Electronic Supplementary Material (ESI) for Nanoscale.

Synthesis of Nitrogen-Doped Carbon Nanostructures from Polyurethane Sponge for Bioimaging and Catalysis

Yong Yang, Jingchao Zhang, Jing Zhuang, Xun Wang*

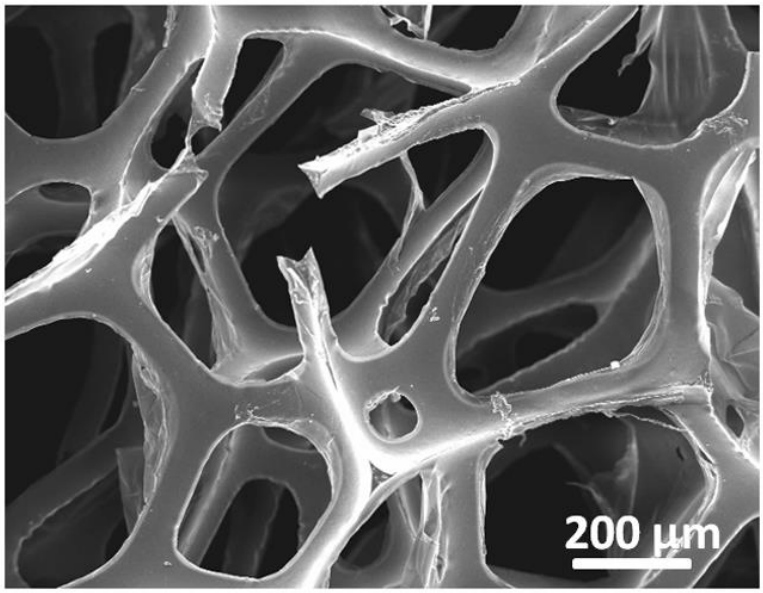


Figure S1. SEM image of the commercial PU sponges.

Table S1.The percentages of C, H, and N of different PU sponges

Sample	C (%)	H (%)	N (%)
1	58.98	7.05	6.99
2	54.44	6.82	5.80
3	61.43	8.36	6.85
4	55.86	6.64	6.57
5	63.19	7.90	7.92

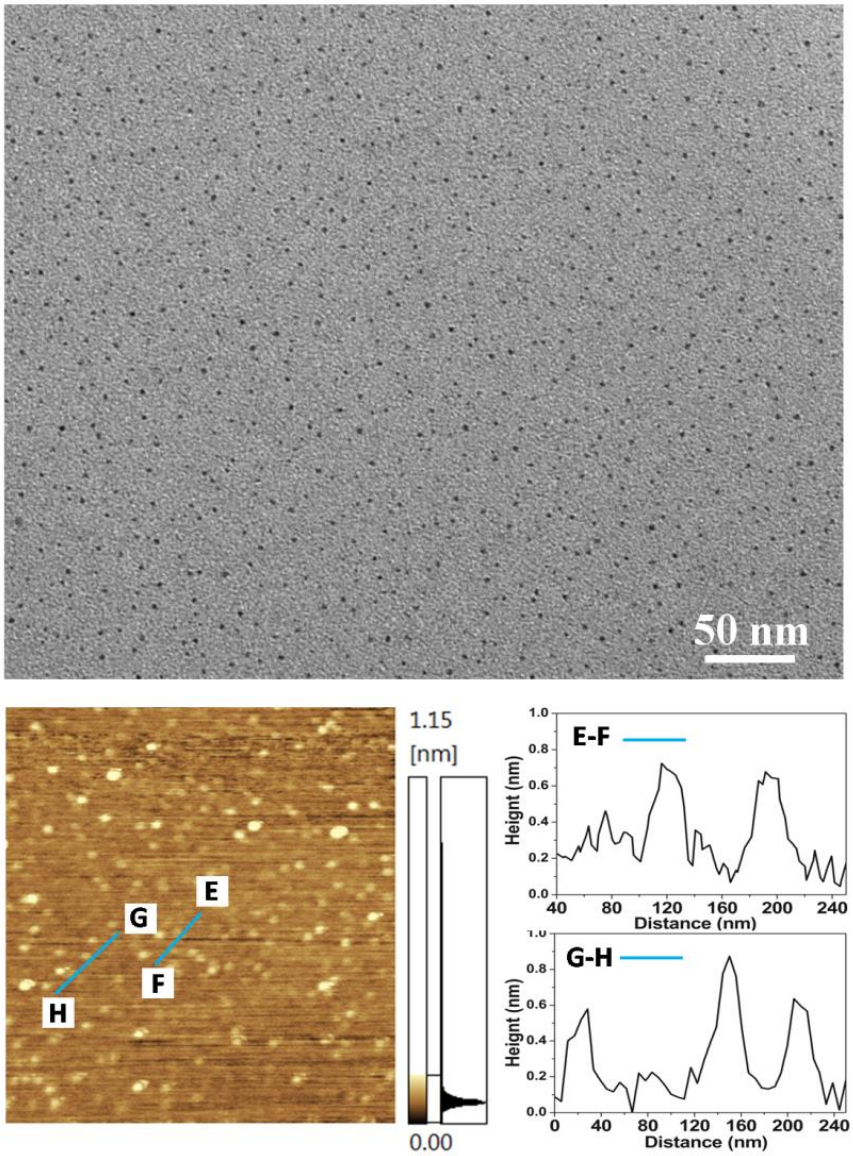


Figure S2. TEM image of as-prepared N-CDs and the correspondingly AFM topography image of the N-CDs on a mica substrate

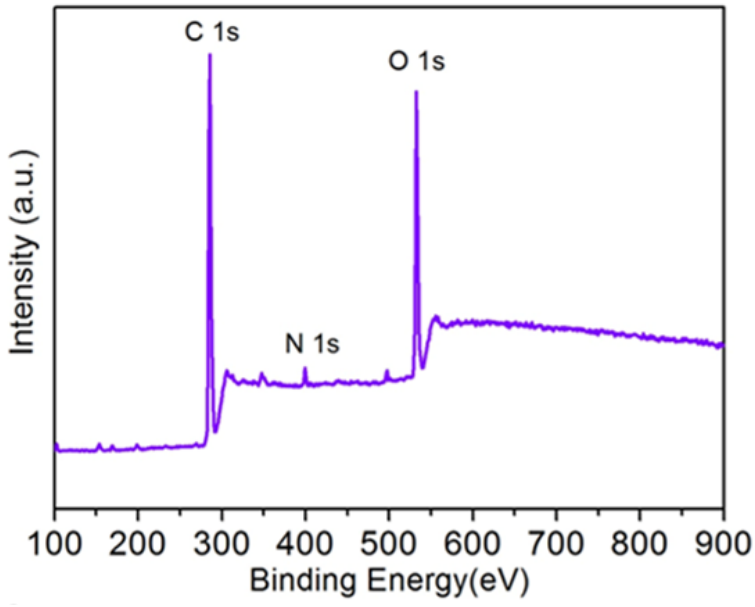


Figure S3. XPS analysis of as-prepared N-CDs.

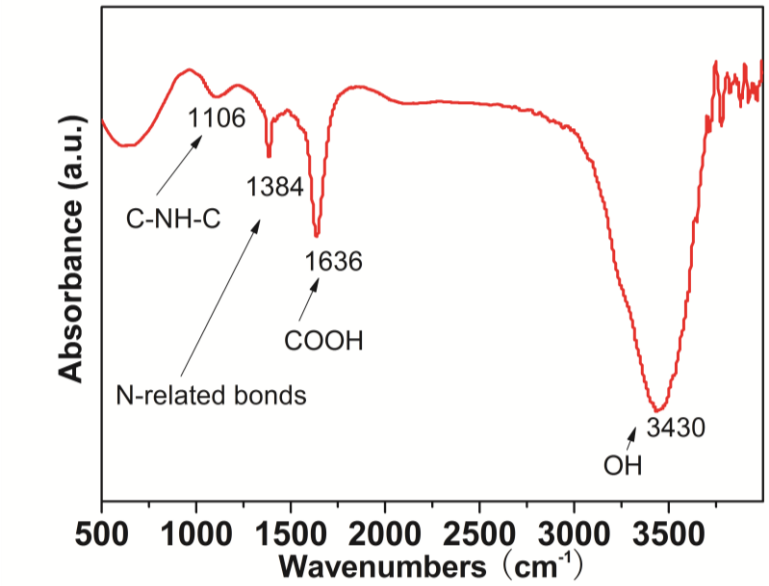
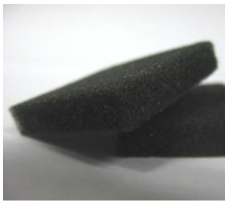
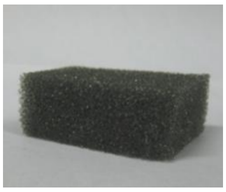


Figure S4. FTIR spectra of as-prepared N-CDs.

Table S2. Hydrothermal treatment of various PU sponges

Serial	Reaction condition In (Teflon)-lined autoclave/180 ºC for 2 h		Photos of CDs aqueous	
			Visible light	UV light
	10mg	30ml Water		
	10mg	30ml Water		
	10mg	30ml Water		
	10mg	30ml Water		
	10mg	30ml Water		

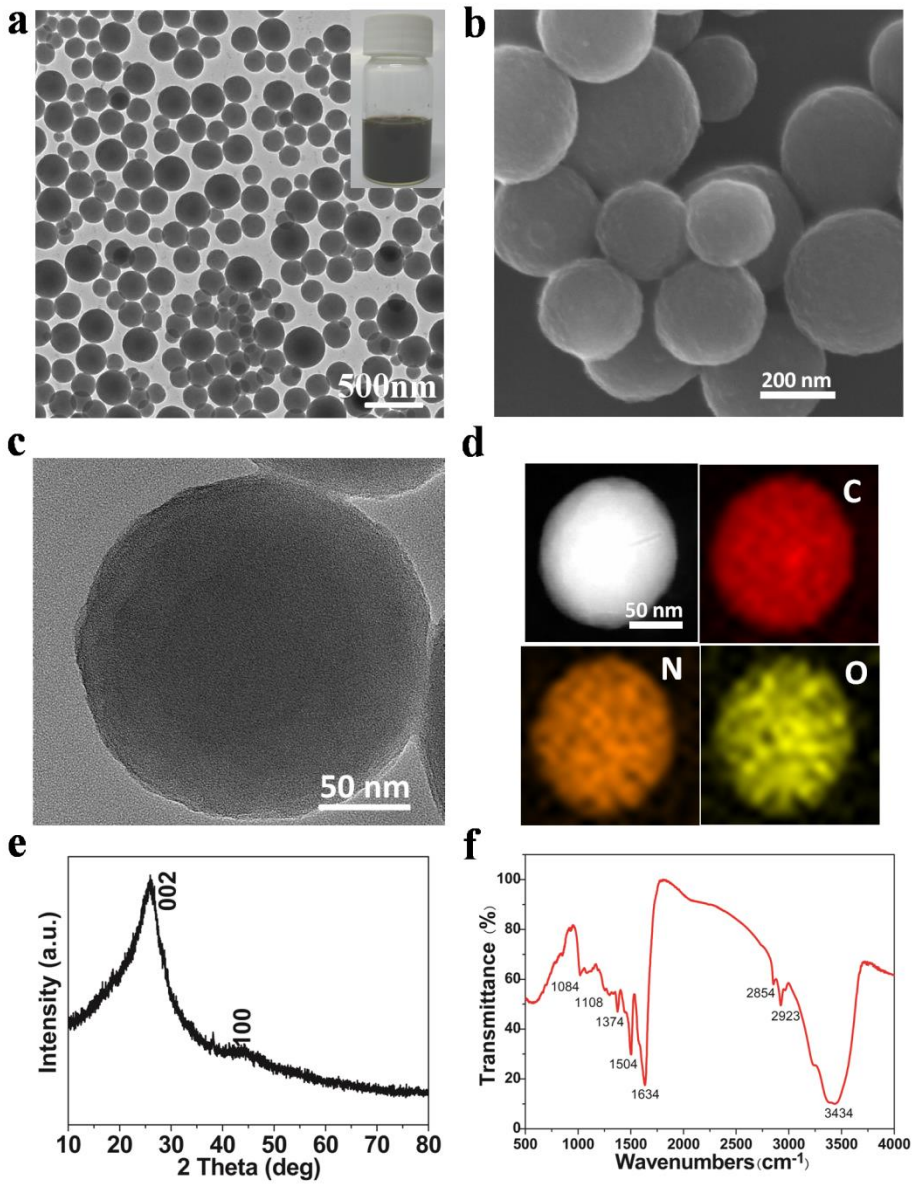


Figure S5. (a-b) TEM images of the as-prepared N-CSs under different magnifications. The inset is a photograph of the N-CSs aqueous solution. (c) HRTEM image of the as-prepared N-CSs. (d) EDX element mapping images of N-CSs. Note that the distribution of elements is homogenous throughout the whole particle. (e) XRD pattern of N-CSs. (f) FTIR spectra of N-CSs. In Fourier transform infrared spectra. The XRD pattern show two broad diffraction peaks at 2θ values of around 25° and 43°, corresponding to (002) and (101) lattice planes of hexagonal graphitic carbon, respectively. The broad absorption bands at 3434 cm^{-1} and 2923 cm^{-1} are assigned to the stretching vibrations of C-OH and C-H, and the band at 1635 cm^{-1} and 1504 cm^{-1} are attributed to the vibrational absorption band of C=O and C=C stretching vibrations. The peaks at 1108 or 1370 cm^{-1} are attributed to the asymmetric stretching vibrations and bending vibrations.

Table S3. XPS analysis of N-CDs and N-CSs

	N-CDs	N-CSs
C-C/C=C (%)	75.80	74.07
Oxygenated carbon (%)	21.72	17.77
Nitrous carbon (%)	2.48	8.16

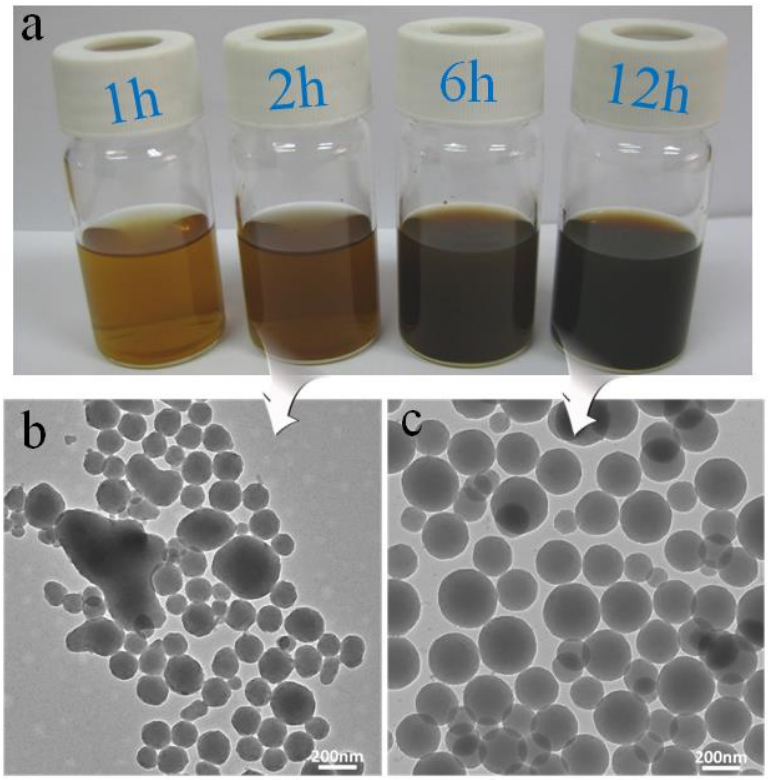


Figure S6. (a) The photographs of the reaction solutions with different reaction time. Note that the color of upper solution gradually change follow yellow to light brown and finally blank, suggesting the formation of N-CSs. (b-c) The corresponding of TEM images with different reaction time.

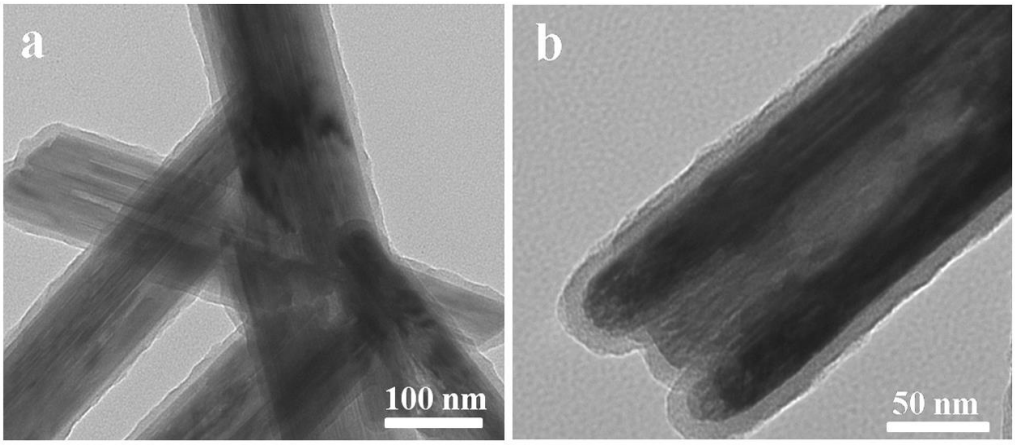


Figure S7. (a-b) TEM images of the prepared MnO_2@N-Cs composites.

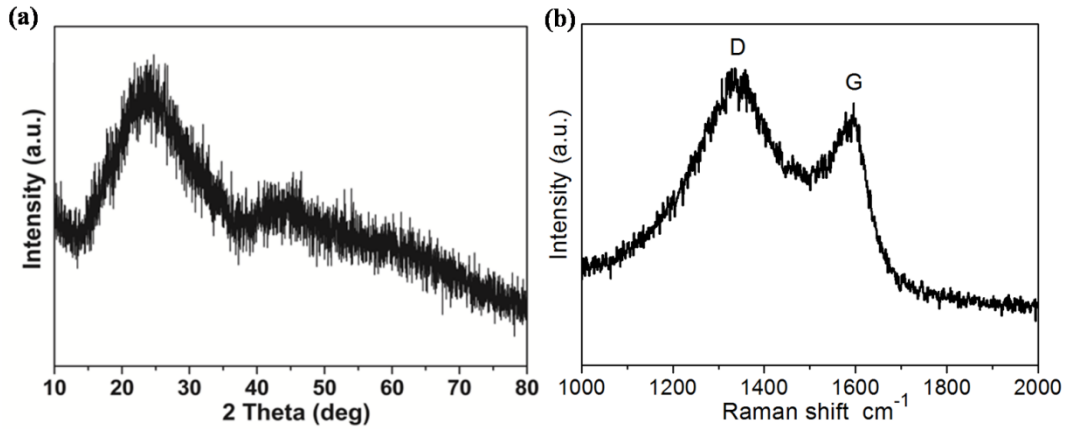


Figure S8. XRD and raman spectra of N-CNTs.

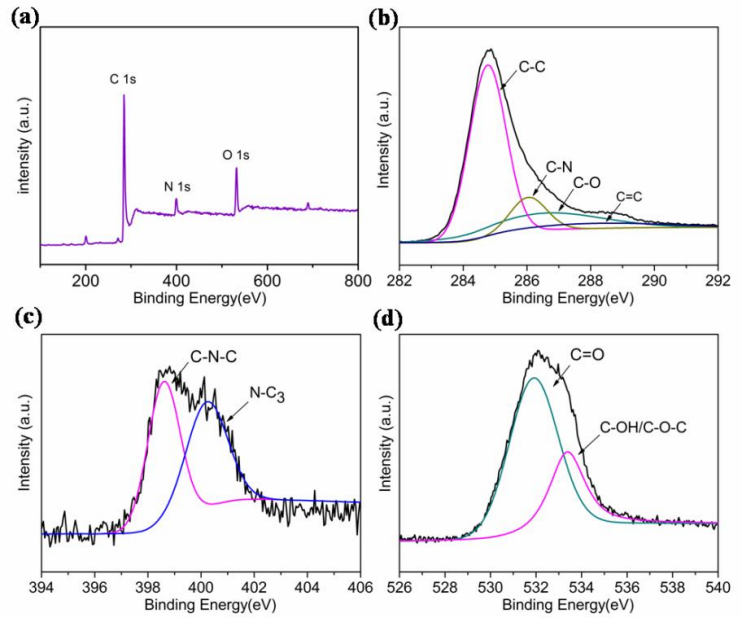


Figure S9. XPS spectra of the N-CNTs. (a) Survey spectrum. (b) C1s spectrum. (c) N1s spectrum. (d) O1s spectrum.

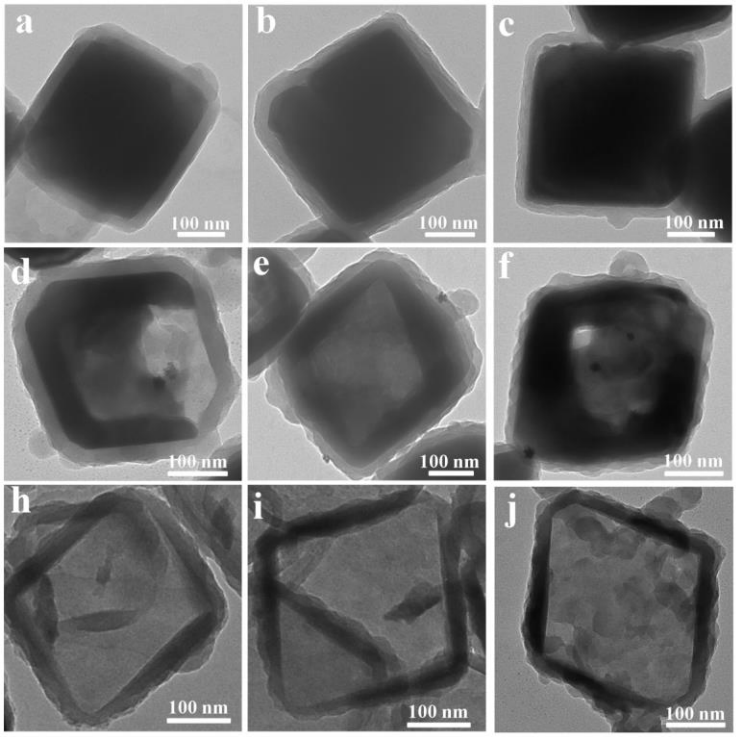


Figure S10. TEM images of Mn_3O_4@N-CS core-shell structure during the hydrothermal treatment at 200 °C with different reaction time：(a-c) 3h; (d-f) 6h. (h-j) TEM images of N-CCs obtained by acid treatment.

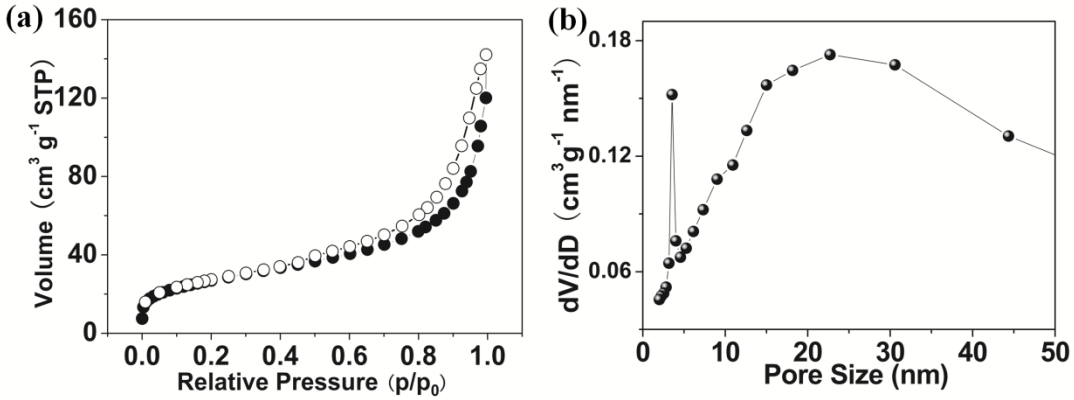


Figure S11. (a) N_2 adsorption/desorption isotherms, and (b) corresponding pore size distribution of the carbon nanocages.

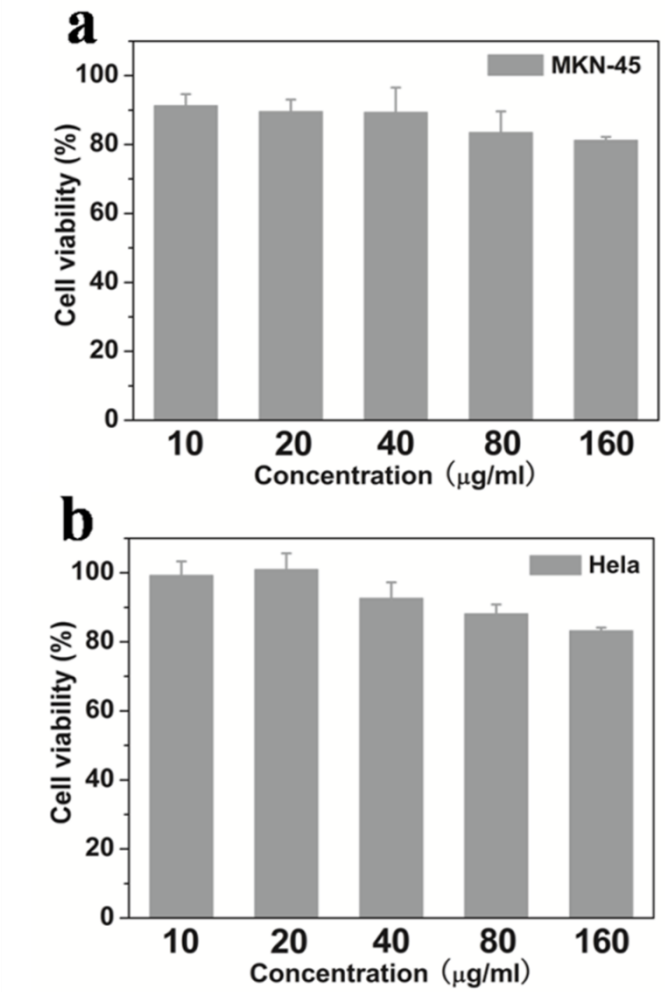


Figure S12. Cytotoxicity testing results via a MTT assay in MKN-45 (a) and Hela (b) living cells (means±SD, n=3). Graphs were plotted as the N-CDs concentrations of 10, 20, 40, 80 and 160 μg.mL^{-1}, respectively.