Electronic Supplementary Material (ESI) for RSC Advances.

Supporting information:

Noncovalent Assembly of Carbon Nanoparticles and Aptamer for Sensitive Detection of ATP

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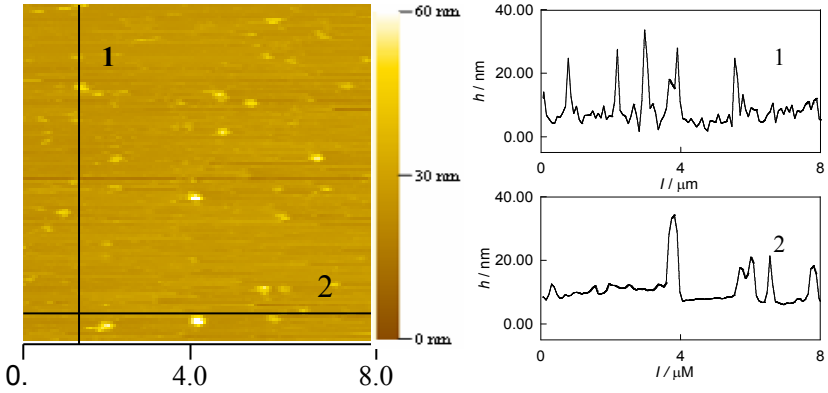

Figure S1. AFM image and depth profiles of as prepared cCNPs.Size:8.0 x 8.0 µm.

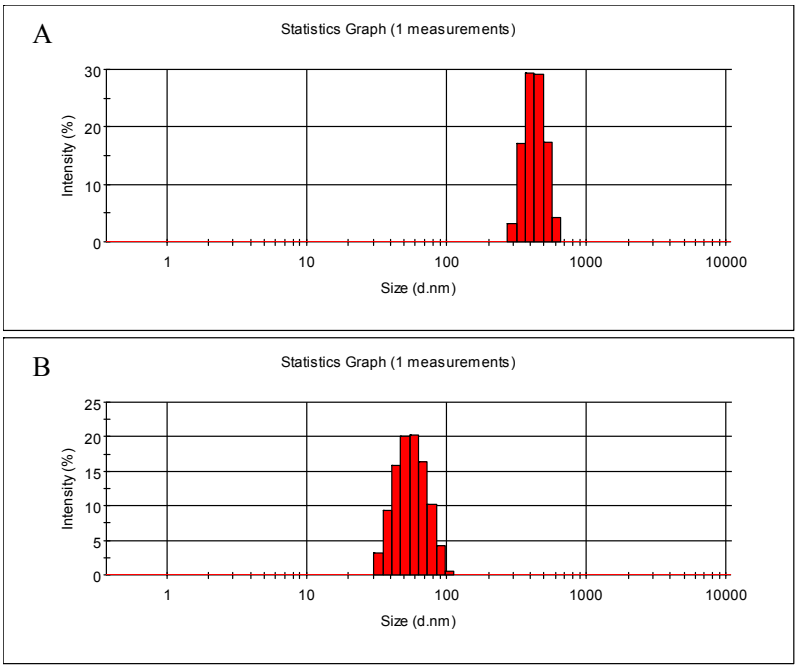

Figure S2. The hydrodynamic sizes of pCNPs (A) and cCNPs (B) measured by dynamic light scattering.

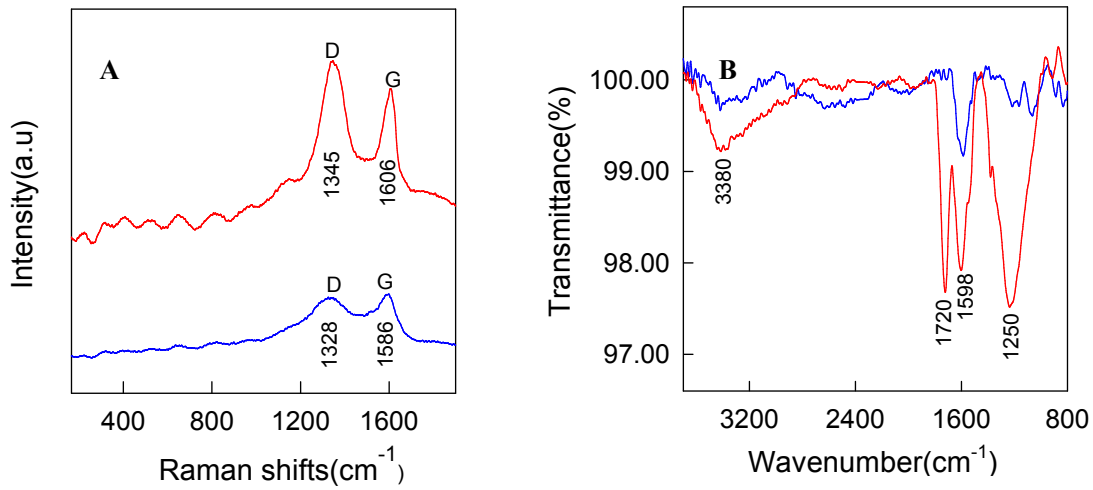

Figure S3. Raman (A) and FT-IR spectroscopy (B) of pCNPs (blue curve) and cCNPs (red curve).

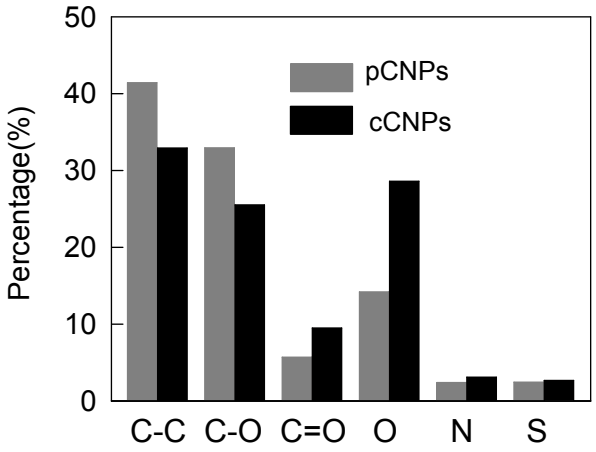

Figure S4. The relative percent of oxygen and oxygen-containing carbon species on the surface of the pCNPs and cCNPs.

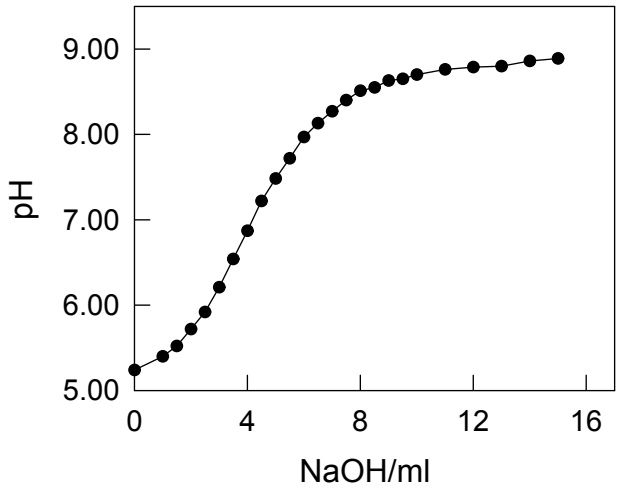

Figure S5. Potentiometric equilibrium curves of 0.1mg/ml of cCNPs at 25°C (• is the experimental data).

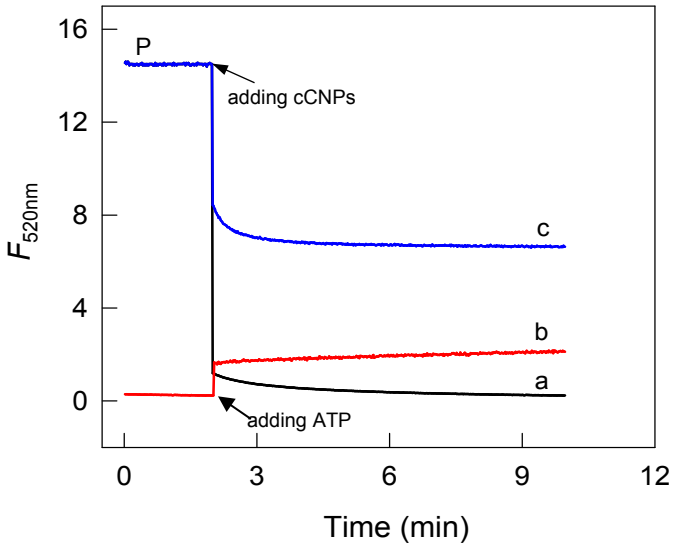

Figure S6. Time course of interactions of P(30 nM) with cCNPs (0.015 mg/mL) of in the Tris-HCl buffer solution at room temperature (a); P+cCNPs+ATP, pre-mixing strategy (b); P+ATP+cCNPs, post-mixing strategy (c). The transitions between each regime are marked with an arrow. Fluorescence emission intensity was recorded at 520nm with an excitation wavelength of 480 nm.

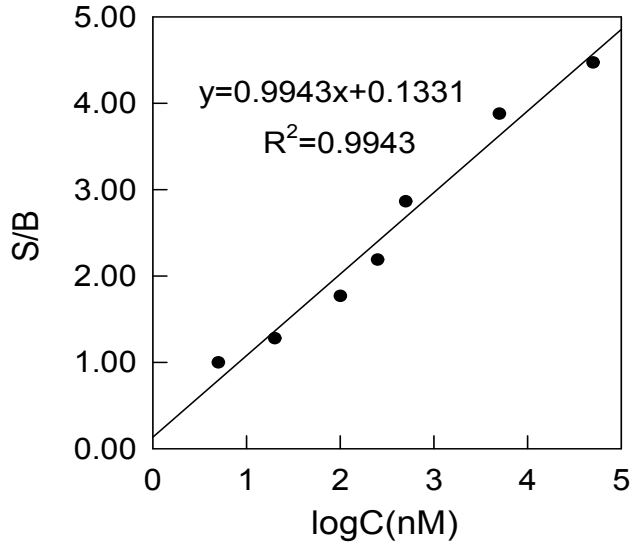

Figure S7. A standard linear concentration calibration curve for the signal changes as increases in the ATP concentrations. Relative fluorescence is calculated from the fluorescence intensity ratio of S/B.

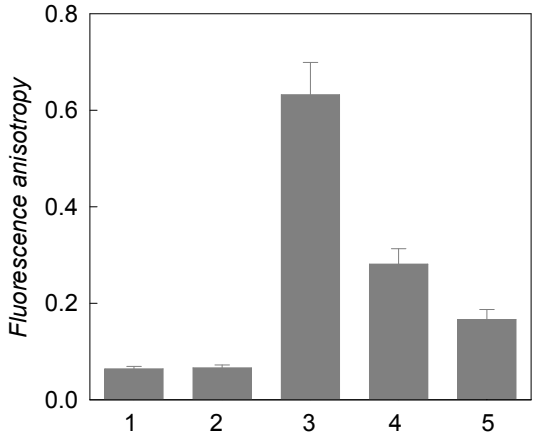

Figure S8. Fluorescence anisotropy changes of (FAM-aptamer) P (30nM) by cCNPs and the ATP (300 μM): 1, P; 2, 1+ATP; 3, 1+cCNPs; 4, 3+ATP; 5, 2+cCNPs. Excitation was at 480 nm, and emission was monitored at 520nm.

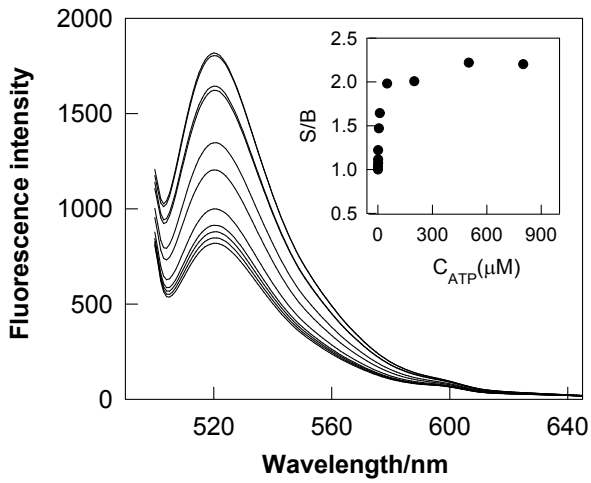

Figure S9. The fluorescence change of the P mixing with ATP of various amounts (0.25, 0.5, 0.75, 1.0, 5.0, 10, 50, 200, 500, 800 μM) in the presence of 0.015 mg/ml cCNPs in 20% urine solution. Inset: S/B of mixing ATP of various amounts.

Table S1: XPS Compositional Analysis of cCNP (top) and pCNP (bottom)*

Name	Position	FWHM	R.S.F.	Area%	Conc.
O 1s	531.42	3.354	0.78	7158.4	14.017
O 1s	531.85	3.318	0.78	7208.7	14.115
C 1s	284.52	2.727	0.278	5988.3	32.900
C 1s	284.50	2.541	0.278	4639.2	25.488
C 1s	287.98	3.569	0.278	1363.6	7.492
N 1s	401.17	2.272	0.477	553.1	1.771
N 1s	401.08	4.195	0.477	475.8	1.523
S 2p	168.72	3.411	0.668	584.9	1.337
S 2p	168.74	3.347	0.668	593.5	1.357

Name	Position	FWHM	R.S.F.	Area%	Conc.
O 1s	531.91	3.043	0.78	16924.3	7.026
O 1s	532.01	3.113	0.78	17169.3	7.128
C 1s	284.52	2.515	0.278	34694.5	40.414
C 1s	284.50	2.487	0.278	27430.3	31.952
C 1s	287.88	6.099	0.278	7453.3	8.682
N 1s	401.66	0.763	0.477	1925.4	1.307
N 1s	401.64	3.333	0.477	1550.2	1.052
S 2p	168.52	2.844	0.668	2502.6	1.213
S 2p	168.90	2.827	0.668	525.9	1.225

*The data were provided by "Analytical Center of Peking University"

Table S2: Comparison of aptasensors for optical detections of ATP.

Strategy	Detection limit	Signal transduction	Ref.
ATP aptamer/ cCNPs	0.1 μM	Fluorescence, turn on	This work
dsDNA/tetrahedralfluorene	20 μM	Fluorescence, turn off	[34a]
ATP aptamer/competitor duplex	0.5 μM	Fluorescence, turn on	[34b]
Split ATP aptamer/AP site ligand	1.0 μM	Fluorescence, turn on	[34c]
ATP aptamer/competitor duplex	10 μM	Fluorescence, turn off	[34d]
ATP aptamer/competitor duplex	2.0 μM	Colorimetry	[34e]
dsDNA coupled with quantum dot	50 μM	Luminescence, turn on	[34f]