

Supporting Information

N,S,P Co-Doped Carbon Nanodot Fabricated from Waste Microorganism and Its Application for Label-Free Recognition of Manganese(VII) and L-Ascorbic Acid and AND Logic Gate Operation

Xiaojuan Gong^{a,‡,}, Zengbo Li^{a,‡}, Qin Hu^b, Ruixin Zhou^a, Shaomin Shuang^a, Chuan Dong^{a,*}*

^aInstitute of Environmental Science, and School of Chemistry and Chemical Engineering, Shanxi University, Taiyuan, 030006 (P. R. China)

^bDepartment of Chemistry, State University of New York at Buffalo, Buffalo, NY 14260, USA

*Corresponding author. Tel: +86-351-7011011; fax: +86-351-7011011.

E-mail addresses: gxj1124@sxu.edu.cn (X.G.), dc@sxu.edu.cn. (C.D.)

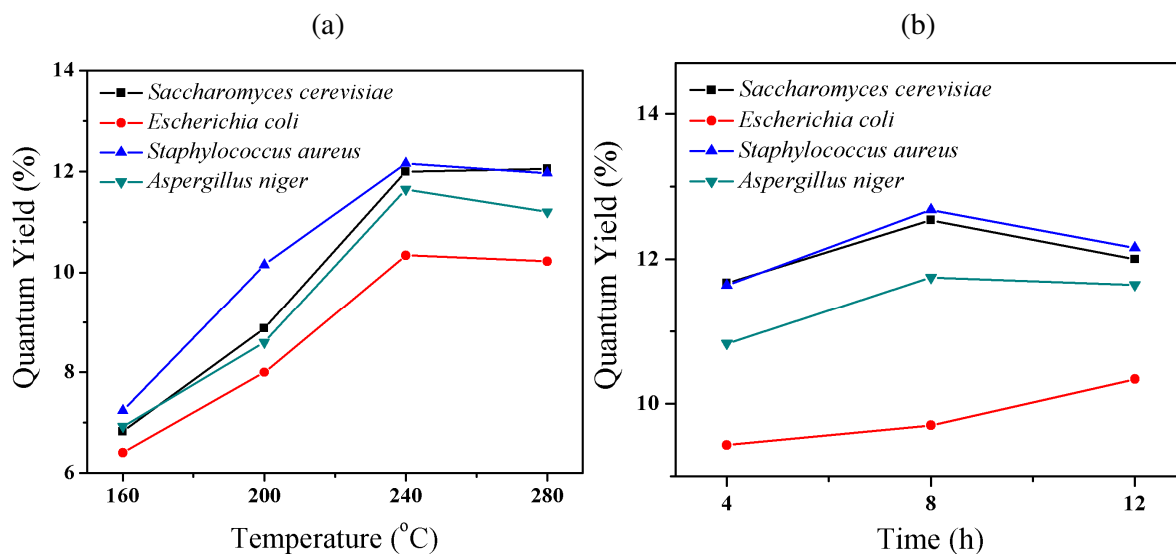


Figure S1. Effect of (a) reaction temperature and (b) reaction time on the quantum yield of N,S,P-CNDs fabricated by different kinds of microorganisms.

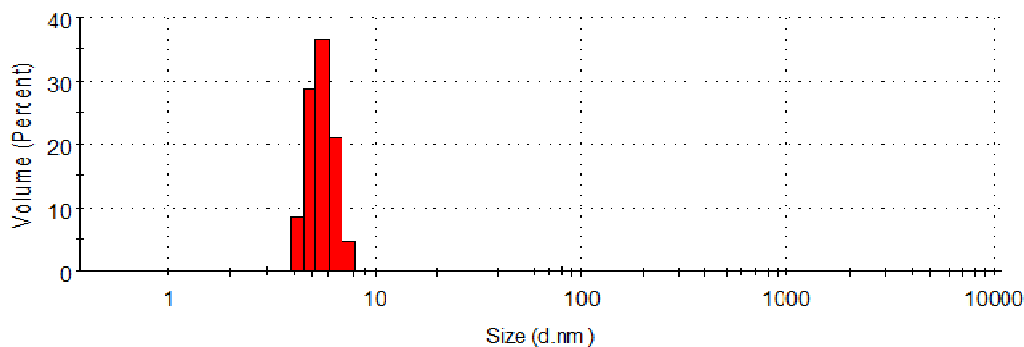


Figure S2. Size distribution histogram obtained from DLS measurement of N,S,P-CND_{Sac} in aqueous solution.

Table S1. Elemental analysis of the as-fabricated N,S,P-CND_{Sac}: (a) elemental content and (b) relative number of atom in N,S,P-CND_{Sac}.

(a)

Sample name	Elemental content (weight %)					
	C	H	N	S	P	O (calculated)
N,S,P-CND _{Sac}	18.91	7.25	17.85	4.26	5.51	16.22

(b)

Sample name	Relative number of atom						Empirical formula
	C	H	N	S	P	O	
N,S,P-CND _{Sac}	24	109	19	2	3	43	C ₂₄ H ₁₀₉ N ₁₉ S ₂ P ₃ O ₄₃

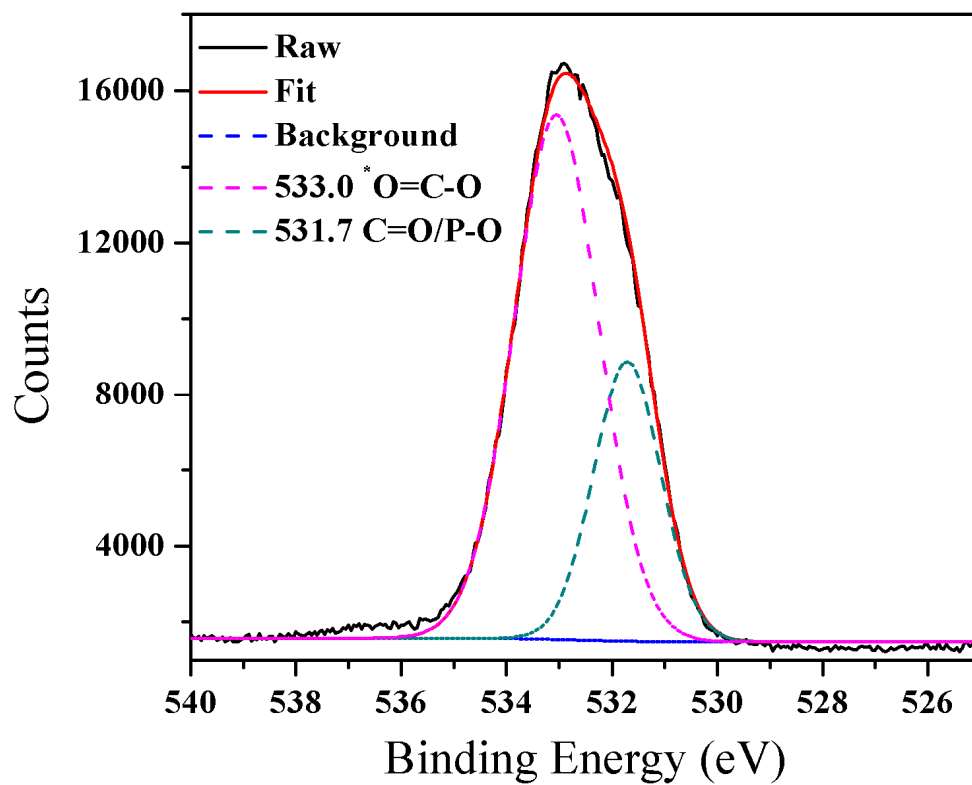


Figure S3. O 1s XPS of N,S,P-CND_{Sac}.

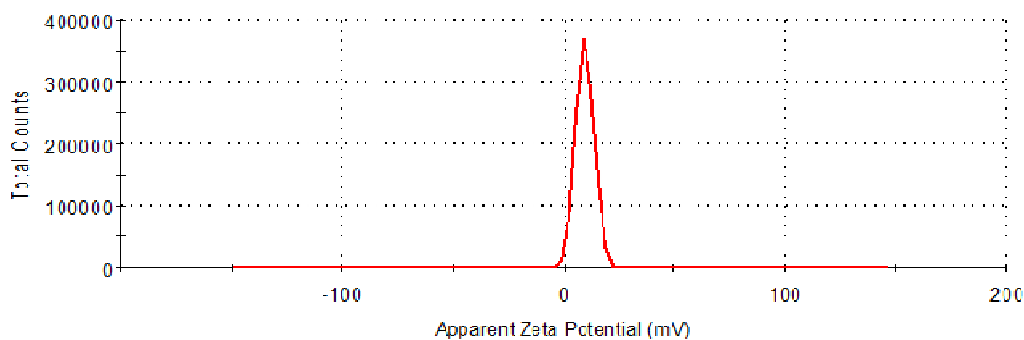


Figure S4. Zeta potential of N,S,P-CND_{Sac}.

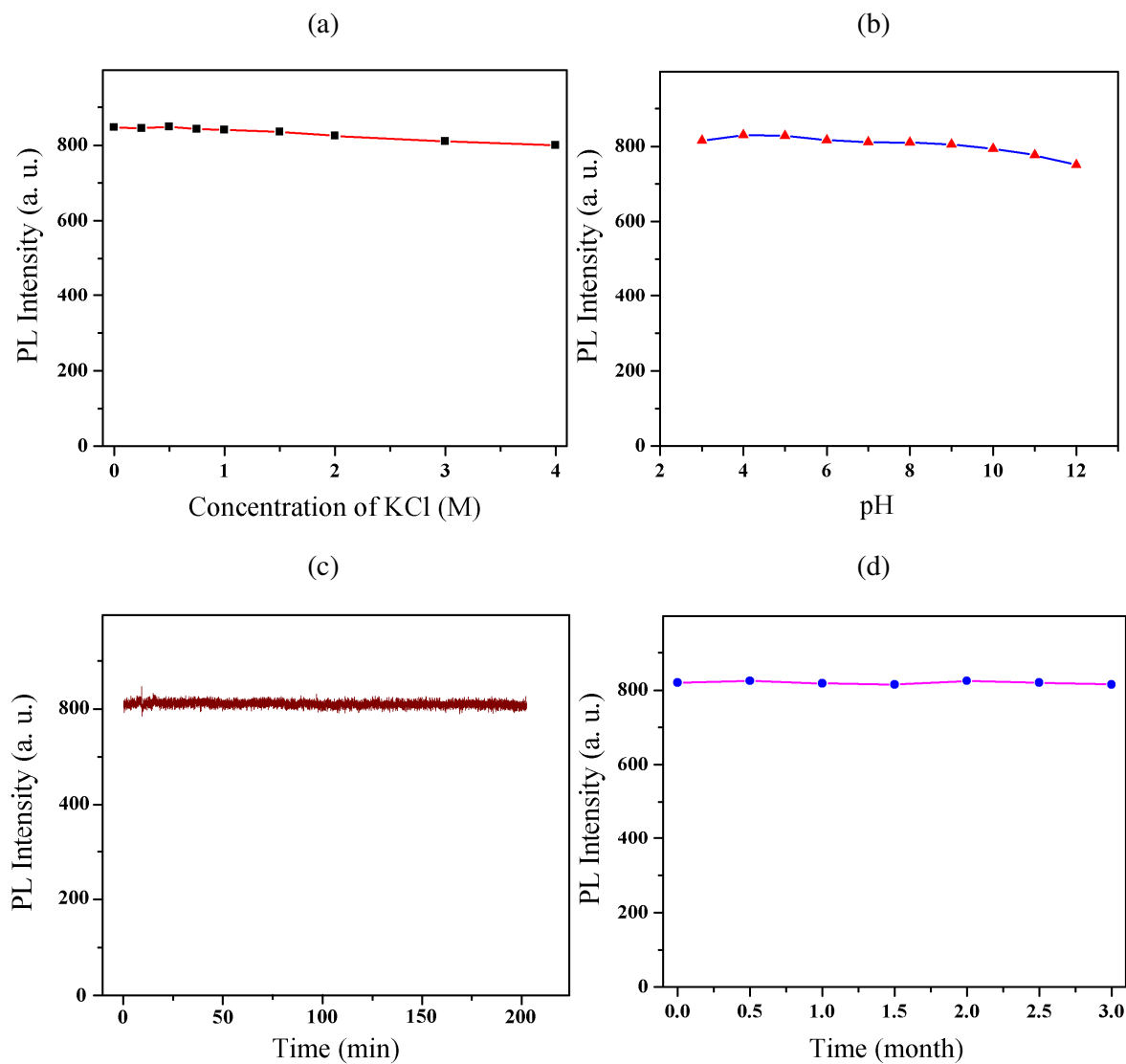


Figure S5. Effect of (a) ionic strength, (b) pH, (c) Xe lamp irradiation time and (d) storage time in room temperature on the fluorescence intensity of N,S,P-CND_{Sac} aqueous (0.1 mg/mL).

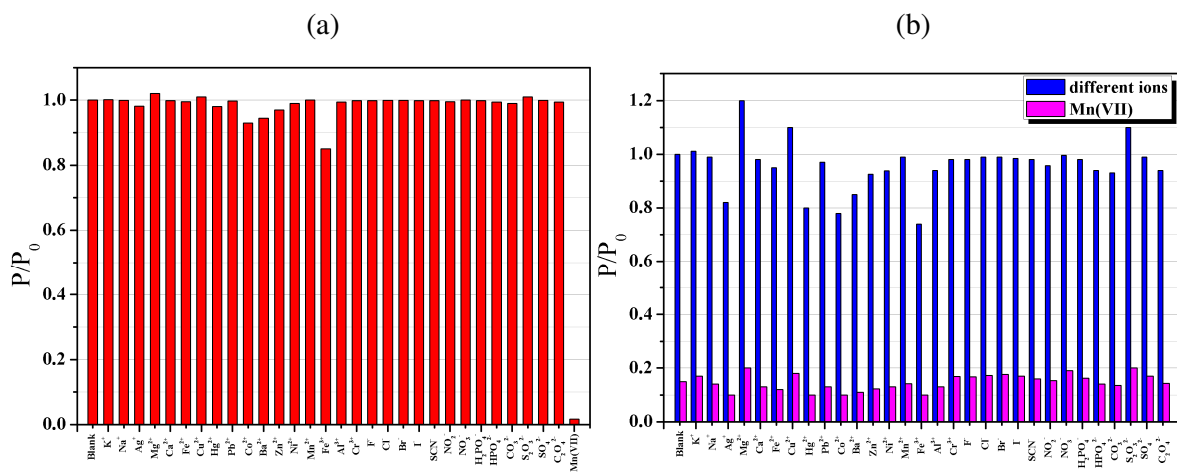


Figure S6. (a) Comparison of fluorescence intensity of N,S,P-CND_{Sac} (0.1 mg/mL) after the addition of Mn(VII) (0.5 mmol/L) or other different metal ions (0.5 mmol/L) or anion ions (0.5 mmol/L). (b) Comparison of fluorescence intensity of N,S,P-CND_{Sac} (0.1 mg/mL) after the addition of Mn(VII) (0.1 mmol/L) and other different metal ions (10 mmol/L) or anion ions (10 mmol/L).

Table S2. Double-exponential fitting of N,S,P-CND_{Sac} and N,S,P-CND_{Sac}/Mn(VII) decay curves.

Sample name	N,S,P-CND _{Sac}	N,S,P-CND _{Sac} /Mn(VII)
$\tau_1(\text{ns})/A_1(\%)$	3.52/56.01	3.56/58.00
$\tau_2(\text{ns})/A_2(\%)$	10.00/43.99	10.21/42.00
Average τ (ns)	6.37	6.36

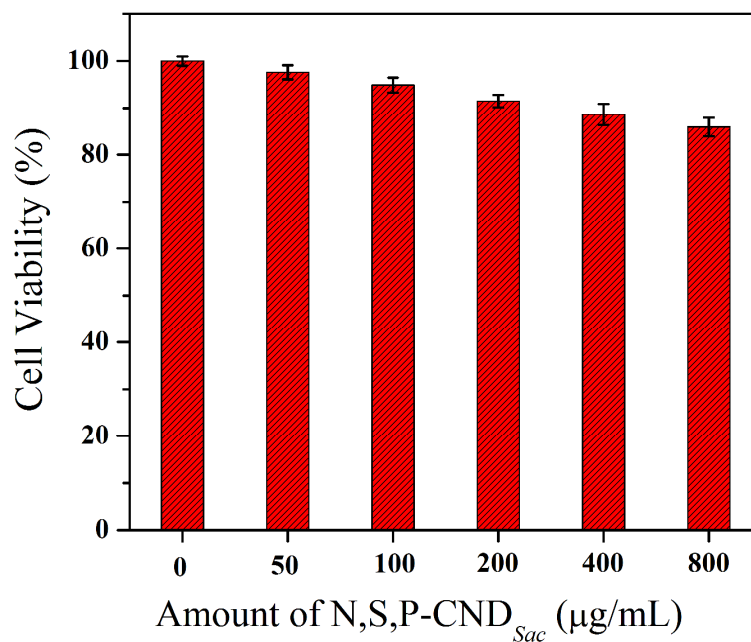


Figure S7. Cell viability test of N,S,P-CND_{Sac} on HepG2 cells. The values represent percentage cell viability (mean% \pm SD, $n = 6$).

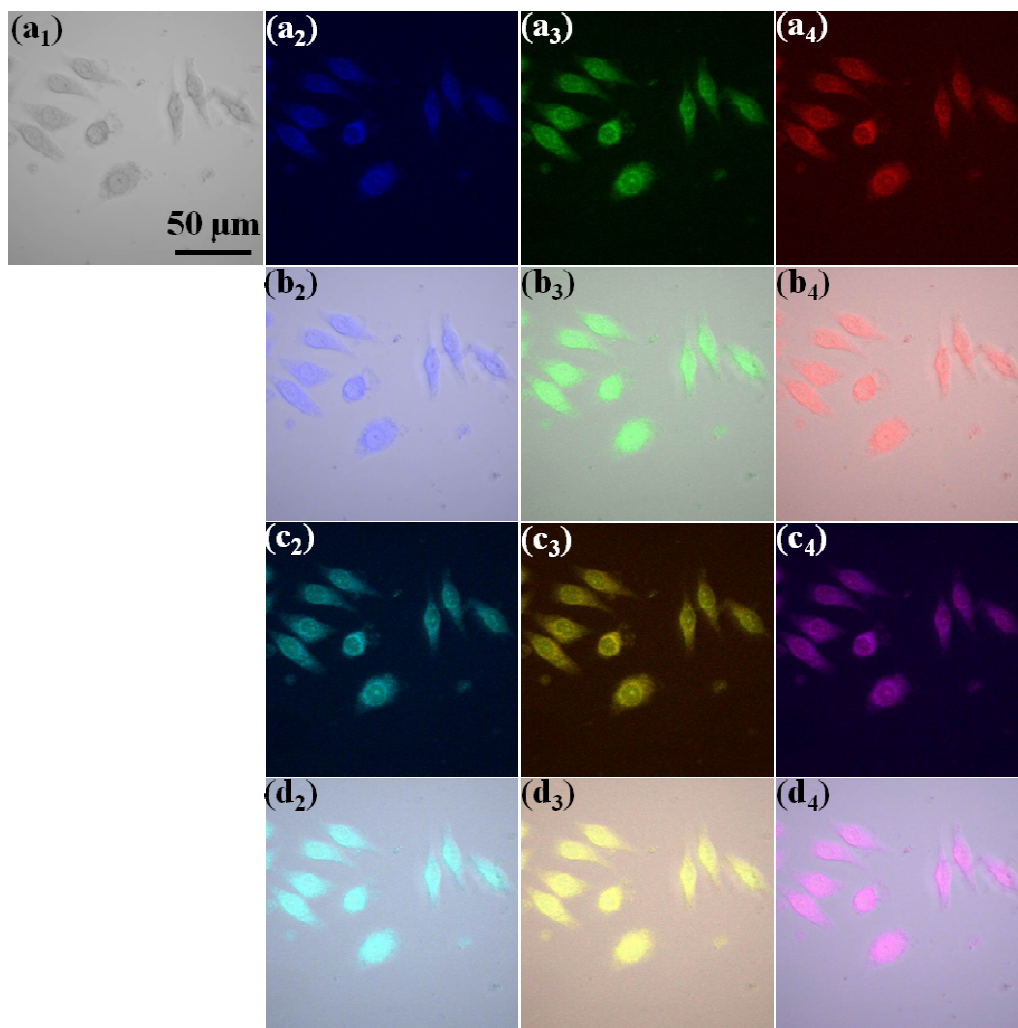


Figure S8. LSCM images of HepG2 cells incubated with 0.5 mg/mL N,S,P-CND_{Sac} at 37 °C for 4h. (a₁) shows the bright-field images of HepG2 cells. (a₂), (a₃) and (a₄) are cell images taken at $\lambda_{ex}/\lambda_{em}$ of $405/422 \pm 25$, $488/500 \pm 25$ and $543/650 \pm 25$ nm, respectively. (b₂), (b₃) and (b₄) are the merged images of (a₁) and (a₂), (a₁) and (a₃), and (a₁) and (a₄), respectively. (c₂), (c₃) and (c₄) are the merged images of (a₂) and (a₃), (a₃) and (a₄), and (a₂) and (a₄), respectively. (d₂), (d₃) and (d₄) are the merged images of (a₁) and (c₂), (a₁) and (c₃), and (a₁) and (c₄), respectively.