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PEDOT:PSS Hydrogels with High Conductivity and Biocompatibility for in situ Cell Sensing

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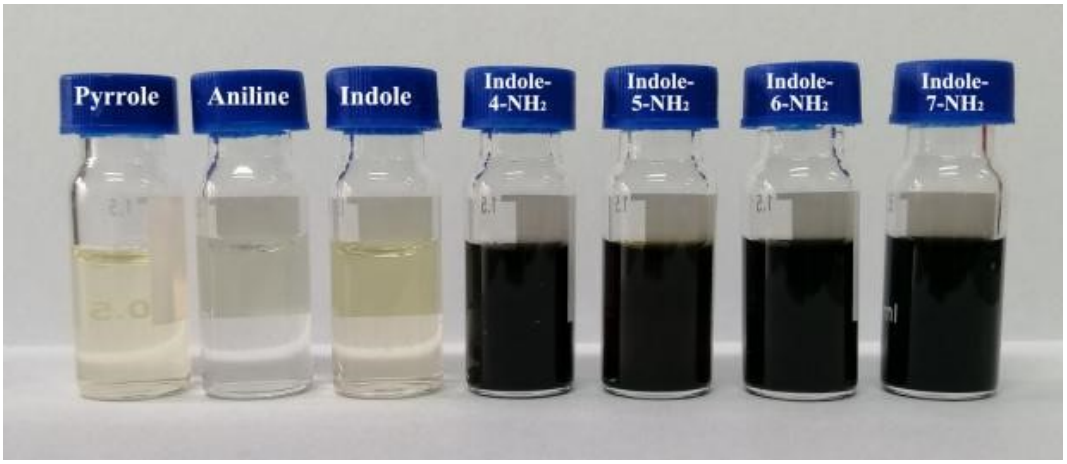

Fig. S1 Photographs of the conductive polymers prepared under acidic system with pH = 3.0 and ammonium persulfate as the oxidant. The only difference from the preparation of hydrogels is that no PEDOT:PSS solution was added during this process.

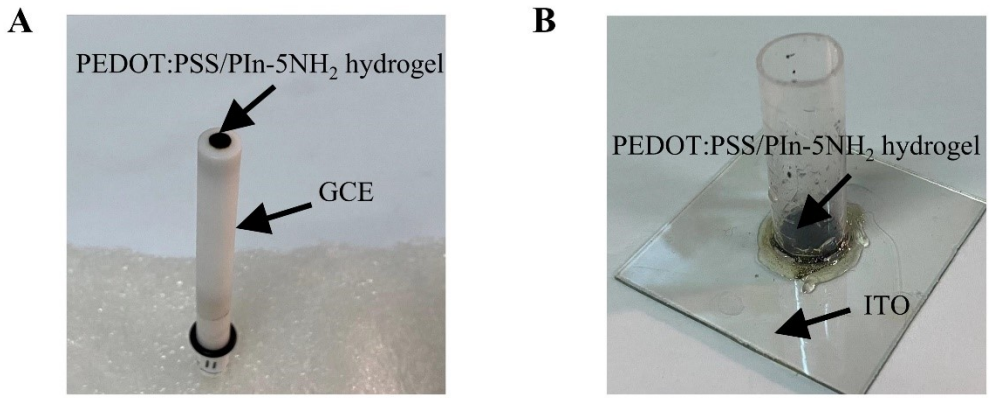

Fig. S2 Photographs of the fabricated PEDOT:PSS hydrogel electrodes. (A) Photograph of the PEDOT:PSS/PIn-5NH_2 hydrogel electrode on GCE. (B) Photograph of the PEDOT:PSS/PIn-5NH_2 hydrogel electrode on ITO.

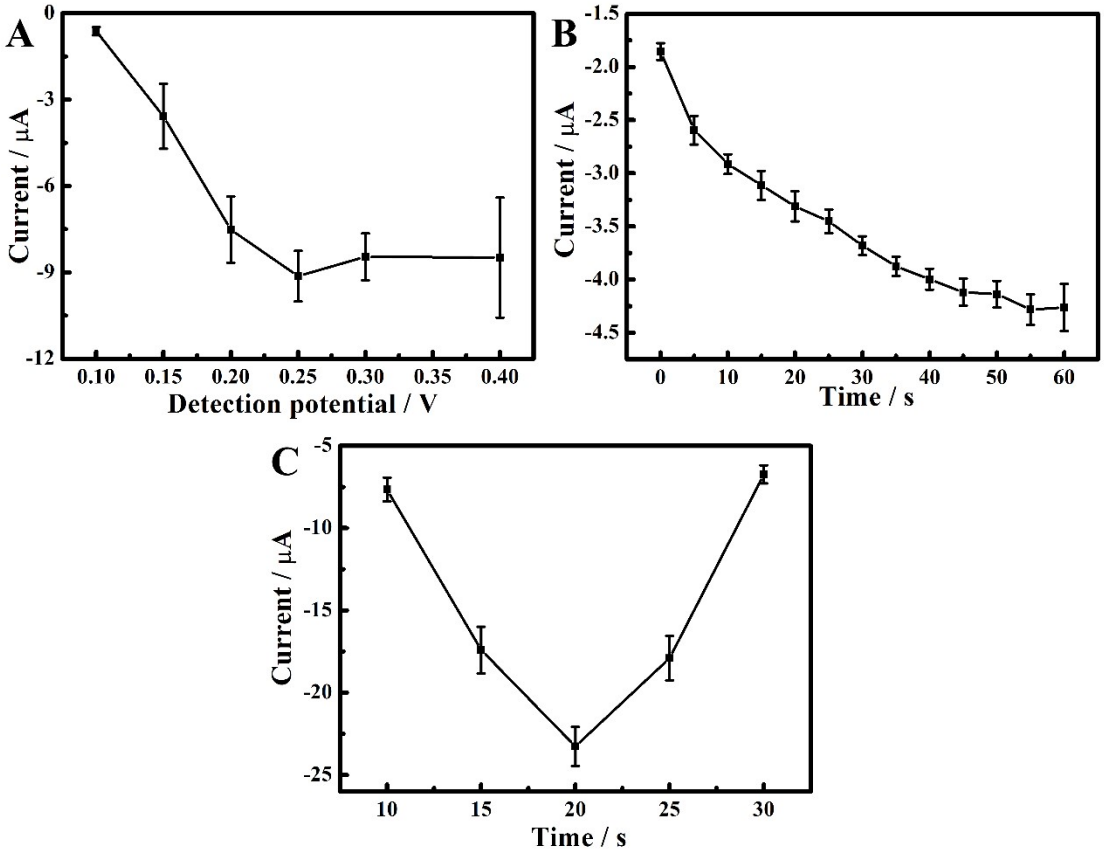

Fig. S3 Electrochemical performance optimization of AuNPs/PEDOT:PSS/PIn- 5-NH_2/GCE. (A) Amperometric responses of AuNPs/PEDOT:PSS/PIn-5-NH_2/GCE to subsequent additions of 20 μL of 100 mM dopamine into 10 mL PBS solution (pH=7.4) at different potentials. (B) Amperometric responses of AuNPs/PEDOT:PSS/PIn-5-NH_2/GCE to subsequent additions of 20 μL of 100 mM dopamine into 10 mL PBS solution (pH=7.4) at different stable time. (C) Amperometric responses of AuNPs/PEDOT:PSS/PIn-5-NH_2/GCE to subsequent additions of 20 μL of 100 mM dopamine into 10 mL PBS solution (pH=7.4) at different electrodeposition time of AuNPs.

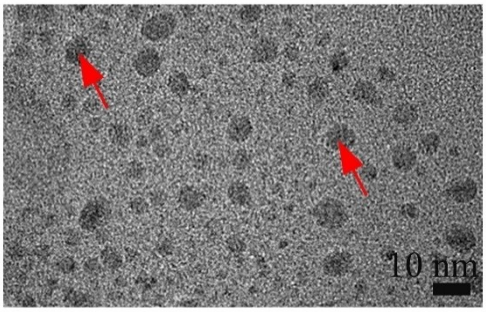

Fig. S4 TEM image of ultrasonic-dispersed AuNPs/PEDOT:PSS/PIn-5-NH_2. Au NPs were marked with red arrows.

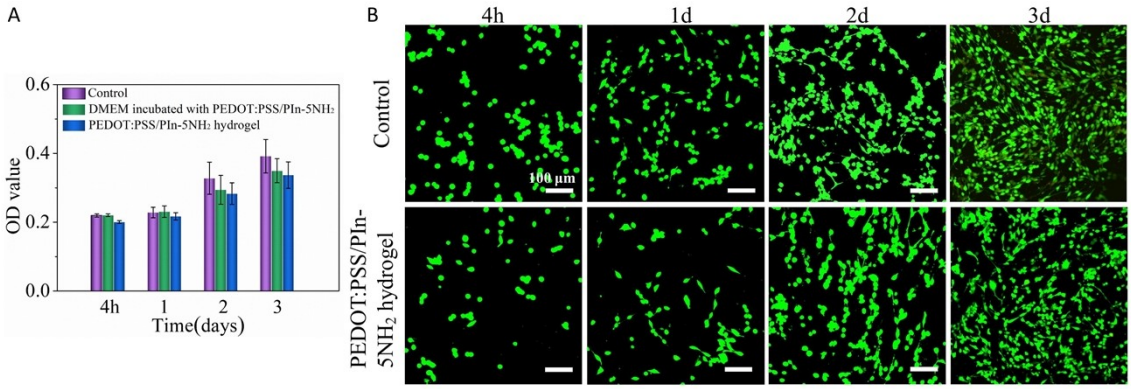

Fig. S5 Biocompatibility of PEDOT:PSS/PIn-5NH_2 hydrogels. (A) The viability of PC12 cells after cultured for 4 h, 1 day, 2 days, and 3 days. The supplemented DMEM cell culture mediums soaked with purified PEDOT:PSS/PIn-5NH_2 hydrogel, purified PEDOT:PSS/PIn-5NH_2 hydrogel were used for *in vitro* biocompatibility tests, and the supplemented DMEM without incubating the PEDOT:PSS/PIn-5NH_2 hydrogel was used as a control. (B) Live (green) and dead (red) staining of PC12 cells cultured on PEDOT:PSS/PIn-5-NH_2 hydrogel for different time: 4 h, 1 d, 2 d, 3 d. scale bar, 100 μm. The supplemented DMEM was used as a control.

Table S1. Comparison of the proposed PEDOT:PSS hydrogels with previously reported pure PEDOT:PSS hydrogels.

Materials	Matrixs/ Corss-linkers (w/w)	Conductivity	Ref.
PEDOT:PSS/conductive polymers	PEDOT:PSS/PPy, PAni, PIn-4NH_2, PIn-5NH_2, PIn-6NH_2, PIn-7NH_2 (~3.3:1)	1176.8-3265 S m^{-1}	This work
PEDOT:PSS/PPy	PPy/PEDOT:PSS (~24.6:1)	867 S m^{-1}	[1]
Conductive polymers/PEDOT:PSS	PPy, PAni, PIn-4NH_2, PIn-5NH_2, PIn-6NH_2, PIn-7NH_2/PEDOT:PSS (~5.71:1)	11.72 -70.54 S m^{-1}	[2]
PEDOT:PSS/DMSO	PEDOT:PSS (100 %)	2000 S m^{-1}	[3]
PEDOT:PSS/concentrated H_2SO_4	PEDOT:PSS (100 %)	880 S m^{-1}	[4]
PEDOT:PSS/DBSA	PEDOT:PSS/DBSA (~1:4)	10 S m^{-1}	[5]

Table S2. Performance comparison of the AuNPs/PEDOT:PSS/PIn-5-NH_2 biosensor towards electrochemical sensing of DA with previously reported electrochemical sensors.

Materials	Detection technique	Linear range (μM)	Detection limit (μM)	Biocompatibility study	Ref.
AuNPs/ PEDOT:PSS/ PIn-5-NH_2	Amperometry	0.03 - 688.75	0.01	Yes	This work
$K_2Fe_4O_7$	DPV	1 - 40.0; 40 - 140.0	0.22	-	
NACP film electrode[a]	DPV	0.05 - 15	0.010	Yes	
MnO_2NFs/NG[b]	DPV	0.1 - 10; 10 - 100.0	0.036	-	
Pt-Ag/Gr	DPV	0.1 - 60.0	0.012	-	
Gold nanocone electrode	CV	1.0 - 43.0	0.184	-	
Cu_xO/ERGO[c]	Amperometry	0.1 - 400.0	0.012	-	
CR-GNP[d]	Amperometry	0.4 - 56.0	0.042	-	
Au@NAC-MWCNTs[e]	DPV	0.1 - 250.0	0.03	-	
ZnO NSB/GF[f]	DPV	1 - 80.0	0.01	-	
NMCS[g]	Amperometry	0 - 500.0	0.01	-	
SNP/GO[h]	Amperometry	0.1 - 100.0	0.2	-	
SPANI/CNSs[i]	Amperometry	0.5 - 1780	0.0152	-	
GNPs/MWCNTs[j]	Square wave voltammetry	0.4 - 5.7	0.07	-	

[a] Ni-MOF composite/AuNPs/CNTs/PDMS; [b] MnO_2 nanoflowers/nitrogen-doped graphene; [c] Cu_2O/CuO/electrochemically reduced graphene oxide; [d] Curcumin functionalized gold nanoparticles; [e] Au clusters/N-acetyl-L-cystein/carboxylated-multiwall carbon nanotubes; [f] ZnO nanosheet balls/graphene foam; [g] 3D-ridge nanosheets of N-doped mesoporous carbon; [h] Silver nanoparticle/graphene oxide; [i] Sulfonated polyaniline/carbon nanospheres; [j] Gold nanoparticles /MWCNTs

Reference

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