

## Supporting Information

### **The role of N/S doping on photoluminescent characteristics of carbon dots from palm bunches for fluorimetric sensing of Fe<sup>3+</sup> ion**

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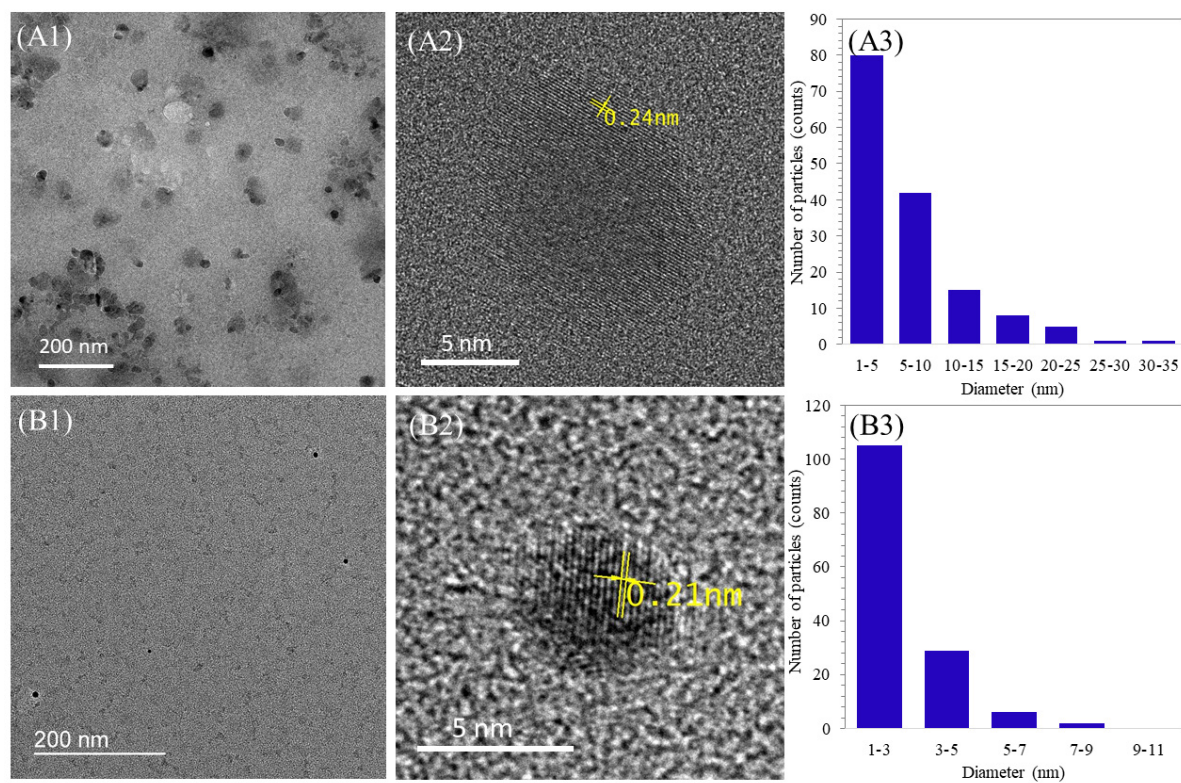
**Table S1.** Relative concentration of each chemical bond from deconvoluted peak from XPS measurement

Elements	CDs		US-CDs		PTS-CDs	
	Bonds	Atomic percent (%)	Bonds	Atomic percent (%)	Bonds	Atomic percent (%)
C 1s	O-C=O	51.99	C-C/C=C	25.05	C-C/C=C	13.08
	C-O	33.64	C-N/C-S	46.56	C-N/C-S	13.03
	C-C/C=C	14.35	C=O	22.27	C=O	26.42
			C=N	6.1	C=N	47.46
O 1s	C=O	58.2	C=O	24.52	C=O	45.16
	C-O-C	24.87	C-O-C	28.1	C-O-C	41.47
	O=C-O	16.92	O=C-O	47.37	O=C-O	13.36
N 1s			N=C	44.57	N=C	62.13
			C-N-C	30.63	C-N-C	29.43
			N-H	24.79	N-H	8.43
S 2p			C-SO <sub>x</sub> (1)	67.84	C-S-H	43.20
			C-SO <sub>x</sub> (2)	32.15	C-S-C	35.30
					C-SO <sub>x</sub>	21.48

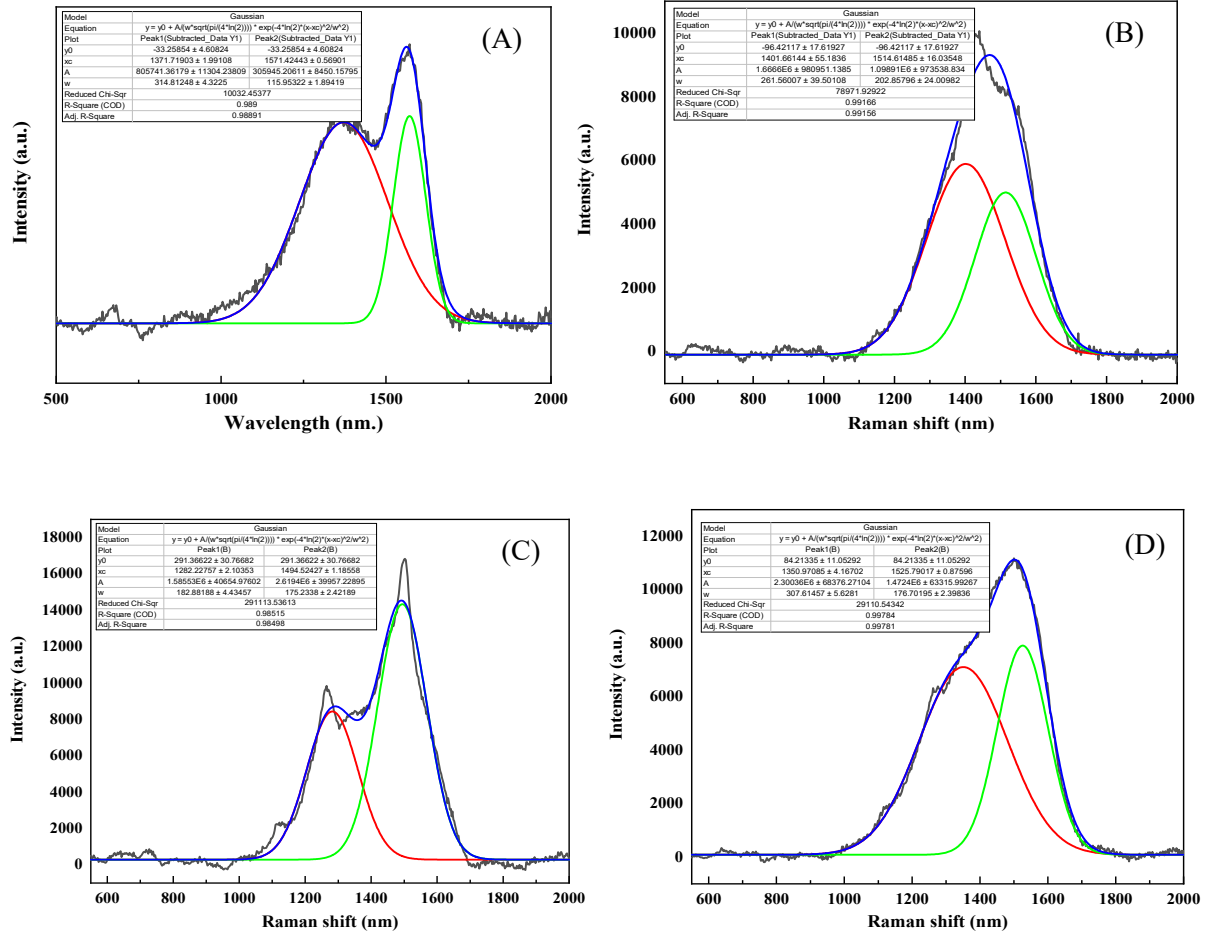
**Table S2.** The element composition by XPS, average diameter from HRTEM, and average hydrodynamic diameter from zeta sizer of CDs, 0.05 M NS/CDs, 0.10 M NS/CDs, 0.20 M NS/CDs, 0.30 M NS/CDs, 0.40 M NS/CDs, CDs/PtNPs, and CDs/AgNPs

Materials	Atomic concentration (%)				Average diameter from HRTEM (nm)	Average hydrodynamic diameter from zeta sizer (nm)
	C 1s	O 1s	N 1s	S 2p		
CDs pure	70.68	27.25	2.06	ND	$6.99 \pm 1.69$	$1097.7 \pm 352.0$
0.05 M NS/CDs	70.06	24.97	2.58	2.38	$9.46 \pm 3.08$	$604.9 \pm 169.7$
0.10 M NS/CDs	76.65	18.34	7.06	2.96	$4.48 \pm 1.10$	$121.5 \pm 31.5$
0.20 M NS/CDs	66.37	25.9	4.2	3.53	$4.91 \pm 1.10$	$1265.2 \pm 346.3$
0.30 M NS/CDs	66.07	20.51	5.78	7.65	$5.77 \pm 0.90$	$2004.1 \pm 541.8$
0.40 M NS/CDs	63.66	26.49	3.49	6.36	$20.41 \pm 2.74$	$5931.7 \pm 772.0$

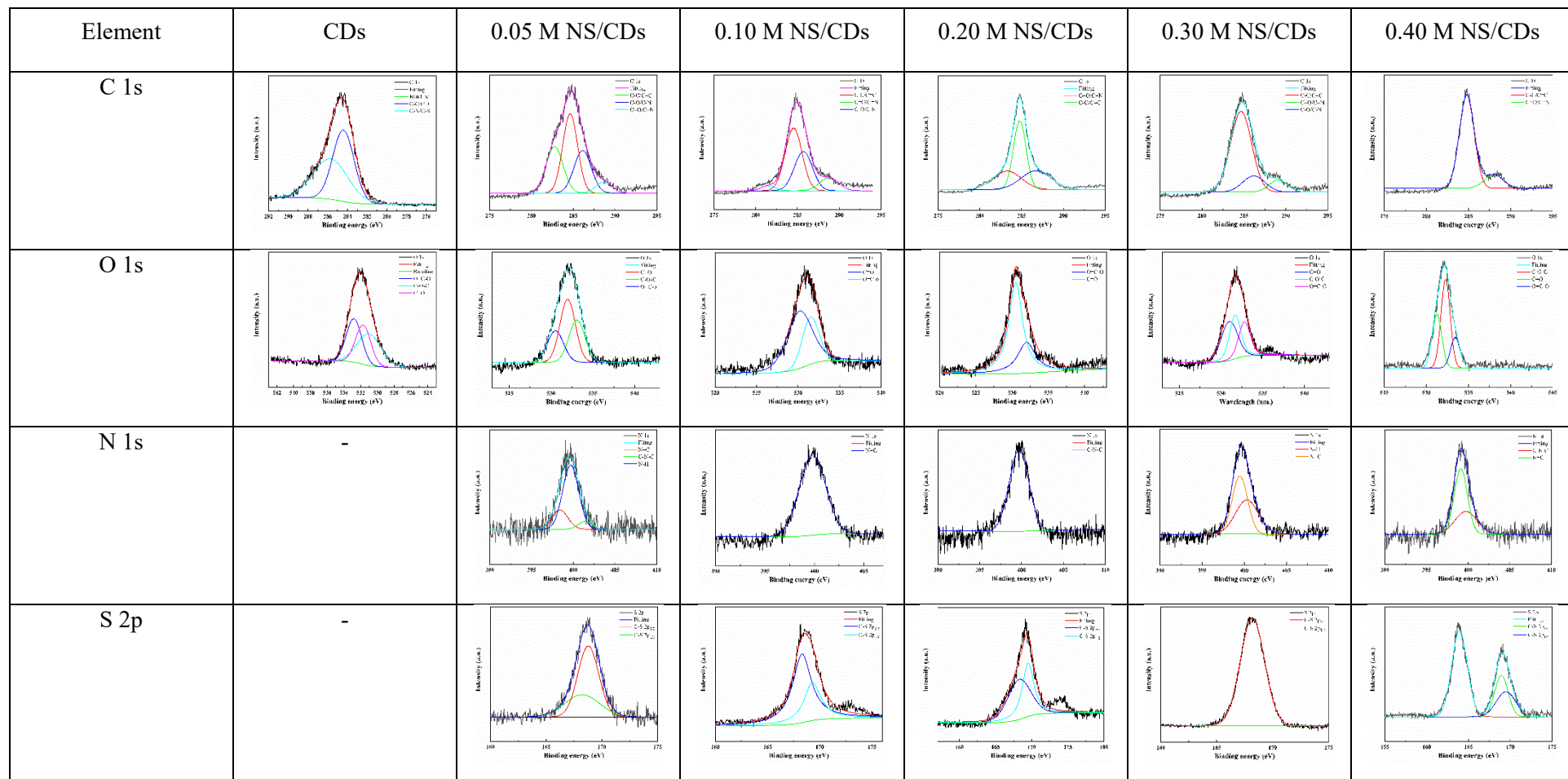
ND = not detected



**Figure S1** HRTEM images of synthesized CDs at  $\times 120,000$ ,  $\times 300,000$  magnifications and size distribution of (A) 220C 6 h EFB derived CDs, (B) 220C 10 h EFB derived CDs, (C) 220C 6H US-CDs, and (D) 220C 6H PNa-CDs.



**Figure S2** Deconvoluted Raman spectra for Id/IG ratio calculation of (A) CDs, (B) P-CDs, (C) PTS-CDs, and (D) PTS-CDs/Fe<sup>3+</sup> (or 0.20 M NS/CDs)



**Figure S3.** High resolution XPS spectra of CDs, 0.05M NS/CDs, 0.10M NS/CDs, 0.20M NS/CDs, 0.30M NS/CDs, and 0.40M NS/CDs for their C1s, O1s, N1s, and S2p