Novel three-dimensional molecularly imprinting polypyrrole electrochemical sensor based on MOF derived porous carbon and nitrogen doped graphene for ultrasensitive determination of dopamine

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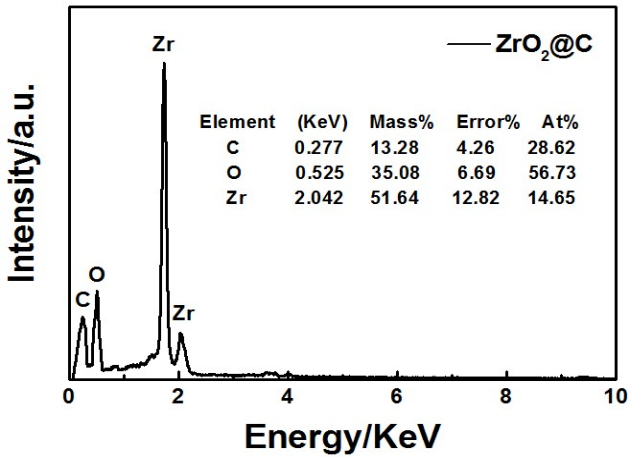

Fig. S1 The energy dispersive X-ray spectroscopy (EDX) of ZrO_2@C

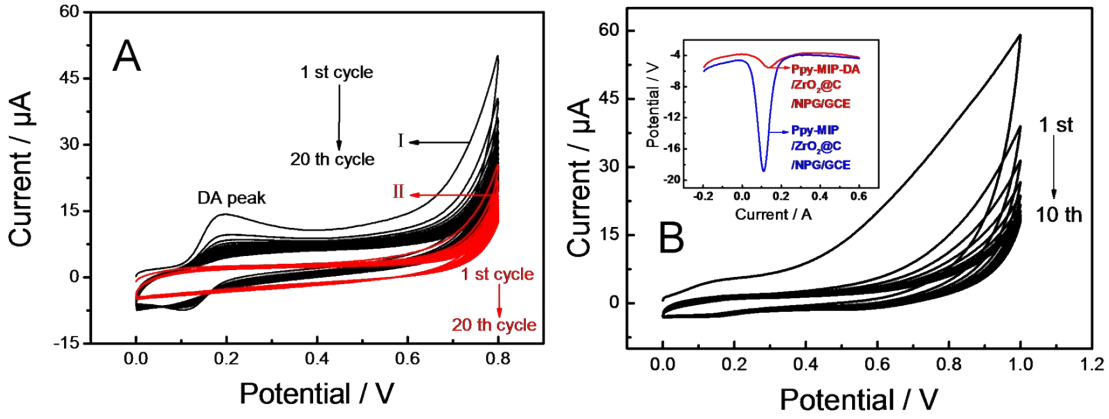

Fig. S2 The scanning curve of Ppy-MIP-DA/ZrO_2@C/NPG/GCE (I) and Ppy-NIP/ZrO_2@C/NPG/GCE (II) in 0.05 M PBS containing 0.3 mM Py and 0.1 mM DA for 20 cycles (A); The scanning curve of Ppy-MIP-DA/ZrO_2@C/NPG/GCE peroxided in 0.1 M KOH for 10 cycles (B).

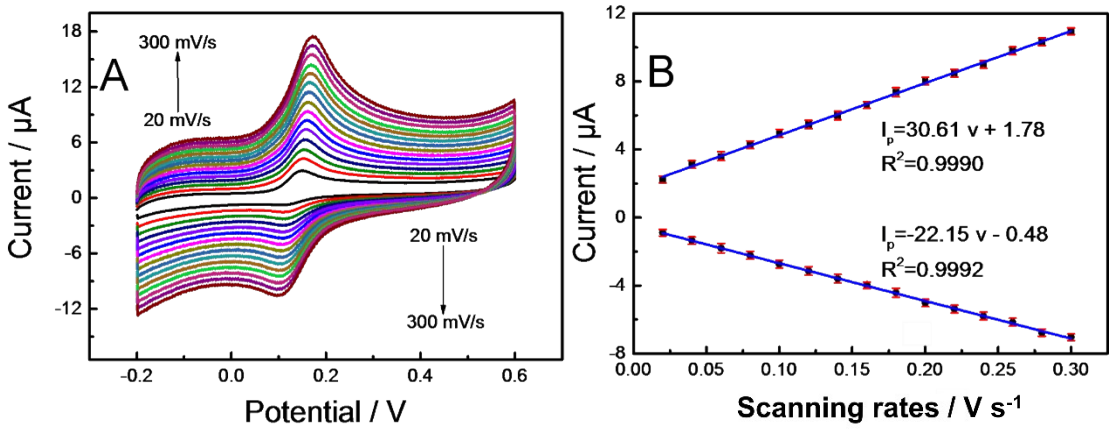

Fig. S3 CV curve of Ppy-MIP/ZrO_2@C/NPG/GCE at different scanning rates (20 mV/s, 40 mV/s, 60 mV/s, …, 300 mV/s) in 0.05 M PBS containing 0.1 mM DA (A); The linear relationships between scanning rate and peak current of Ppy-MIP/ZrO_2@C/NPG/GCE (B).

Different modified electrodes	R_{et} values
GCE	123.6 Ω
UiO-66/GCE	1588.3 Ω
ZrO_2@C/GCE	68.0 Ω
NPG/GCE	48.0 Ω
ZrO_2@C/NPG/GCE	36.7 Ω
Ppy-MIP-DA/ZrO_2@C/NPG/GCE	8957.4 Ω
Ppy-MIP/ZrO_2@C/NPG/GCE	278.2 Ω
Ppy-NIP/ZrO_2@C/NPG/GCE	6612.3 Ω
Ppy-NIP/ZrO_2@C/NPG/GCE after peroxidation	5247.1 Ω

Table S1 The R_{et} values of different modified electrodes

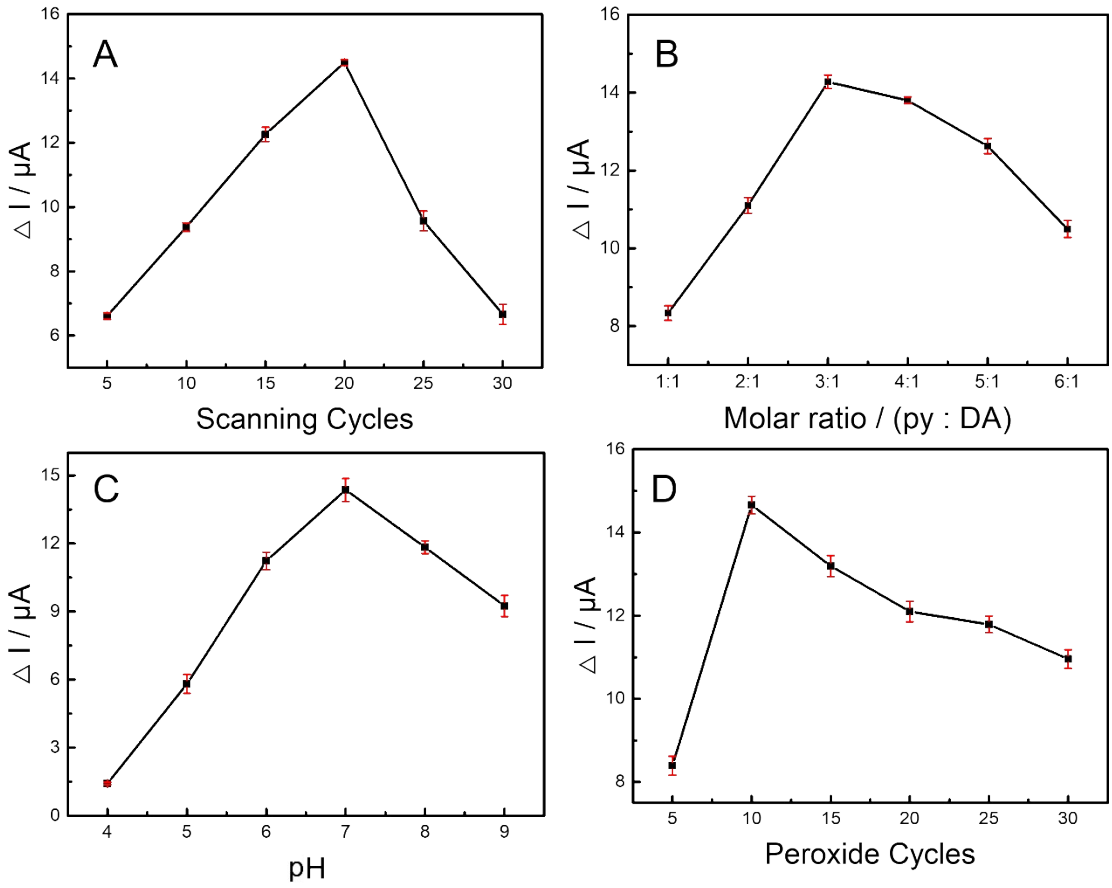

Fig. S4 Effect of electropolymerization cycles in 0.05 M PBS containing 0.3 mM Py and 0.1 mM DA (A), the molar ratio of Py and DA (B), the pH of Electropolymerization solution (C), and peroxide cycles in 0.1 M KOH (D).

Added (mol/L)	Found (mol/L)	Recovery (%)	RSD (%) (n=3)
0	None	0	0
	0.98×10^{-5}	98.0	
1.0×10^{-5}	1.02×10^{-5}	102.0	2.16
	1.03×10^{-5}	103.0	
	0.96×10^{-6}	96.0	
1.0×10^{-6}	1.05×10^{-6}	105.0	3.86
	1.03×10^{-6}	103.0	

Table S2 Determination of DA in real samples.