Histogram of peak current intensity of UiO-bpydc-Cu/MWCNTs/GCE after adding 200 μM (a) HQ or (b) CT, 100-folds concentration (20 mM) of NaCl, Na_2SO_4, KCl, $CaCl_2$, $Mg(NO_3)$ and 10-folds concentration (2 mM) of Glucose and VC.

Table S1. Performance of various electrodes for detecting HQ and CT

Sensors	Linear range (μM)		LOD (μM)		$\Delta E_{p(CT-HQ)}$ (mV)	Refs
	HQ	CT	HQ	CT		
MWCNT-NH_2-AuNP/GCE	4.3-150	3.9-150	1.28	1.06	100	[3]
Pt/ZrO_2−RGO/GCE	1-1000	1-400	0.4	0.4	111	[4]
TACoPc/PANI/AgNPs	10-100	10-100	0.60	0.46	90	[5]
c-MWCNTs/CTS/Au/GCE	0.5-1500	5-900	0.17	0.89	100	[6]
Fe,N-CNs/GCE	0.5-80	0.5-80	0.17	0.17	106	[7]
SPE	0.5-90	0.5-90	0.12	0.82	90	[8]
OV-LDHs/H-MWCNTs/GCE	0.5-150	0.5-150	0.076	0.074	104	[9]
PEDOT/GO/GCE	2.5-200	2-400	1.6	1.6	100	[10]
HMCCSs/GCE	0.3-1000	2.0-2000	0.12	0.19	104	[11]
UiO-bpydc-Cu/MWCNTs/GCE	0.5-565	1-1350	0.361	0.245	108	This work

Table S2. Detection results of CT in detergent by the composite electrode

	Sample	Detected (μM)	Added (μM)	Found (μM)	Recovery (%)
CT in diluted detergent solution	1	0	100	99.1	99.1
	2	0	200	193.2	96.6
	3	0	300	283.5	94.5

References

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