Electronic Supplementary Information

Carbon dots-assisted colorimetric and fluorometric dual-mode protocol for acetylcholinesterase activity and inhibitors screening based on the inner filter effect of silver nanoparticles

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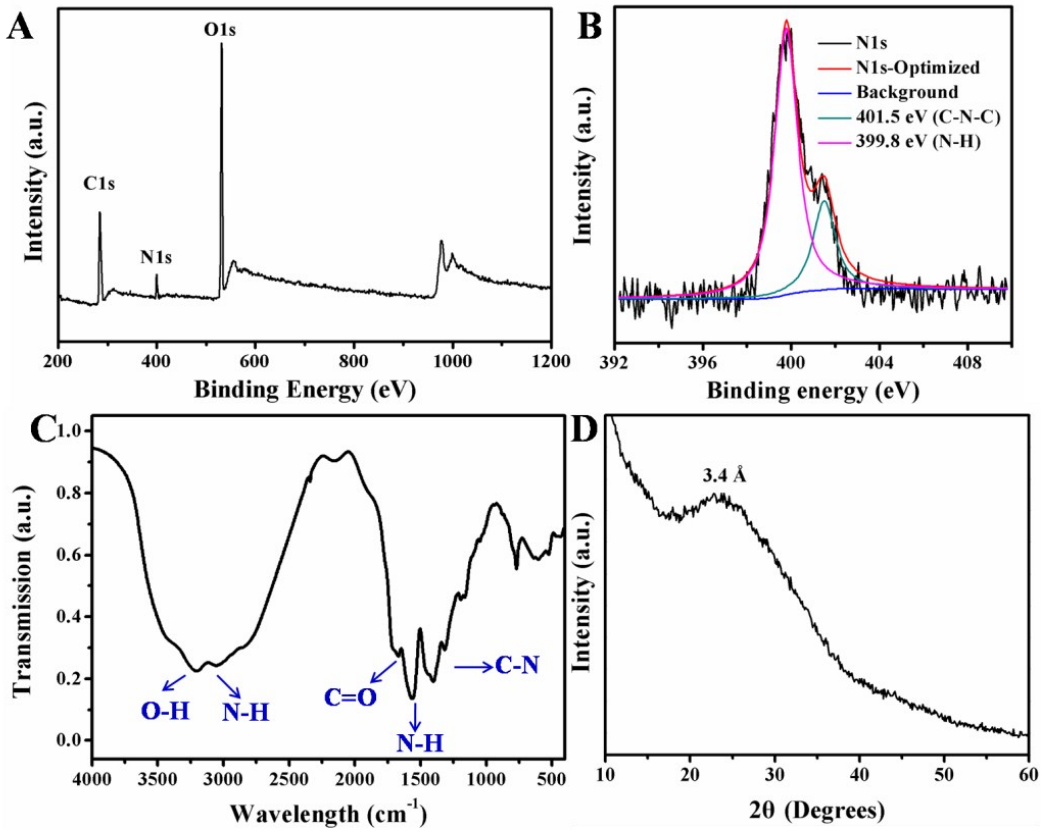

Fig. S1. (A) XPS pattern of the as-prepared CDs. (B) the N 1s spectrum. (C) FTIR spectrum of the as-prepared CDs. (D) XRD pattern of the as-prepared CDs.

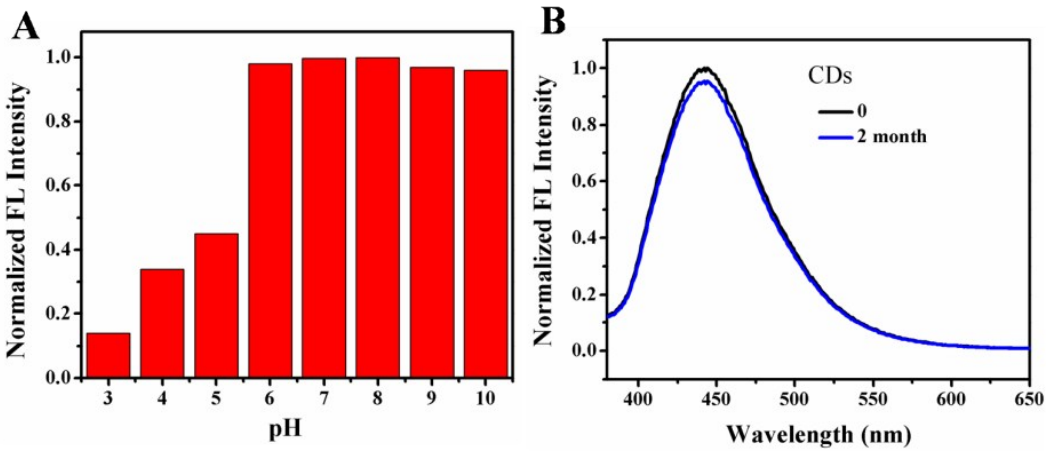

Fig. S2. (A) The relative fluorescence intensity of CDs under different pH values. (B) Fluorescence spectra of CDs at ambient conditions for 2 months.

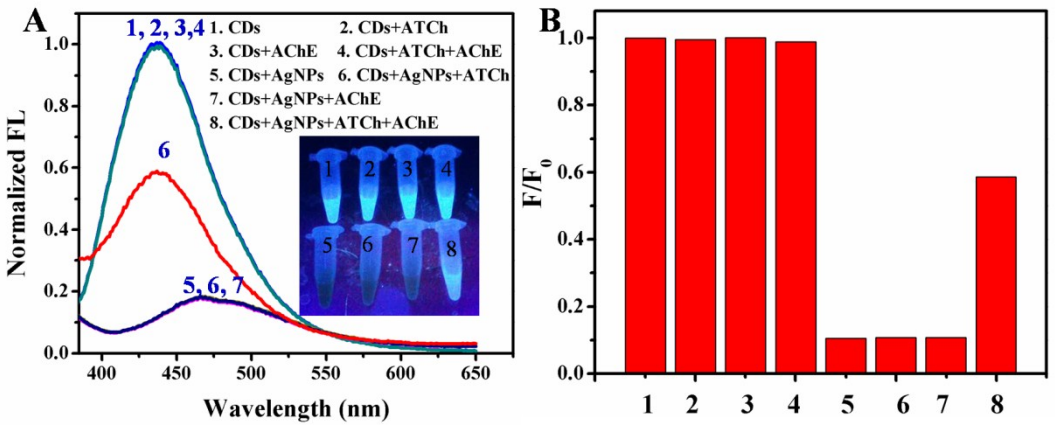

Fig. S3. (A) Fluorescence emission spectra and (B) relative fluorescence intensities of the sole CDs (1), CDs+ATCh (2), CDs+AChE (3), CDs+ATCh+AChE (4), CDs+ AgNPs (5), CDs+ AgNPs +ATCh (6), CDs+ AgNPs +AChE (7) and CDs+ AgNPs+ATCh+AChE (8).

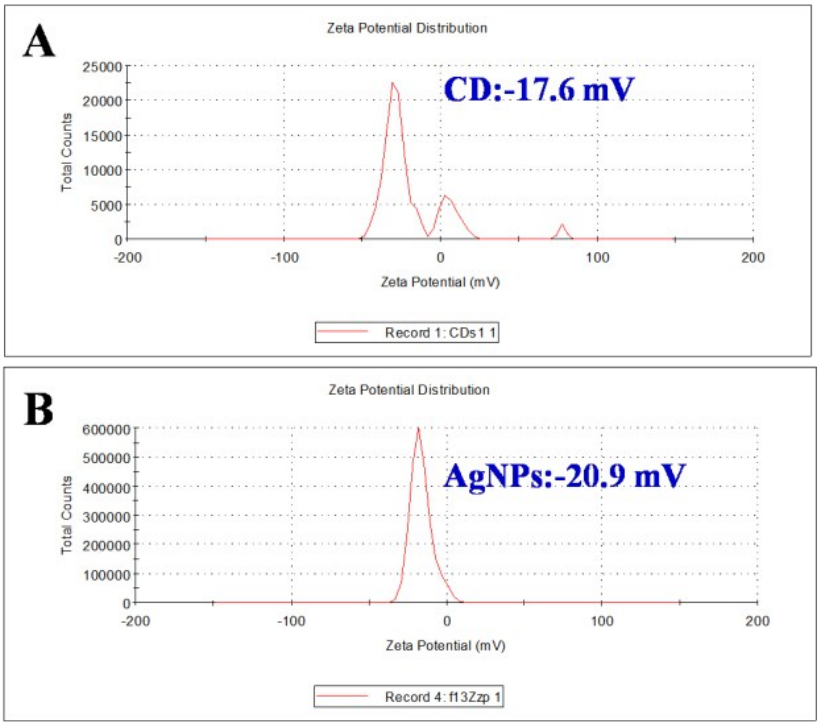

Fig. S4. The zeta potentials of the (A) as-prepared CDs and (B) AgNPs in pH 8.0 buffer.

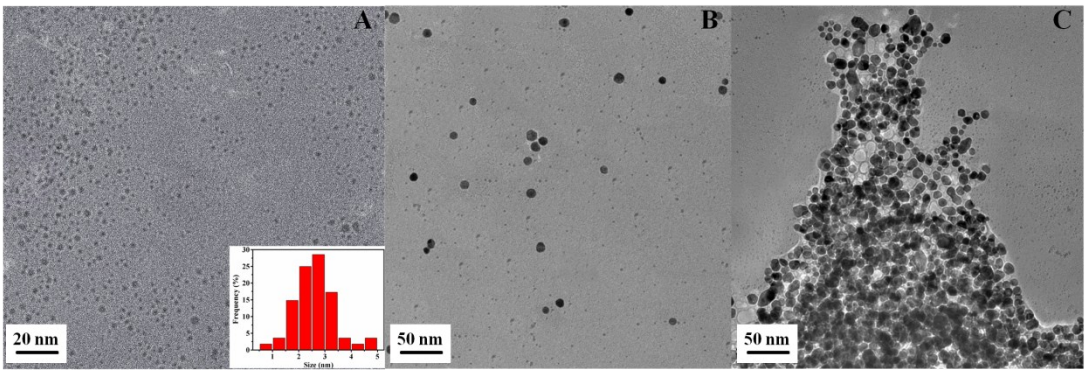

Fig. S5. TEM images of the CDs (A), CDs+AgNPs (B) and CDs+AgNPs+ATCh+AChE (C).

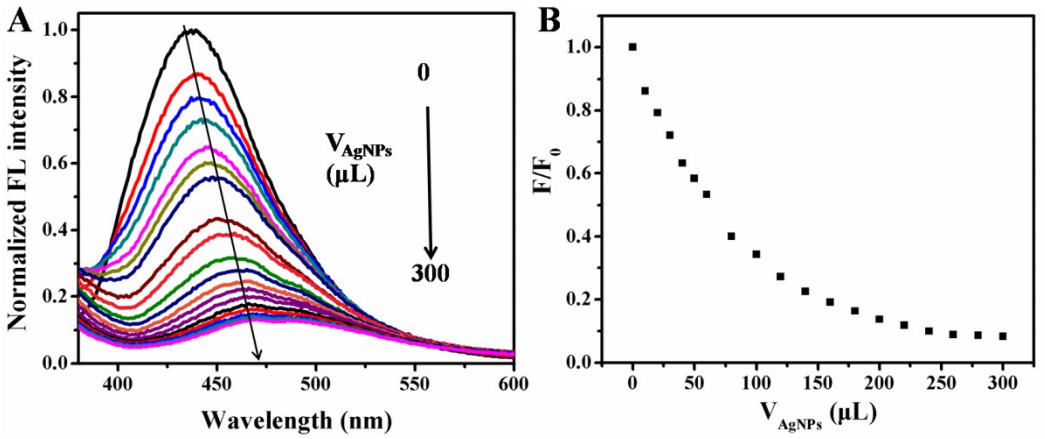

Fig. S6. (A) Fluorescence emission spectra of CDs in the presence of various volumes of AgNPs. (B) Plot of the F_0/F value as a function of the volume of AgNPs.

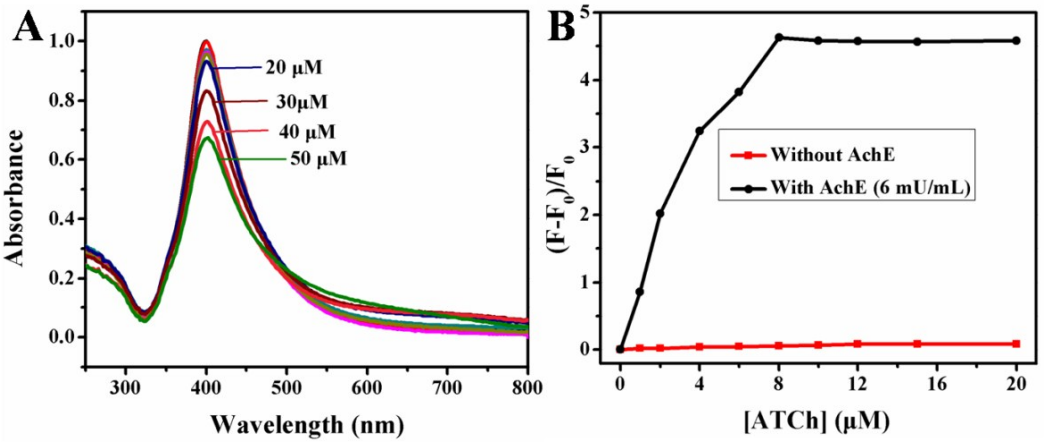

Fig. S7. (A) The absorption spectra of AgNPs incubation with different concentrations of ATCh in the absence of AChE. (B) Fluorescence responses of CDs/AgNPs as a function of the concentration of ATCh in the presence or absence of AChE.

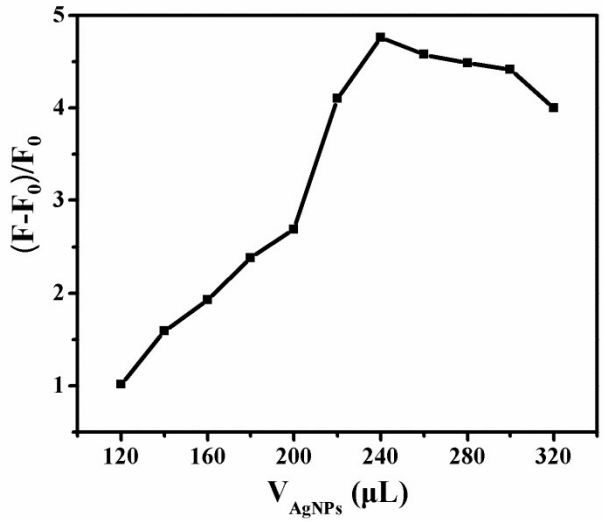

Fig. S8. Effect of the volumes of the AgNPs on the detection of 6 mU/mL AChE.

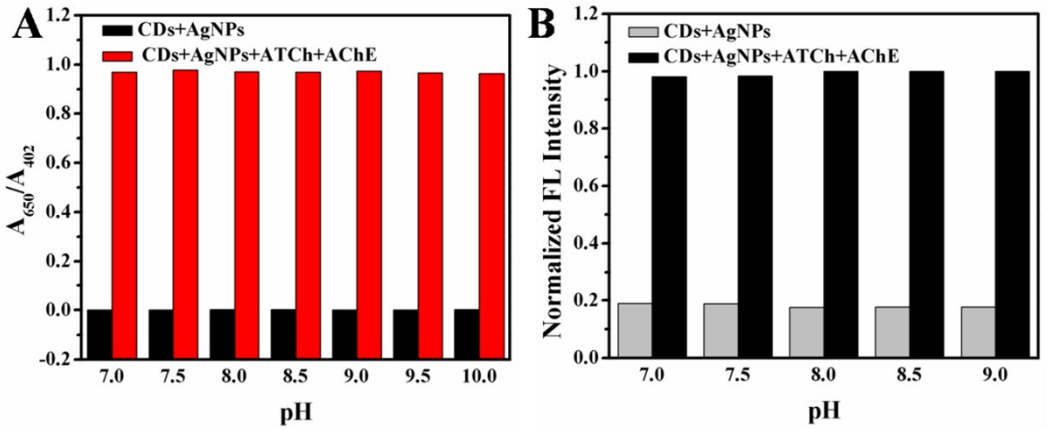

Fig. S9. (A) The absorbance ratio A_{650}/A_{402} and (B) normalized FL intensity of the proposed assay as a function of various pH values in the absence and presence of AChE (6 mU/mL).

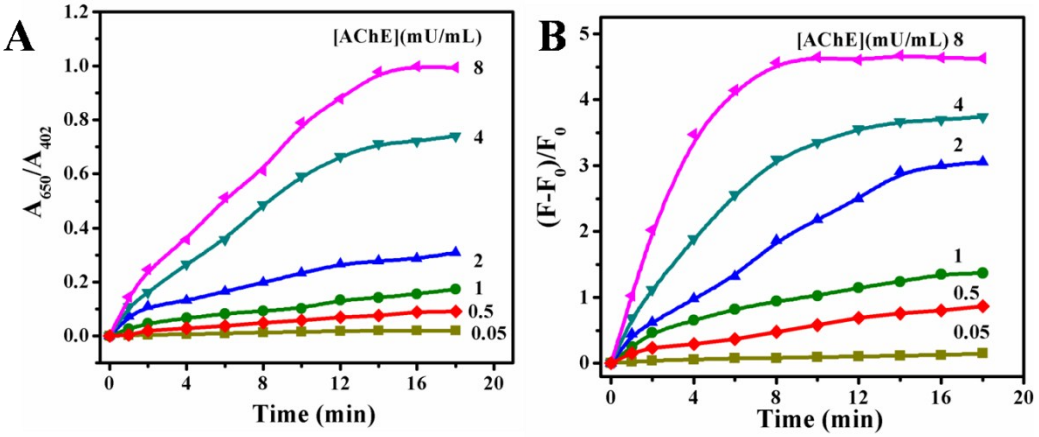

Fig. S10. (A) The absorbance ratio A_{650}/A_{402} and (B) fluorescence enhancement efficiency $(F-F_0)/F_0$ of the proposed assay in the presence of different concentrations of AChE as a funciton of time.

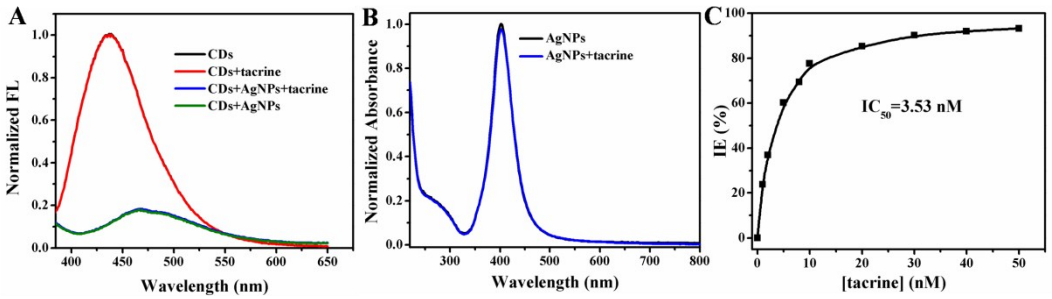

Fig. S11. (A) Fluorescence emission spectra of the CDs (black), CDs+tacrine (red), CDs+AgNPs (blue), and CDs+AgNPs+tacrine (green). (B) UV-vis spectra of the AgNPs (black) and AgNPs+tacrine (blue). (C) Plot of the inhibition efficiency for AChE versus the concentration of tacrine.

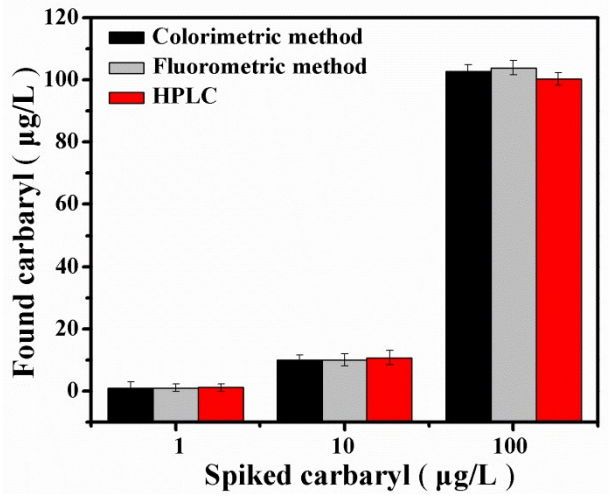

Fig. S12. Coloriemtric (black) and fluorometric (gray) results of spiked carbaryl in apple samples by using our proposed method and by HPLC (red).

Table S1. Comparison of different optical nanosensors for AChE activity.

Probe	Mode	Linear range	LOD (mU/mL)	Time (min)	Reference
AuNPs	Colorimetric	—	0.6	15	3
Polythiophene derivative	Colorimetric	—	200	18	4
11-MUA-AuNCs-Cu^{2+}	Fluorometric	0.05-2.5 mU/mL	0.05	20	5
CDs-Cu^{2+}	Fluorometric	14.2- 121.8 mU/mL	4.25	60	6
H39GFP-Cu^{2+}	Fluorometric	0.025-2 mU/mL	0.015	30	7
Rhodamine-B-AuNPs	Colorimetric	1-5 mU/mL	1	—	14
	Fluorometric	0.1-3mU/mL	0.1	—	
CDs-AgNPs	Colorimetric	0.025 - 2 mU/mL	0.021		
	Fluorometric	0.025- 2 mU/mL	0.016	16	This work

Table S2. Comparison of the present assay with other reported methods for the detection of carbaryl.

Probe	Mode	LOD (μg/L)	Reference
H39GFP-Cu^{2+}	Fluorometric	0.0073	7
Rhodamine-B-AuNPs	Colorimetric	0.1	8
	Fluorometric	0.1	
Sol-gel derived silica inks	Colorimetric	6	44
PABSA-AuNPs[*a]	Colorimetric	50.25	45
CdSe/ZnS QDs@MIPs	Fluorometric	29.4	46
CDs-AgNPs	Colorimetric	0.007	This work
	Fluorometric	0.006	

[*a] p-Amino benzenesulfonic acid functionalized AuNPs