**Electronic Supplementary Material (ESI) for Analyst.
This journal is © The Royal Society of Chemistry 2019**

Electronic Supplementary Information

High quantum yield blue- and orange-emitting carbon dots: one-step microwave synthesis and applications as fluorescent film, fingerprint and cellular imaging

Zhiqin Deng,[a] Chang Liu,[a] Yanzi Jin,[a]* Jianlin Pu,[a] Bin Wang[a] and Jiucun Chen[a,b]*

[a] *Key Laboratory of Luminescent and Real-Time Analytical Chemistry (Southwest University), Ministry of Education, Faculty of Materials and Energy, Southwest University, Chongqing 400715, China*
[b] *Chongqing Engineering Research Centre for Micro-Nano Biomedical Materials and Devices, Chongqing 400715, China*

* Corresponding author. E-mail: jinyz0127@swu.edu.cn; chenjc@swu.edu.cn

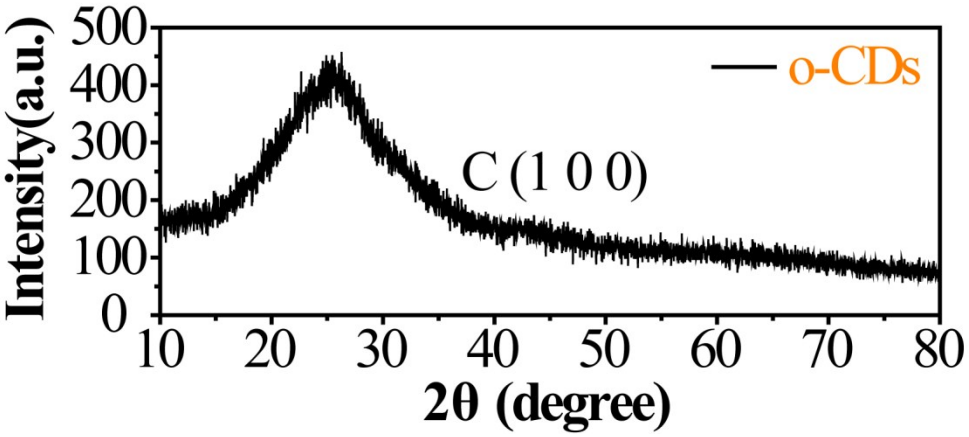

Figure S1. XRD spectra of o-CDs.

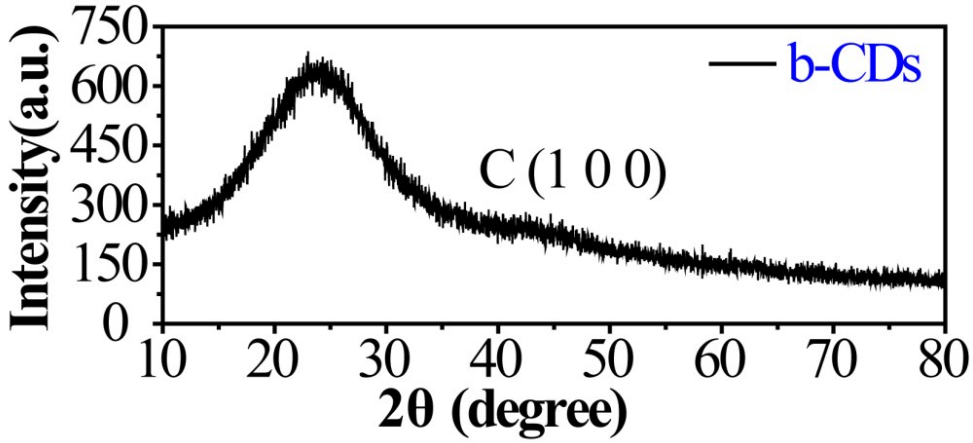

Figure S2. XRD spectra of b-CDs.

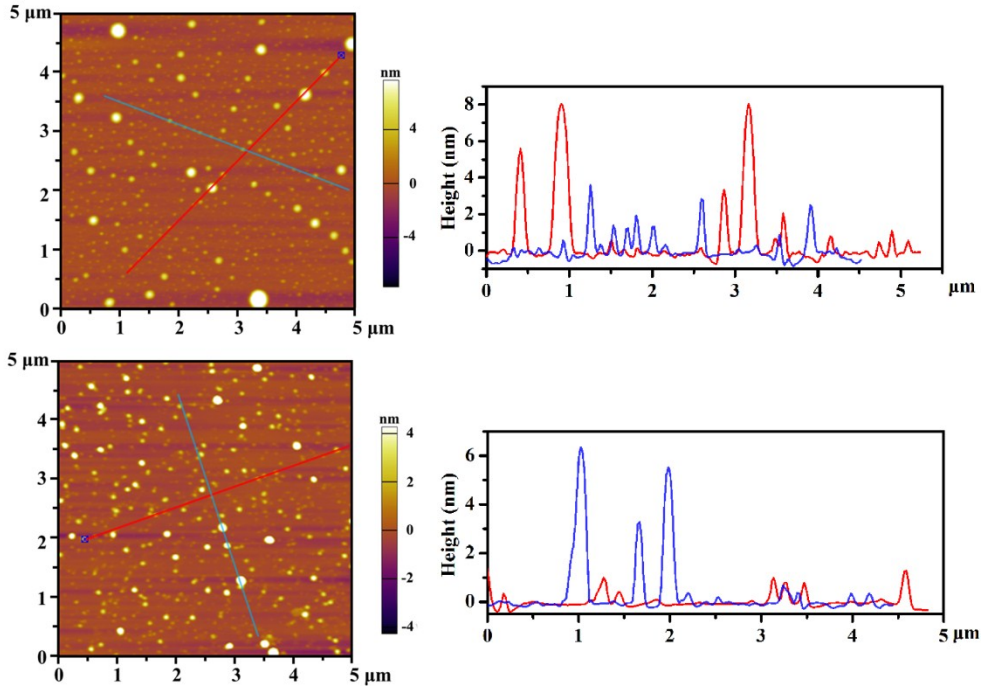

Figure S3. AFM image and height profile along the red and blue line of the (a) b-CDs and (b) o-CDs on a Si substrate.

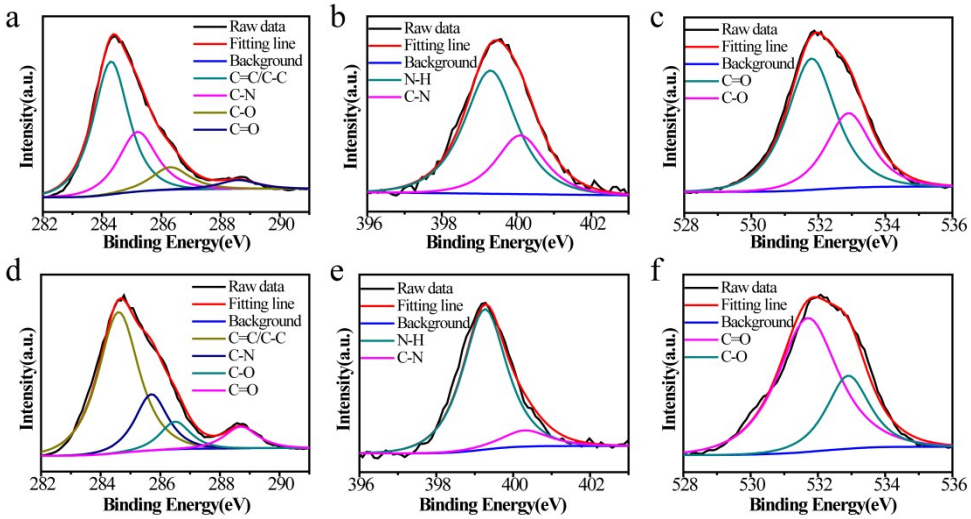

Figure S4. Deconvoluted high-resolution XPS spectra of (a-c) b-CDs and (d-f) o-CDs for (a, d) C1s, (b, e) N1s and (c, f) O1s.

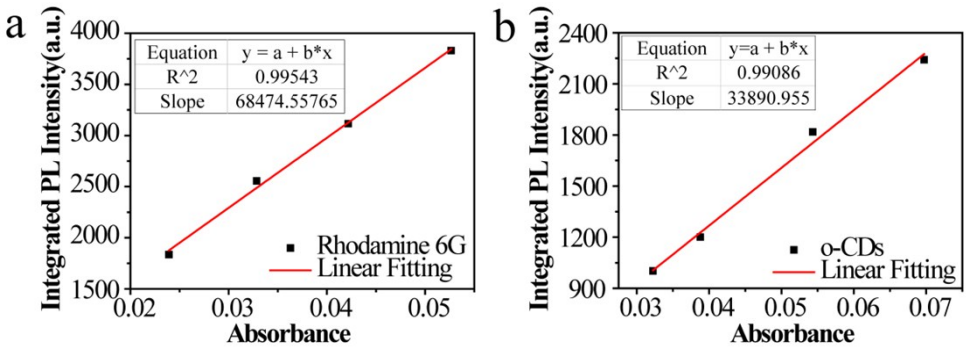

Figure S5. Plots of integrated PL intensity of (a) rhodamine 6G and (b) o-CDs as a function of optical absorbance and relevant data.

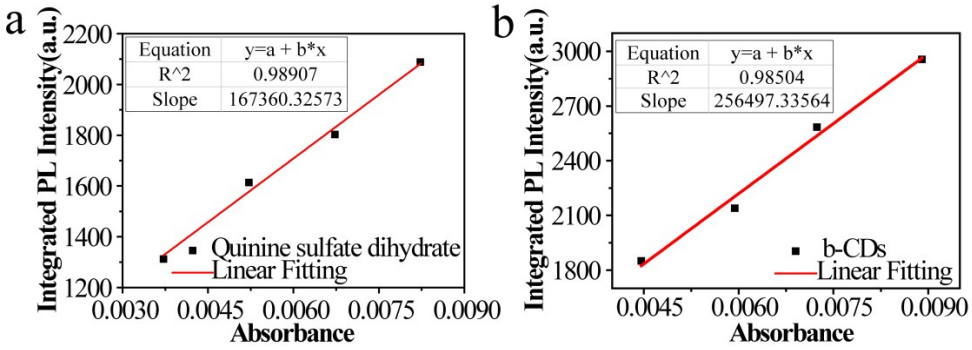

Figure S6. Plots of integrated PL intensity of (a) quinine sulfate and (b) b-CDs as a function of optical absorbance and relevant data.

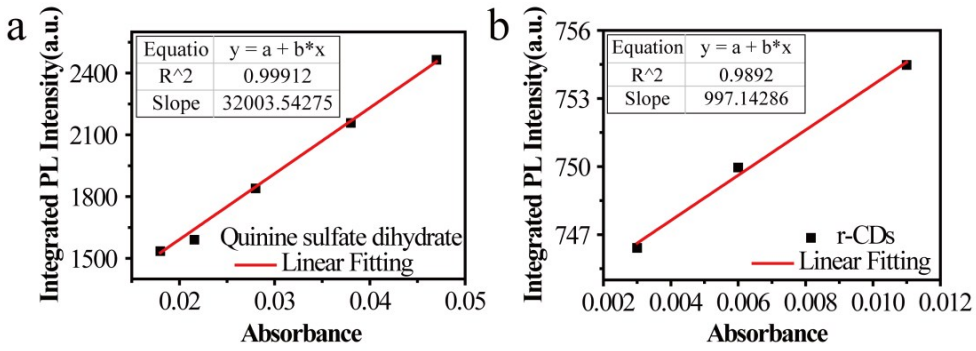

Figure S7. Plots of integrated PL intensity of (a) quinine sulfate and (b) r-CDs as a function of optical absorbance and relevant data.

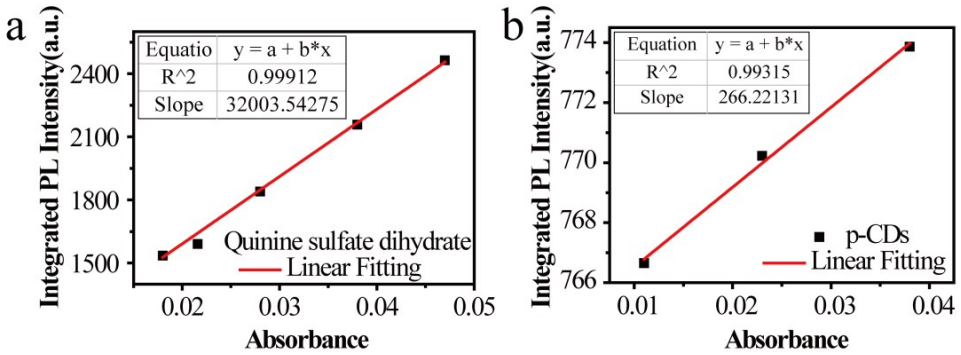

Figure S8. Plots of integrated PL intensity of (a) quinine sulfate and (b) p-CDs as a function of optical absorbance and relevant data.

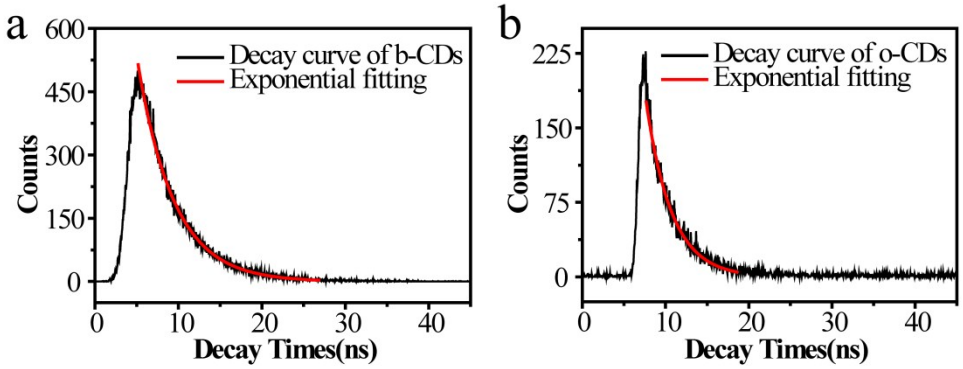

Figure S9. PL delay (black lines) and fitting (red lines) curves of (a) b-CDs and (b) o-CDs.

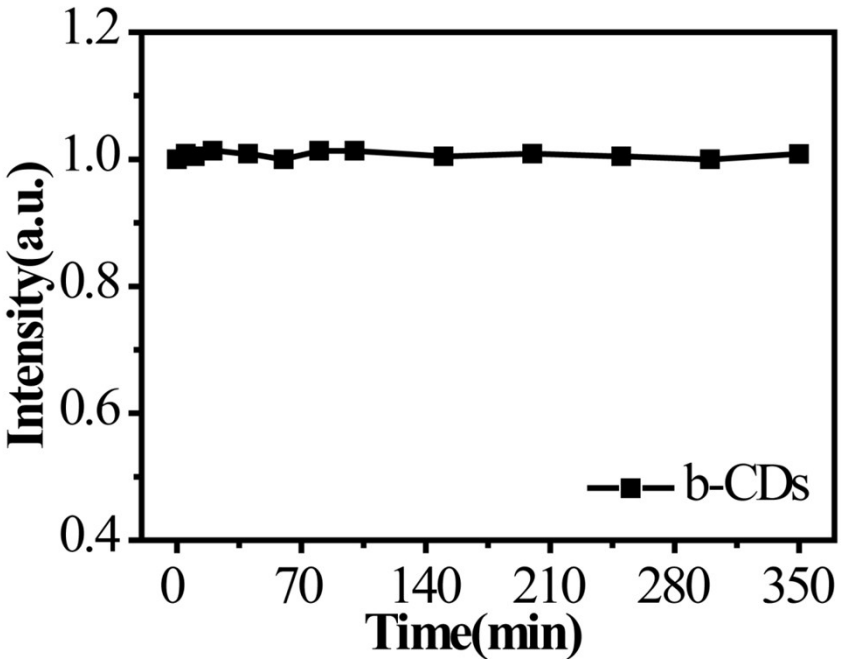

Figure S10. The time-dependent photoluminescence curves of b-CDs.

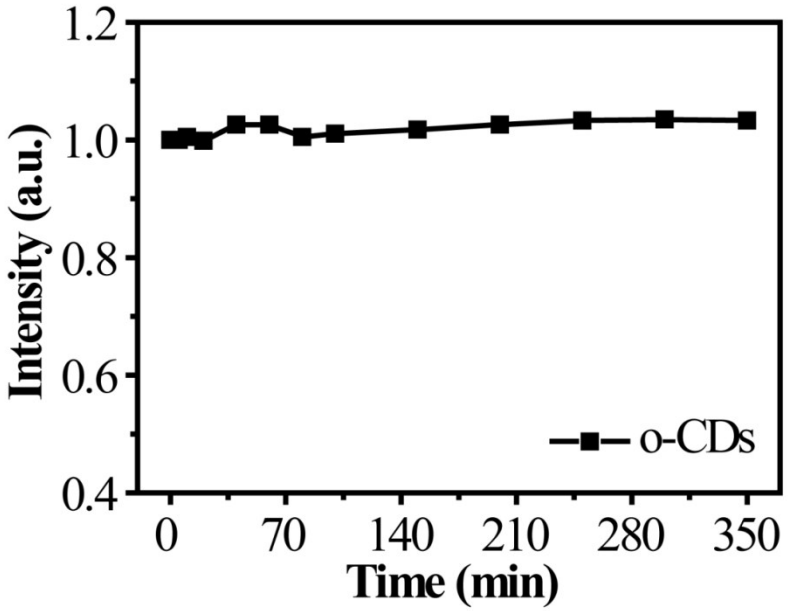

Figure S11. The time-dependent photoluminescence curves of o-CDs.

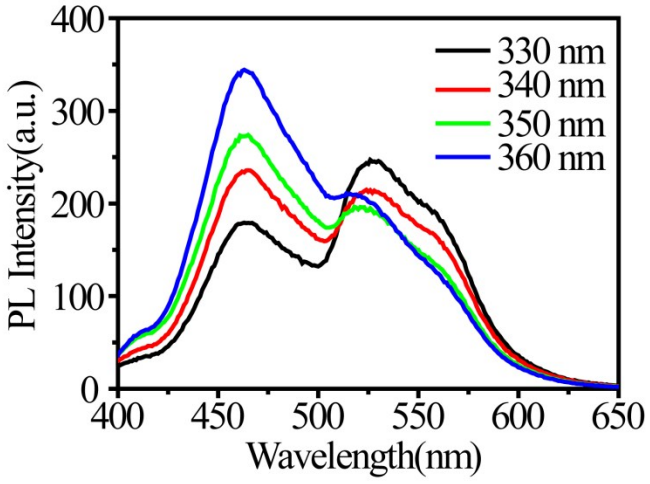

Figure S12. The emission spectra of b-o-CDs (figure 6f) under excitation with light of different wavelengths.

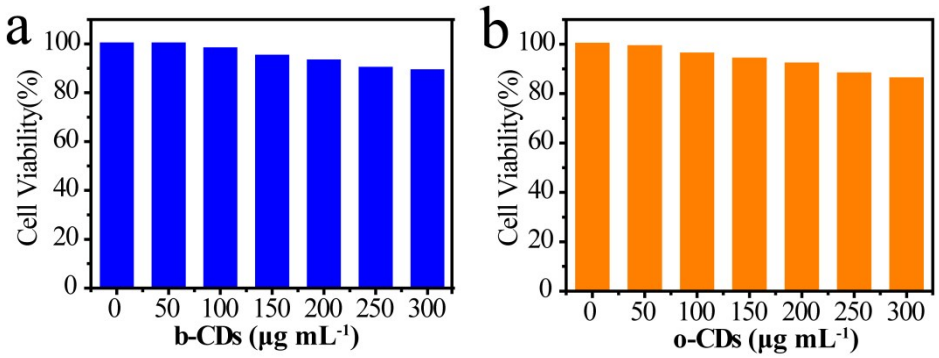

Figure S13. Cytotoxicity of the (a) b-CDs and (b) o-CDs toward MCF-7 cells.

Table S1. The quantum yield calculation data of the o-CDs.

	Rhodamine 6G				o-CDs			
Abs	0.05266	0.04218	0.03286	0.02392	0.06971	0.05434	0.03881	0.03226
Intergrated PL	3830.59	3115.22	2555.3	1834.27	2241.92	1817.74	1200.13	1001.97
Slope	68474.55765				33890.995			
QY	95%				47%			

Table S2. The quantum yield calculation data of the b-CDs.

	Quinine sulfate dihydrate				b-CDs			
Abs	0.00823	0.00673	0.00522	0.00372	0.0089	0.00724	0.00594	0.00446
Intergrated PL	2088.16	1802.69	1613.72	1312.02	2955.53	2584.18	2139.23	1850.05
Slope	167360.3257				256497.3356			
QY	54%				83%			

Table S3. The quantum yield calculation data of the r-CDs.

	Quinine sulfate dihydrate				r-CDs		
Abs	0.047	0.038	0.028	0.018	0.011	0.006	0.003
Intergrated PL	2464.579	2158.349	1839.945	1535.334	763.585	760.971	757.667
Slope	32003.54275				997.14286		
QY	54%				1.8%		

Table S4. The quantum yield calculation data of the p-CDs.

	Quinine sulfate dihydrate				p-CDs		
Abs	0.047	0.038	0.028	0.018	0.038	0.023	0.011
Intergrated PL	2464.579	2158.349	1839.945	1535.334	773.866	770.224	766.651
Slope	32003.54275				266.22131		
QY	54%				0.5%		

Table S5. The quantum yield of the references.

Year	Raw Material /Solvent	Synthetic Method	Quantum Yield(%)	References
2018	Phloroglucinol /ethanol,H_2SO_4	Solvothermal 200℃	54 - 72	[1]
2014	catechol, resorcinol, hydroquinone /water,H_2SO_4	microwave 800 W	9.2 - 42.8	[2]
2014	Resorcinol /water,H_2SO_4	microwave 800 W	72	[3]
2018	Resorcinol /ethanol	Solvothermal 200℃	6.9	[4]

Table S6. The fluorescence lifetime data of b-CDs and o-CDs.

	λ_{ex} [nm]	λ_{em} [nm]	B_1 [%]	τ_1 [ns]	χ^2
b-CDs	405	466	100	4.4	1.06
o-CDs	515	543	100	3.1	1.14

References

[1] F. L. Yuan, T. Yuan, L. Z. Sui, Z. B. Wang, Z. F. Xi, Y. C. Li, X. H. Li, L. Z. Fan, Z. A. Tan, A. M. Chen, M. X. Jin and S. H. Yang, *Nat.Commun.*, 2018, **9**, 1-5.

[2] J. Wang, C. M. Cheng, Y. Huang, B. Z. Zheng, H. Y. Yuan, L. Bo, M. W. Zheng, S. Y. Yang, Y. Guo and D. Xiao, *J. Mater. Chem. C.*, 2014, **2**, 5028–5035.

[3] Y. Lu, J. Wang, H. Y. Yuan and D. Xiao, *Anal. Methods*, 2014, **6**, 8124-8128.

[4] C. L. Ye, Y. J. Qin, P. C. Huang, A. F. Chen and F. Y. Wu, *Anal. Chim. Acta*, 2018, **1034**, 144-152.