Electronic Supplementary Material (ESI) for Analytical Methods.

Electronic Supplementary Information

Amphiprotic paper-based electrode for glucose detection based on layered carbon nanotubes with silver and polystyrene particles

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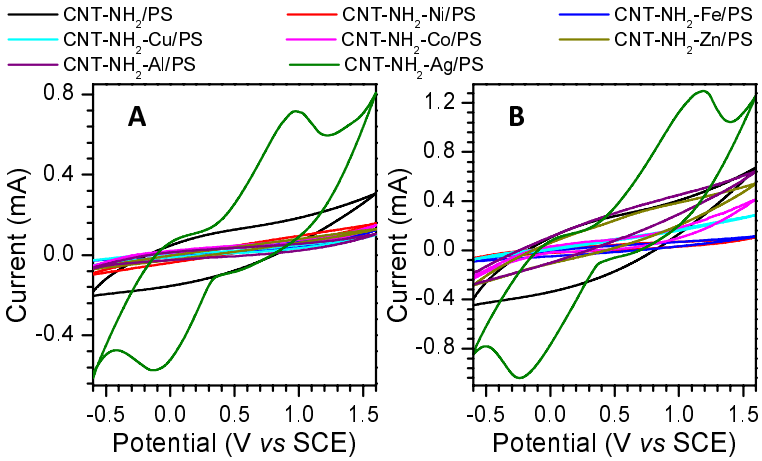

Figure S1. Comparison of the electrochemical performance of different paper electrodes containing various metal particles in the **(A)** absence and **(B)** presence of glucose (scanning speed: 50 mV s^{-1}; concentration of glucose: 100 µM).

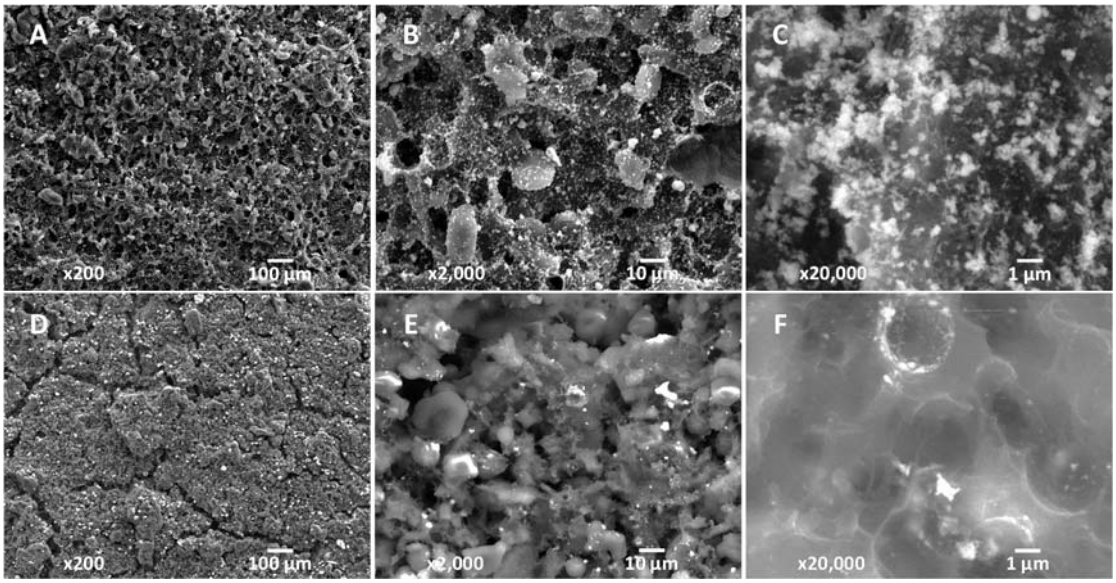

Figure S2. **(A)** SEM images of CNT-NH_2/Ag-PS paper electrode and its [**(B)** and **(C)**] magnification images; **(D)** SEM images of CNT-NH_2-Ag-PS paper electrode and its [**(E)** and **(F)**] magnification images.

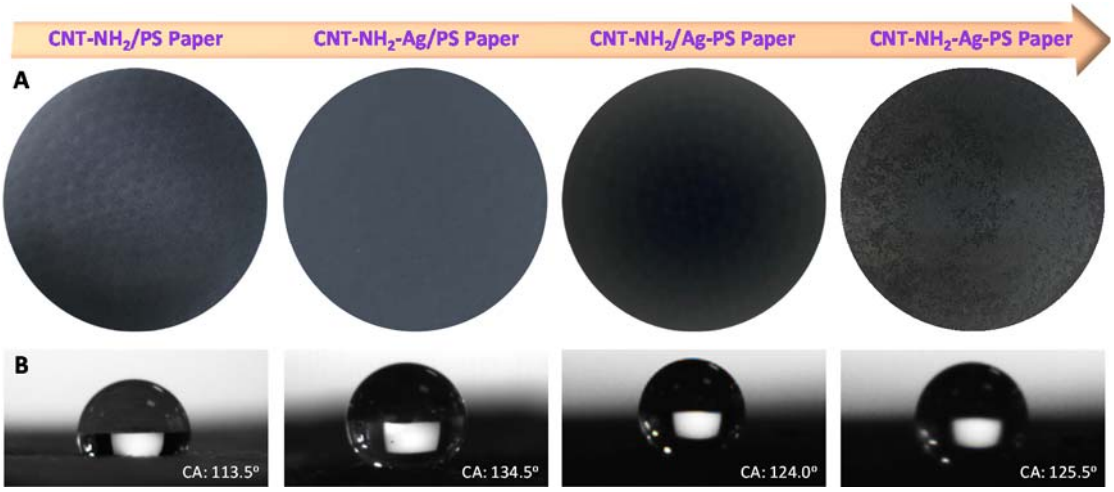

Figure S3. **(A)** Photographic images and **(B)** hydrophobicity of different paper electrodes.

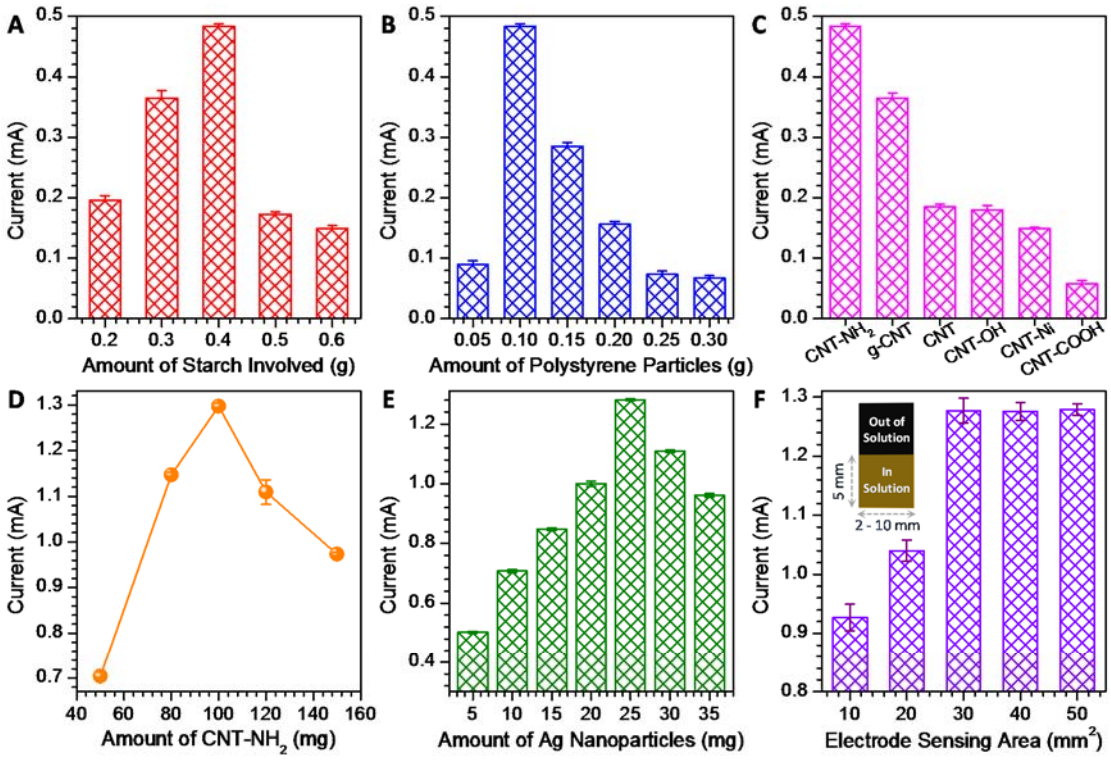

Figure S4. Effects of different experimental parameters on the electrochemical performance of CNT-NH_2-Ag/PS paper electrode: **(A)** amount of starch involved, **(B)** amount of PS particles involved, **(C)** type of CNTs, **(D)** amount of CNT-NH_2 particles, **(E)** amount of Ag nanoparticles, and **(F)** electrode sensing area (inset is the schematic of paper electrode out of/in sample solution).

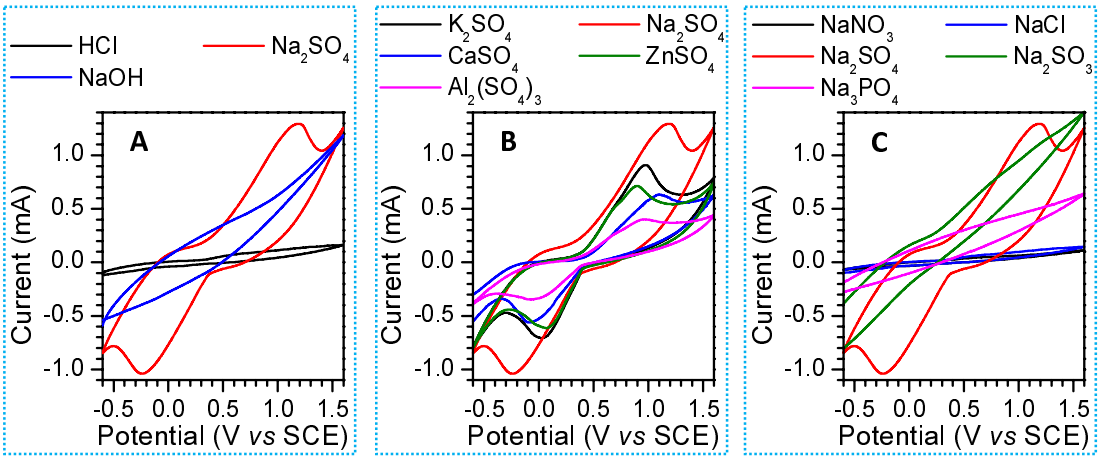

Figure S5. Comparison of the electrochemical performance of CNT-NH_2-Ag/PS paper electrode in different systems: **(A)** acidic, neutral and basic solution; **(B)** metal salts containing various cations; **(C)** metal salts containing various anions (scanning speed: 50 mV s^{-1}; concentration of glucose: 100 µM).

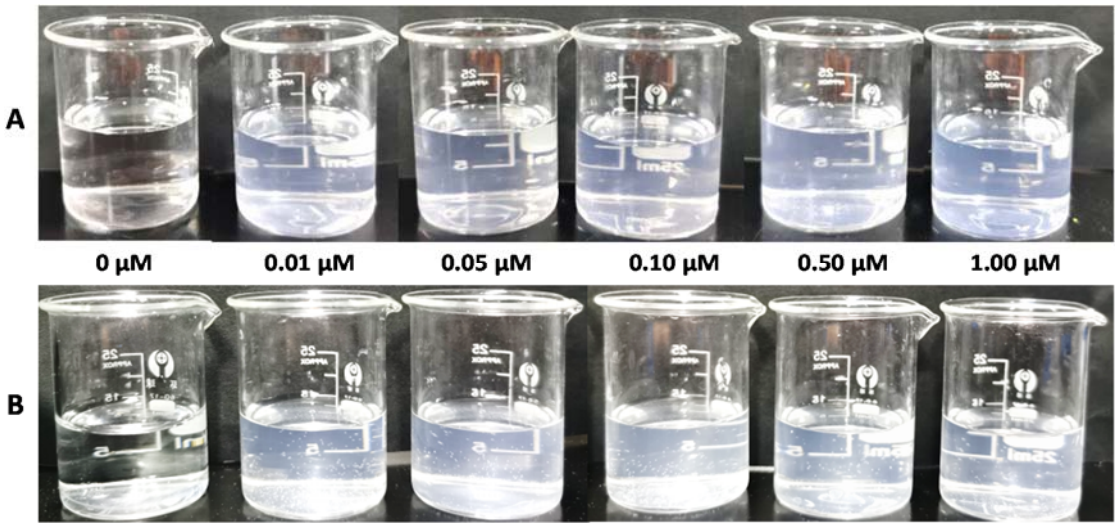

Figure S6. Photographic images of glucose solution by adding different concentrations of $AgNO_3$ solutions **(A)** without and with **(B)** electrochemical measurement (electrode: CNT-NH_2-Ag/PS; scanning speed: 50 mV s^{-1}; concentration of glucose: 100 µM).

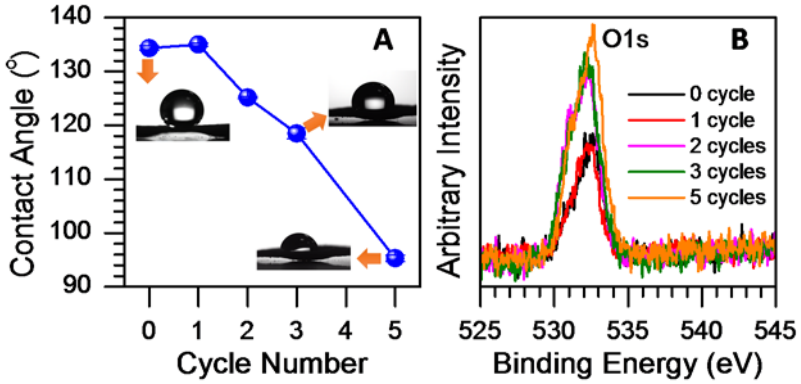

Figure S7. Variation of **(A)** the contact angles and **(B)** the peak intensity of O1s spectra with increase in the cycle number of fabricated paper electrode (the experiment conditions were same as that in **Figure 4D**, and insets are the corresponding images of hydrophobic properties).

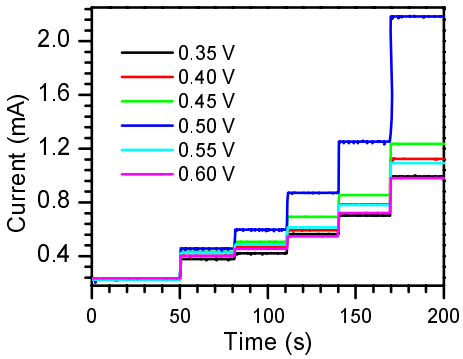

Figure S8. Amperometric response of CNT-NH_2-Ag/PS paper electrode by the successive addition of glucose at the applied potential of 0.35, 0.40, 0.45, 0.50, 0.55 and 0.60 V.

Figure S8 is a typical amperometric response of the same CNT-NH_2-Ag/PS paper electrode at different working potentials ranging from 0.35 V to 0.60 V. By the successive addition of glucose at various potential, amperometry plots of CNT-NH_2-Ag/PS paper electrode demonstrated a series of stair-step response. By varying the working potential, the current demonstrated a first increasing trend followed by a decreasing one. As the applied potential was 0.50 V, the current reached the highest increment. Due to this reason, 0.50 V was chosen as the optimal potential.

Table S1. Fitting equivalent circuit parameters of different fabricated electrodes immersed in 0.1 M Na_2SO_4 solution, 5.0 mM $K_3[Fe(CN)_6]$, and 5.0 mM $K_4[Fe(CN)_6]$.

electrodes	R_s (Ω)	R_{ct1} (Ω)	R_{ct2} (Ω)	*CPE1* (μF)	*CPE2* (μF)
CNT-NH_2+Ag/PS	53.41	573.1	1873.0	0.969	0.265
CNT-NH_2+Ag+PS	57.65	667.3	2726.0	0.958	0.369
CNT-NH_2+Ag/PS	58.19	844.3	2807.0	1.008	0.408
CNT-NH_2/PS	59.66	1180.0	1666.0	1.032	0.233