

Employing bulk-heterostructure conductive polymer PFBT/PFO for Photoelectrochemical Analysis of *p*-phenylenediamine

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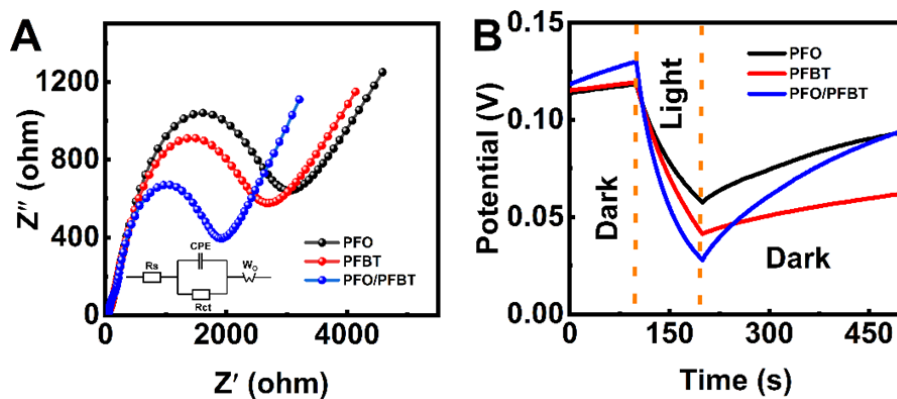


Fig. S1. (A) EIS and (B) OCP spectra of PFO/ITO, PFBT/ITO, and PFO/PFBT/ITO electrodes.

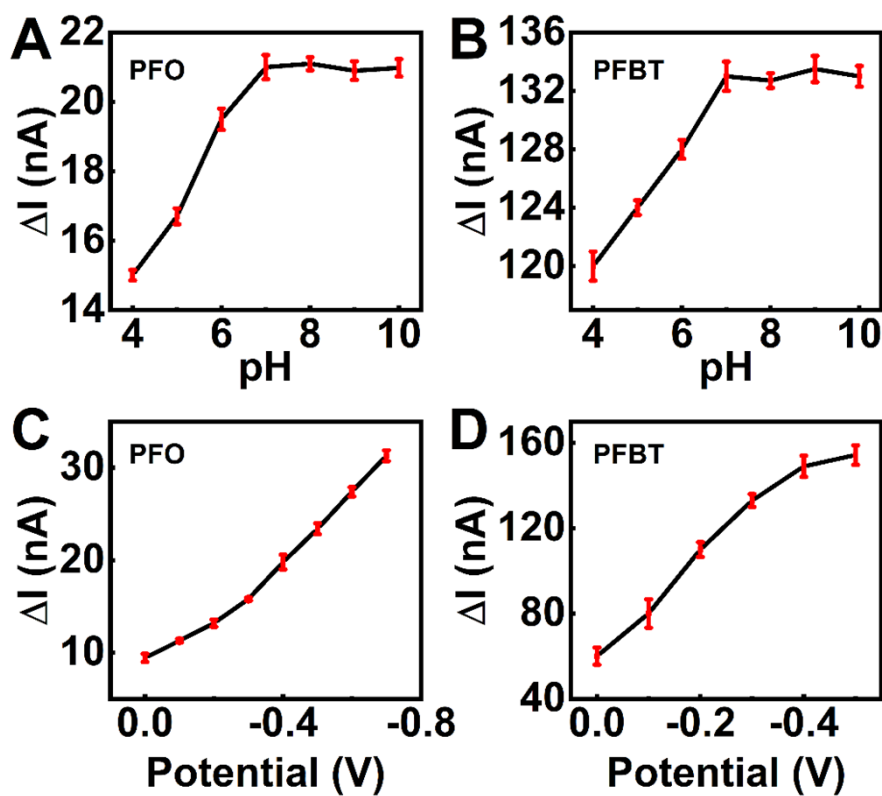


Fig. S2. Effects of solution pH on (A) PFO/ITO and (B) PFBT/ITO electrode electrochemical response, and external potential on (C) PFO/ITO and (D) PFBT/ITO electrode electrochemical response in the presence of 20 μM p-PD.

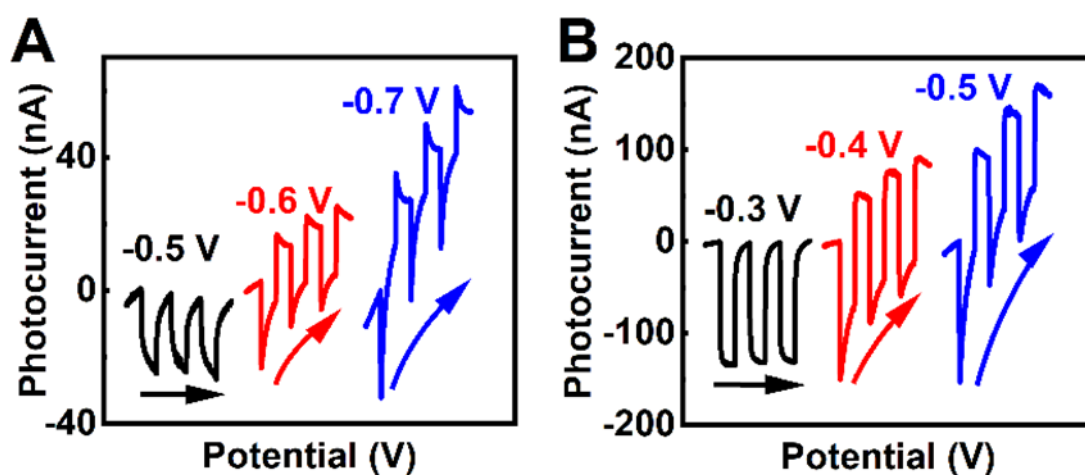


Fig. S3. The amperometric response was recorded for (A) PFO/ITO and (B) PFBT/ITO at different potential in the presence of 20 mM p-pd.

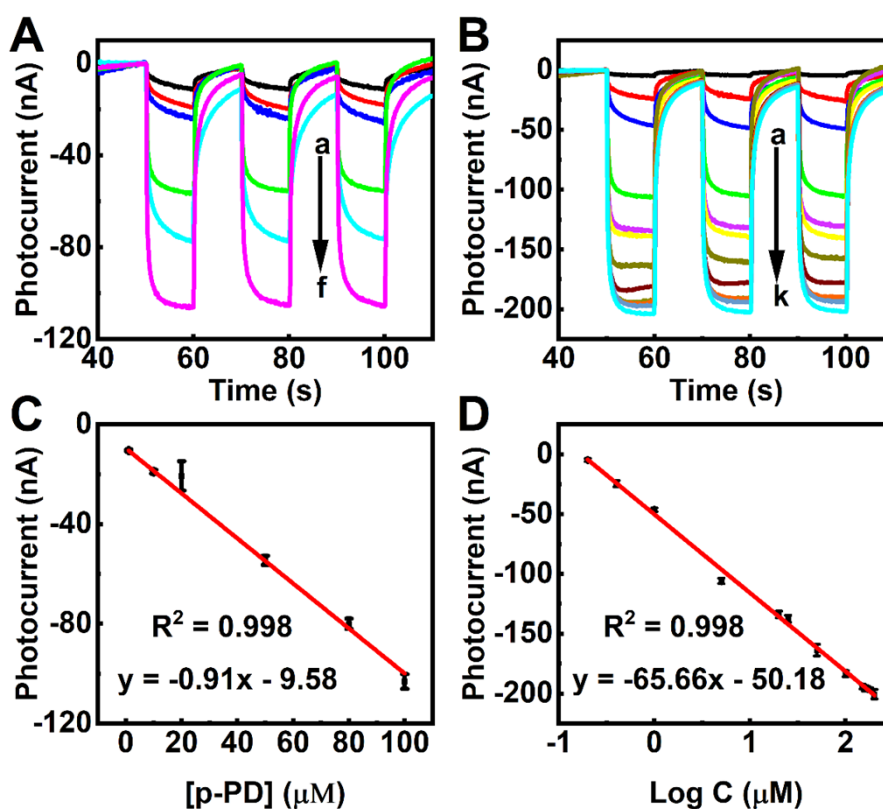


Fig. S4. (A) Photocurrent responses of the PFO/ITO electrode to 1, 10, 20, 50, 80, 100 μM (from a to f). (B) Photocurrent responses of the PFBT/ITO electrode to 0.2, 0.4, 1, 5, 20, 50, 100, 150, 160, 180, 200 μM (from a to k). (C) Plot of peak current vs p-pd concentration on PFO/ITO electrode, and (D) Plot of peak current vs logarithm of p-pd concentration on PFO/PFBT/ITO electrode.

Table S1. The analytical performance of PFO/ITO, PFBT/ITO and PFO/PFBT/ITO electrode toward p-pd.

Electrode	Regression equation	correlation coefficient	detection limit (μM)
PFO	$\Delta I = -0.91x - 9.58$	0.998	0.47
PFBT	$\Delta I = -65.66x - 50.18$	0.998	0.16
PFO/PFBT	$\Delta I = -79.37x - 78.43$	0.993	0.096

Table S2. Comparison on the analytical performance toward p--PD between the present protocol and previously reported sensors.

Range of detection (μM)	Limit of detection (μM)	Method	Reference
30-400	30	Fluorescence	1
0.1-10	0.056	Fluorescence	2
0.1-3	0.043	Photoelectrochemical	3
0.02-10	0.007	Fluorescence	4
0.1-200	0.096	Photoelectrochemical	This work

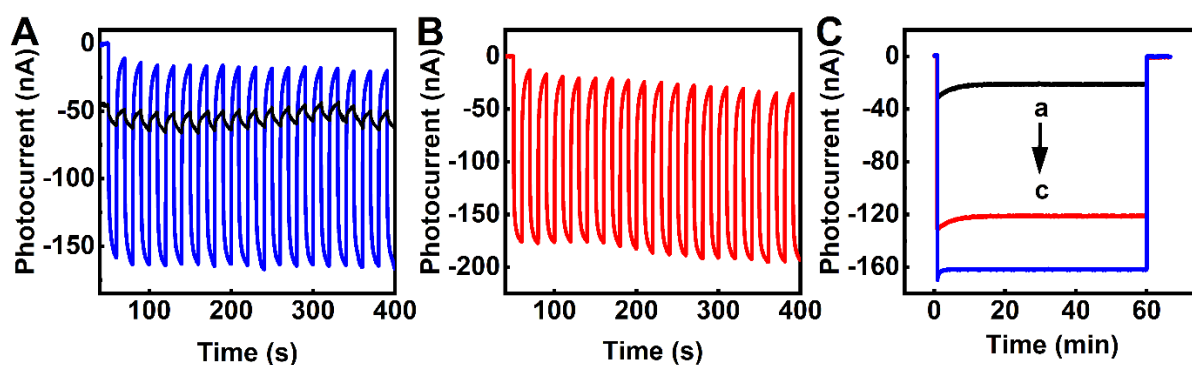


Fig. S5. Amperometric response of (A) PFO/ITO electrode (black) and PFBT/ITO electrode (blue), and (B) PFO/PFBT/ITO electrodes in the presence of 20 μM p-pd in 0.1 M PBS. (C) I-t plots recorded at -0.3 V for PFO/ITO electrode (a), PFBT/ITO electrode (b), and PFO/PFBT/ITO electrodes (c) in the presence of 20 μM p-pd in 0.1 M PBS.

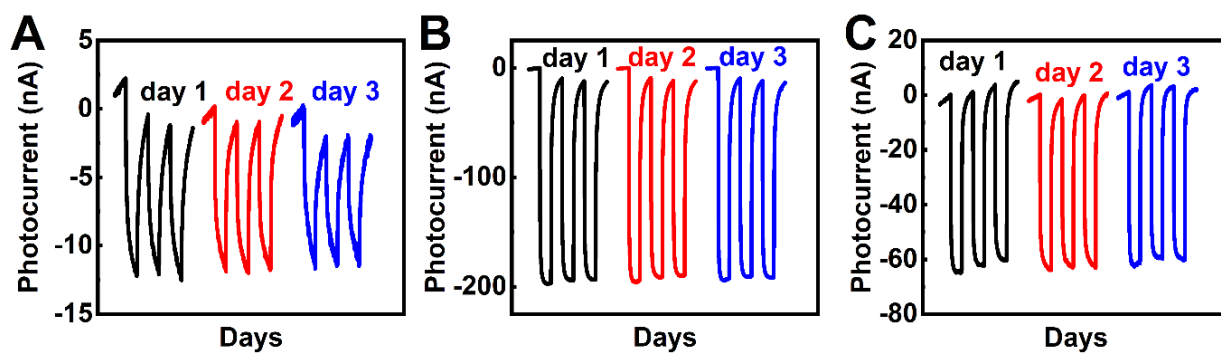


Fig. S6. The amperometric response was recorded for (A) PFO/ITO electrode, (B) PFBT/ITO electrode and (C) PFO/PFBT/ITO electrode at -0.3 V in the presence of 20 μM p-pd in 0.1 M PBS with different time.

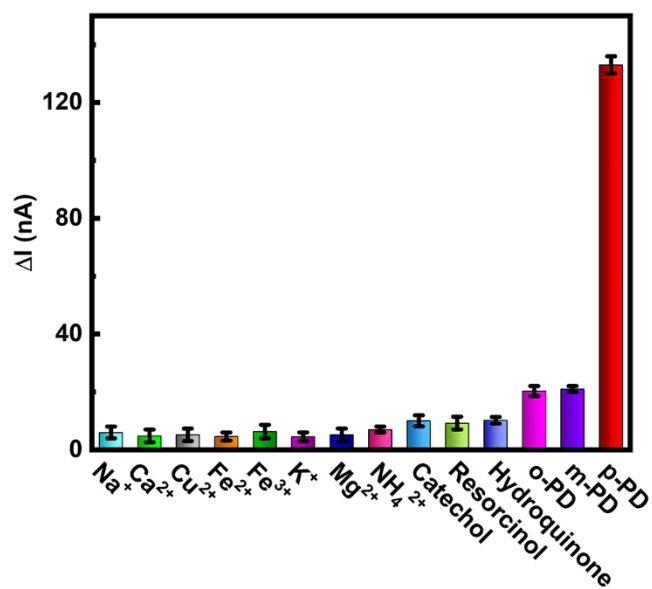


Fig. S7. Photocurrent response (ΔI) of PFO/PFBT/ITO electrode toward 10 μM p-PD and 1 mM interfering species.

Table S3 PEC sensing of p-PD in hair dye creams.

Sample	Blank (μM)	Addition (μM)	Actuality (μM)	Recovery	Average recovery	RSD
S1 (0.05g)	0.156	0.2	0.377	105.90%	108.99%	3.85%
			0.382	107.30%		
			0.405	113.76%		
	0.172	0.5	0.714	106.25%	99.16%	8.57%
			0.603	89.73%		
			0.682	101.49%		
	0.169	1	1.283	109.75%	104.42%	4.51%
			1.179	100.86%		
			1.200	102.65%		
	S2 (0.1g)	0.335	0.2	0.548	102.43%	100.69%
0.527				98.50%		
0.541				101.12%		
0.327		0.5	0.793	95.89%	99.92%	5.13%
			0.812	98.19%		
			0.874	105.68%		
0.367		1	1.402	102.56%	102.90%	1.17%
			1.425	104.24%		
			1.393	101.90%		
S3 (0.5g)		1.637	0.2	1.859	101.20%	101.60%
	1.823			99.24%		
	1.917			104.35%		
	1.835	0.5	2.318	99.27%	100.09%	1.83%
			2.307	98.80%		
			2.386	102.18%		
	1.727	1	2.808	102.97%	99.84%	3.56%
			2.655	97.36%		
			2.631	96.48%		

Table S4 PEC sensing of p-PD in dye wastewater.

Sample	Blank (μM)	Addition (μM)	Actuality (μM)	Recovery	Average recovery	RSD	
S1 (0.05g)	0.247	1	1.235	99.04%	102.97%	3.36%	
			1.301	104.33%			
			1.316	105.53%			
	0.266	5	5.172	98.21%	99.78%	1.43%	
			5.318	100.99%			
			5.274	100.15%			
	0.295	10	10.406	101.08%	97.25%	3.48%	
			9.883	96.00%			
			9.747	94.68%			
	S2 (0.1g)	0.575	1	1.493	94.79%	98.41%	4.56%
				1.528	97.02%		
				1.629	103.43%		
0.612		5	5.668	101.00%	103.35%	2.78%	
			5.752	102.49%			
			5.980	106.56%			
0.625	10	10.379	97.68%	102.25%	6.94%		
		10.481	98.64%				
		11.732	110.42%				
S3 (0.5g)	2.688	1	3.790	102.77%	107.34%	4.29%	
			3.914	106.13%			
			4.172	113.12%			
	2.493	5	7.911	105.58%	106.34%	7.84%	
			7.374	98.41%			
			8.619	115.03%			
2.741	10	12.633	99.15%	94.43%	4.47%		
		11.596	91.01%				
		11.865	93.12%				

Reference

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