Supporting Information

Combined determination of Copper ion and β-Amyloid peptide by a Single ratiometric Electrochemical Biosensor

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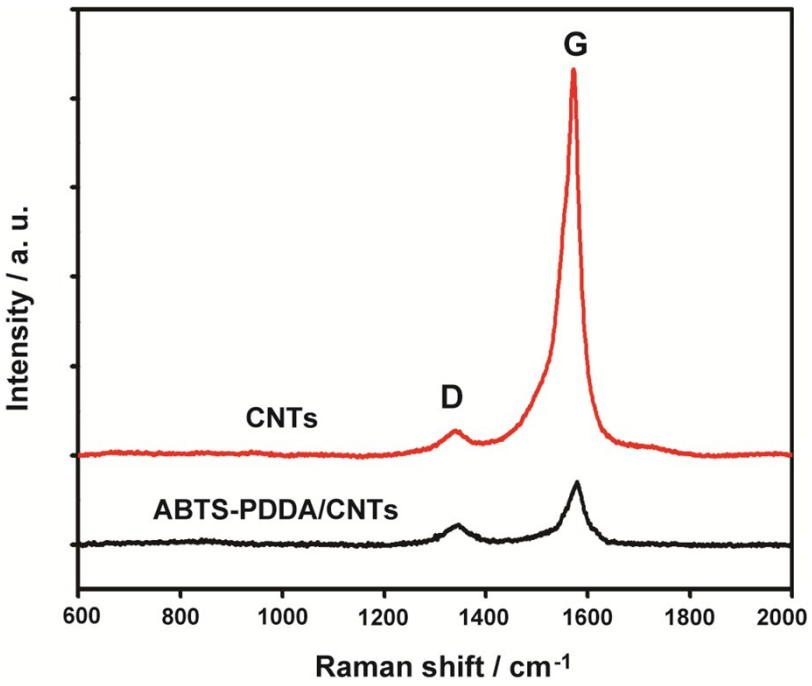

Fig. S1 Raman spectrum of CNTs and ABTS-PDDA/CNTs.

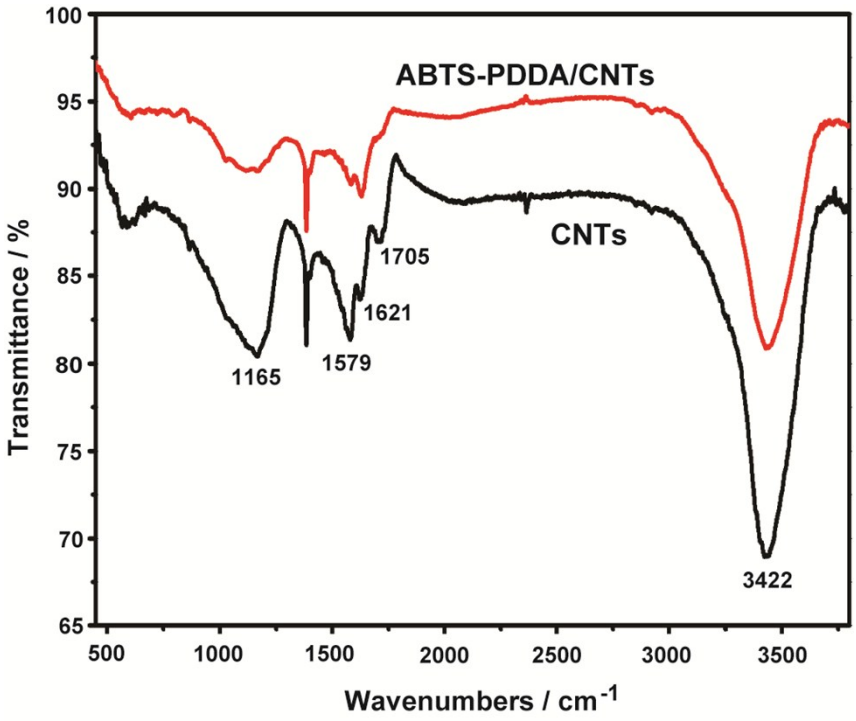

Fig. S2 FT-IR spectrum of CNTs and ABTS-PDDA/CNTs.

As demonstrated in Fig. S3, after the modification of PDDA/CNTs, two obvious peaks belonging to C 1s and O 1s located at 284.7 and 532.5 eV respectively were observed and the intensity of them gradually increased along with the modification of ABTS and NKB. What's more, the presence of N 1s and S 2p peaks located at 403.1 and 166.3 eV in the ABTS-PDDA/CNTs and ABTS-PDDA/CNTs-NKB composites also demonstrated that ABTS and NKB have both immobilized onto electrode.

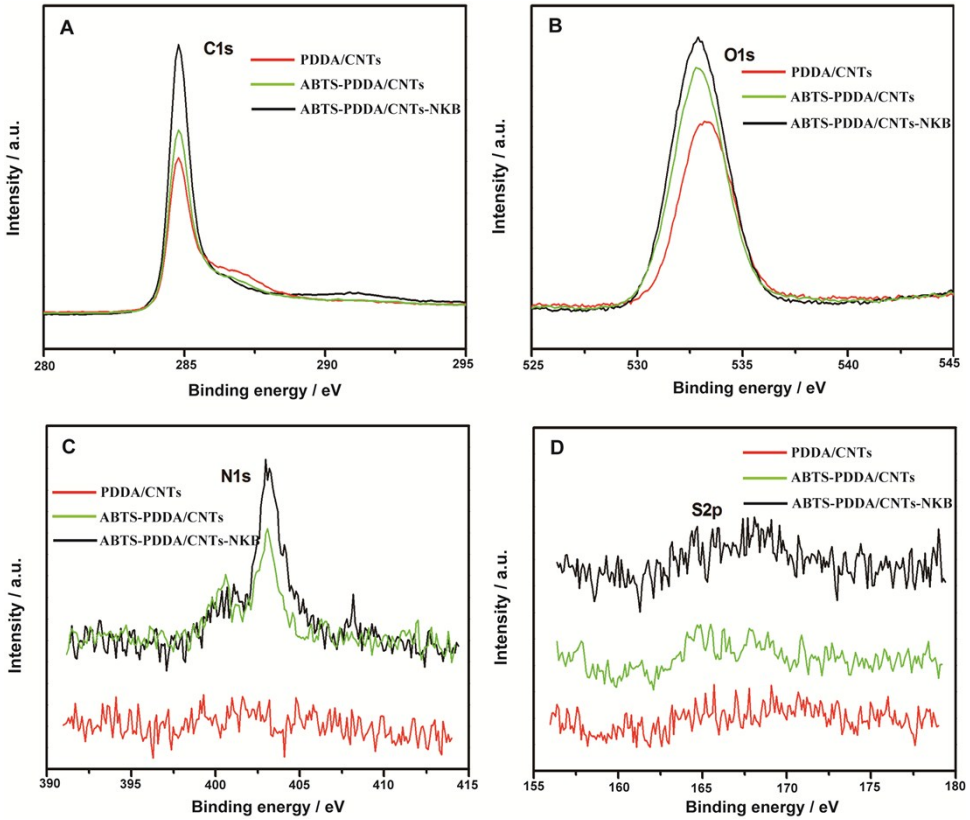

Fig. S3 XPS spectra of (A) C 1s, (B) O 1s, (C) N 1s and (D) S 2p for samples of PDDA/CNTs, ABTS-PDDA/CNTs and ABTS-PDDA/CNTs-NKB composites.

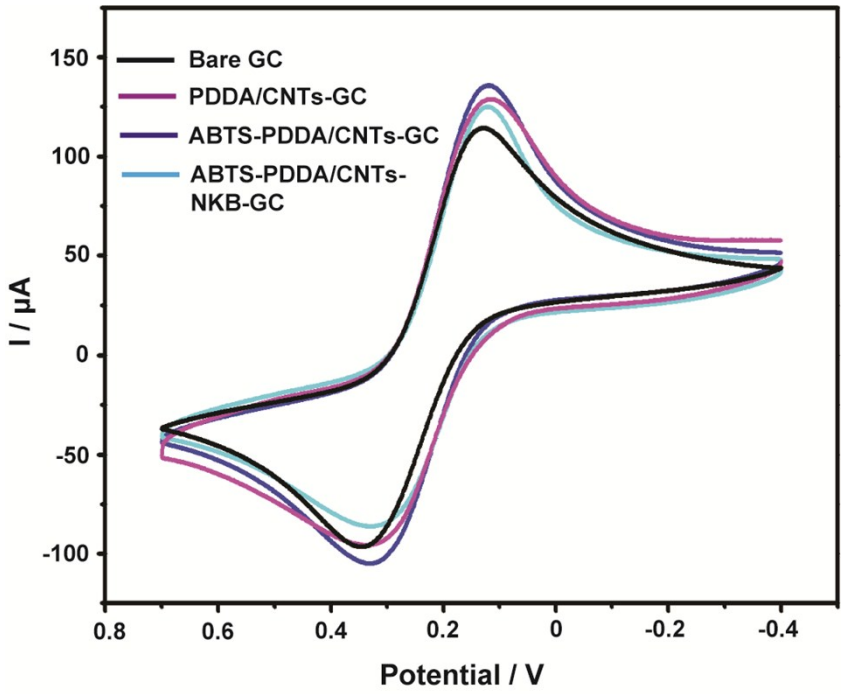

Fig. S4 Cyclic voltammograms of bare GC, and PDDA/CNTs, ABTS-PDDA/CNTs, ABTS-PDDA/CNTs-NKB modified electrodes in 0.1M KCl solution containing 1mM $K_3Fe(CN)_6$.

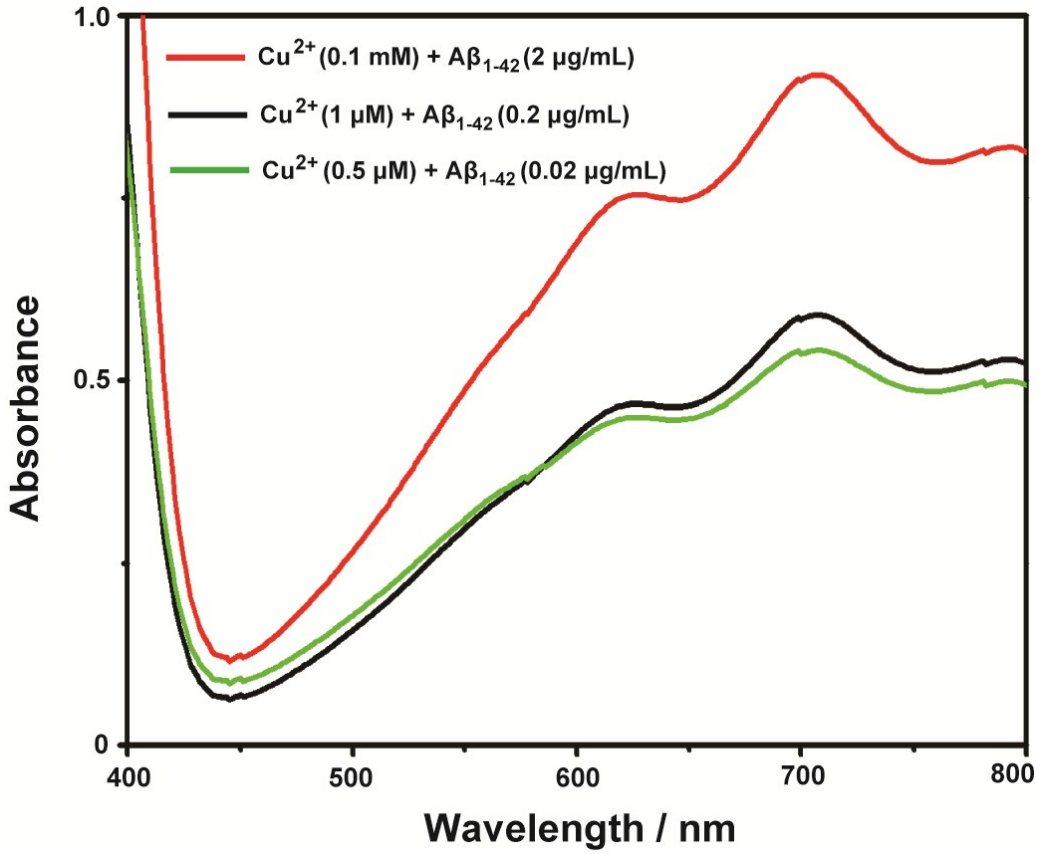

Fig. S5 The UV-*vis* absorption spectra of the formed Cu^{2+} - $A\beta_{1-42}$ complex prepared by incubating them with three different concentrations of Cu^{2+} and $A\beta_{1-42}$ at 37°C. The peroxide activity of Cu^{2+} - $A\beta_{1-42}$ complex was tested by the catalytic oxidation of ABTS (0.15 mM) in the presence of H_2O_2 (100 mM).

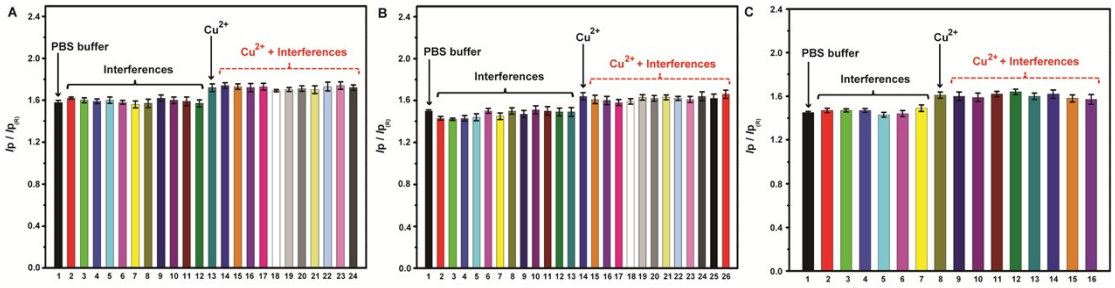

Fig. S6 Selectivity investigations of Cu^{2+} and $A\beta_{1-42}$ determination by ABTS-PDDA/CNTs-NKB modified electrode in the presence of other metal ions (A), amino acids (B) and several endogenic species (C). "Cu^{2+} + interferences" experiments were carried out by adding Cu^{2+} into PBS containing other metal ions, amino acids and other endogenic species. The Cu^{2+} concentration was 9 μM. Concentrations of the tested metal ions are 1 mM for Ca^{2+} (1), Mg^{2+} (6), Na^{+} (7) and 10 μM for Cd^{2+} (2), Co^{2+} (3), Cu^{+} (4), Fe^{3+} (5), Mn^{2+} (8), Ni^{2+} (9), Pb^{2+} (10), Zn^{2+} (11). The twelve amino acids are all 5 μM for cysteine (1), phenylalanine (2), methionine (3), glycine (4), glutamic acid (5), arginine (6), lysine (7), leucine (8), serine (9), threonine (10), valine (11), histidine (12). Concentrations of the tested endogenic species are 10 μM for ascorbic acid (1), dopamine (2), uric acid (3) and 1 mM for glucose (4) and lactate (5). Concentrations of the aggregated Aβ form were 0.1 μg/mL for $A\beta_{1-38}$ and $A\beta_{1-42}$ by incubating them at 37°C for three days.

Table S1. Results of detection of $A\beta_{1-42}$ in hippocampus homogenates from normal and AD groups by the present electrochemical method (Cu^{2+} concentration: 0.95 μM).

Samples	Added amount (μg/mL)	Detected amount (μg/mL)	Recovery (%)	RSD (n = 3)
Normal	0.05	0.05	100	6.5
	0.10	0.11	110	7.2
	0.30	0.33	110	5.9
AD	0.02	0.02	100	5.6
	0.04	0.04	100	7.6
	0.12	0.11	91.7	8.1