Supplementary Information: A novel electrochemical aptasensor based on polyaniline and gold nanoparticles for ultrasensitive and selective detection of ascorbic acid

Optimization of parameters

To enhance the sensitivity of the as-prepared sensor, possible factors affecting the detection of AA were optimized by taking the content of PANI as a crucial control factor. As shown in Fig. S1A, the increase in PANI concentration led to an enhancement in ΔI. The highest current response value was obtained at 1.5 mg/ml concentration of PANI and remained constant as a function of further rise in concentration. Hence, 1.5 mg/ml PANI was determined as the optimal value and used in subsequent experiments.

Different aptamer concentrations were investigated and the results are gathered in Fig. S1B. The increment immobilization of the aptamer resulted in a gradual rise in ΔI to reach a platform after 5 μM, indicating saturation for aptamer binding. Thus, 5 μM was determined as the optimized aptamer concentration.

The incubation time between the aptamer and AuNPs/PANI/GCE strongly influenced the response of the as-prepared sensor toward AA. As shown in Fig. S1C, ΔI obviously increased with the incubation time from 30 min to 120 min. The ΔI changed slightly from 120 min to 210 min, indicating aptamer nearly reaching saturation at 120 min. Thus, 120 min was sufficient for the fabrication of sensors.

The effects of the aptamer incubation temperature on the DPV response of $[Fe(CN)_6]^{3-/4-}$ were also studied. In Fig. S1D, a gradual rise in incubation temperature led first to an increase in ΔI and then a decrease. The maximum ΔI was observed for incubation at 37 ^{o}C, suggesting an optimal incubation temperature, which was utilized for further experiments.

The plot of change in pH as a function of AA detection is illustrated in Fig. S1E. The ΔI first increased with pH value from 5.0 to 7.4 and then diminished at higher pH values. Thus, Tris-HCl at pH 7.4 was selected as the optimal solution in the following analytical tests.

The influence of the binding time between AA and aptamer on the analytical signal was also evaluated. As the binding time rose (Fig. S1F), the ΔI greatly increased from 5 to 25 min, and then inclined to a stable value for longer times, revealing the saturation of the AA-aptamer complex. As a result, 25 min was selected as the optimal binding time.

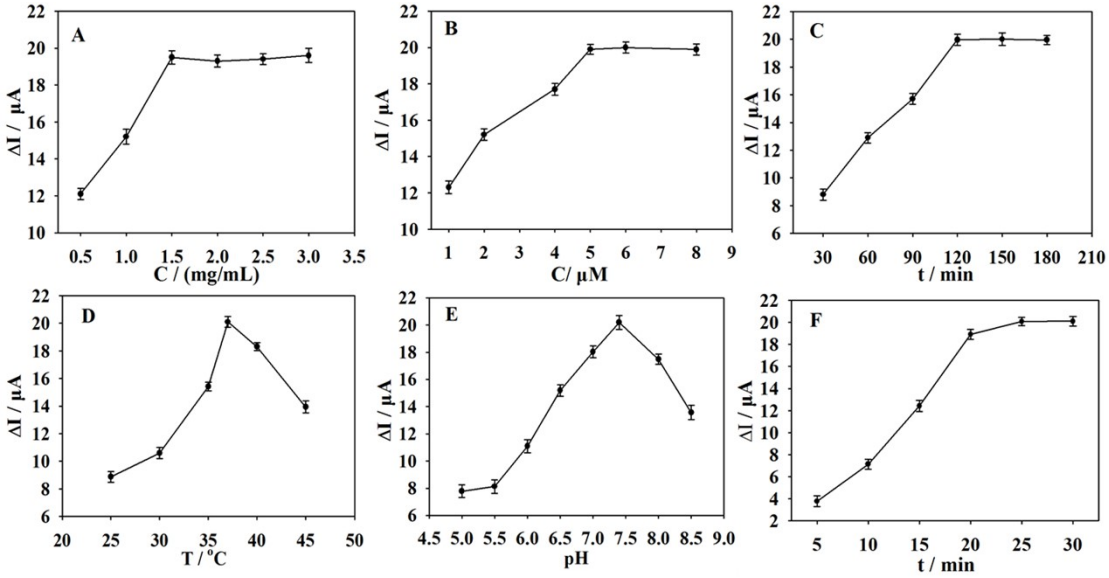

Fig. S1 Influence of PANI concentration (A), aptamer concentration (B), aptamer incubation time (C), aptamer incubation temperature (D), pH value (E), and binding time of AA (F) on the change in DPV peak current of the aptasensor after interaction with 100 ng/L AA. Error bars are standard deviations for three repetitive experiments (n =3).