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

Supporting Information

Fluorescence detection of 2, 4-dichlorophenoxyacetic acid by ratiometric fluorescence imaging on paper-based microfluidic chips

Zhong Zhang [‡a,b,c], Xin Ma [‡a], Bowei Li [c], Jia Zhao [b], Ji Qi [c], Guoying Hao [a], Rong Jianhui [b,*] and Xingbin Yang [a,*]

[a] Shaanxi Engineering Laboratory for Food Green Processing Safety Control, and College of Food Engineering and Nutritional Science, Shaanxi Normal University, Xi'an, Shanxi, 710119, China.

[b] School of Chinese Medicine, Li Ka Shing Faculty of Medicine, The University of Hong Kong, 10 Sassoon Road, Pokfulam, Hong Kong.

[c] Key Laboratory of Coastal Environmental Processes and Ecological Remediation, Yantai Institute of Coastal Zone Research, Chinese Academy of Sciences, Yantai, Shandong, 264003,China.

* Correspondence authors.

E-mail: xbyang@snnu.edu.cn (X.B. Yang); jrong@hku.hk (J.H. Rong);

Fax: +86 29-85310580, Tel: +86 29-85310580

Fax: +852-39176537, Tel: +852-39176537

‡ Contributed equally to this work.

Table of Contents

Figure S1

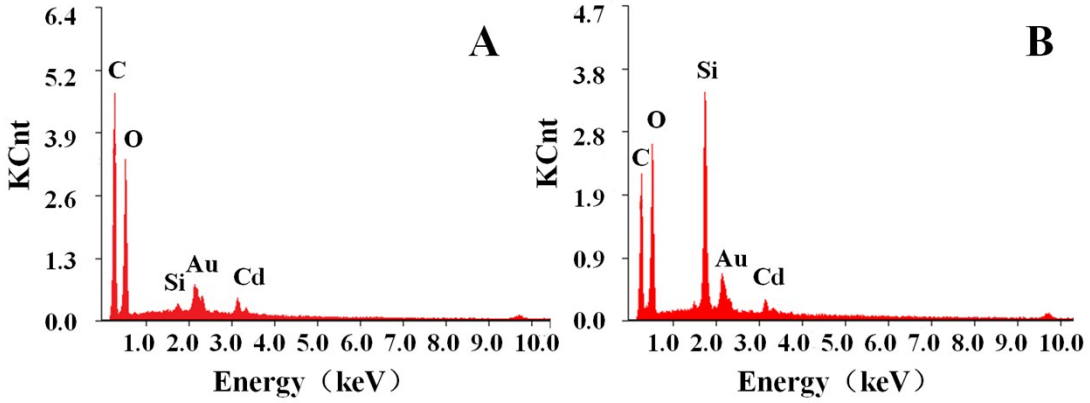

Figure S1 EDS spectrum result of (A) paper@QDs, (B) paper@QDs@NBD@MIPs.

Figure S2

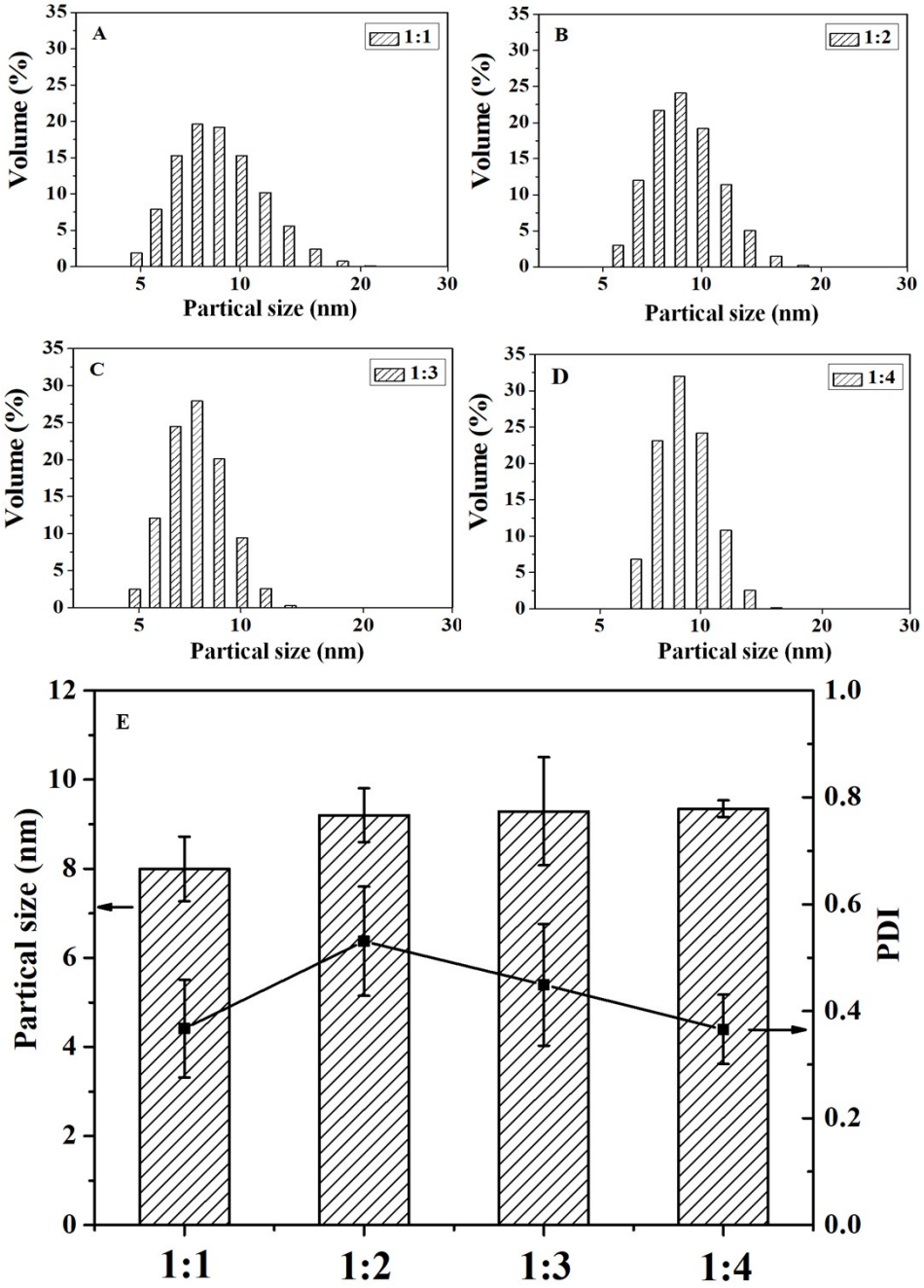

Figure S2 Determination of particle size of CdTe QDs solution. (A) diluted 1 times; (B) diluted 2 times; (C) diluted 3 times; (D) diluted 4 times; (E) the particle sizes change of CdTe QDs solution with different dilution factor.

Figure S3

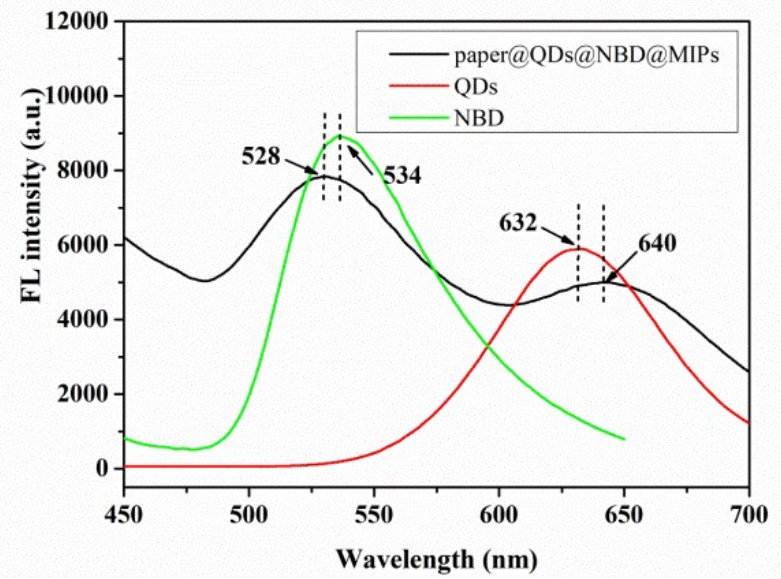

Figure S3 Fluorescence spectral changes of two fluorescent materials during synthesis process.

Figure S4

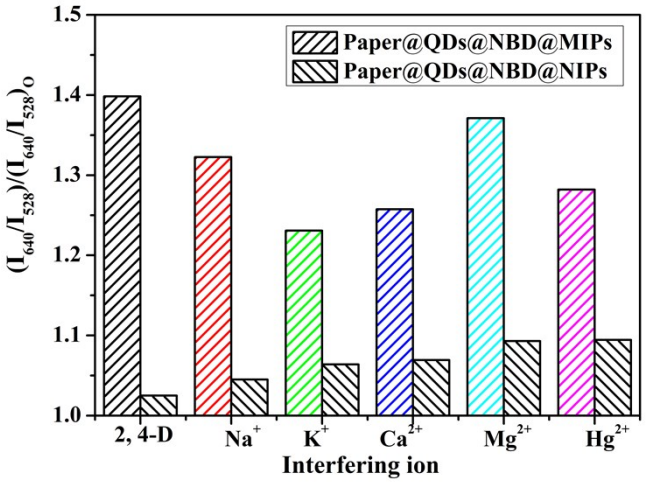

Figure S4 Interfering experiment of paper@QDs@NBD@MIPs and paper@QDs@NBD@NIPs for 2, 4-D including Na^+, K^+, Ca^{2+}, Mg^{2+}, Hg^{2+}.

Figure S5

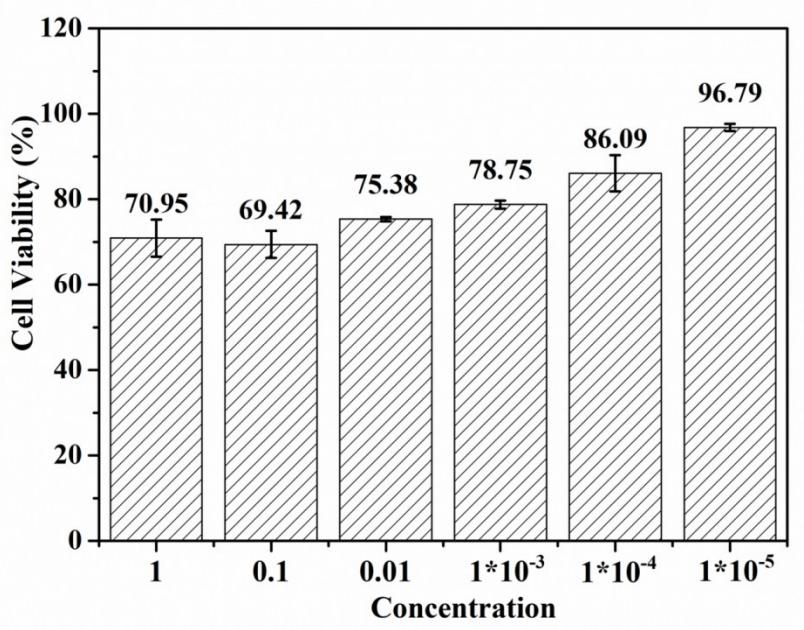

Figure S5 CdTe QDs for cell viability experiments.

Figure S6

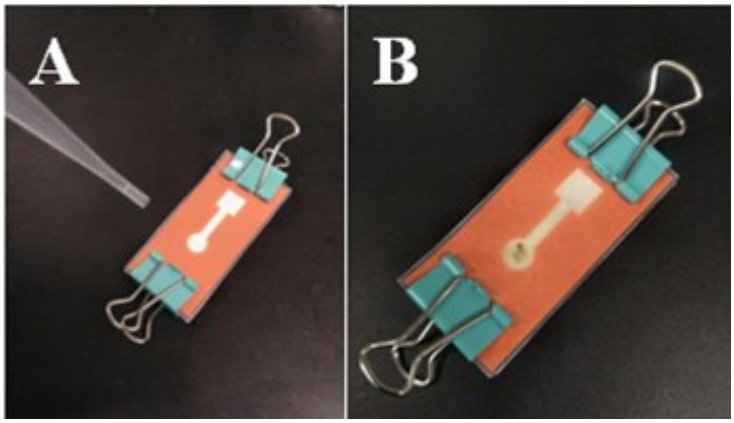

Figure S6 (A) The dirty water sample was draped on the microfluidic paper chip. (B) The microfluidic paper chip could realize the simple sample filter function.

Table S1 Atomic composition ratios of paper@QDs and paper@QDs@NBD@MIPs from EDS spectrum analysis.

Element	paper@QDs		paper@QDs@NBD@MIPs	
	Wt %	At %	Wt %	At %
C K	50.52	59.45	46.35	57.09
O K	45.06	39.81	39.58	36.60
Si K	0.50	0.25	11.28	5.94
Cd L	3.92	0.49	2.79	0.37

Table S2 Zeta potential of CdTe QDs.

	Zeta potential （mv）	Mobility （cm^2/Vs）	Conductivity （mS/cm）	Avg. electric field （V/cm）
QDs	-4.06	$-3.12*10^{-5}$	0.969	-16.3

Table S3 Quantum yield determination of CdTe QDs.

	Quantum yield	Abs	Peak wavelength
CdTe QDs1	0.123	0.106	363.5
CdTe QDs2	0.126	0.105	363.5
CdTe QDs3	0.127	0.104	363.5
Average	0.125	0.105	363.5

Table S4 Comparison of method performances for determination of 2, 4-D.

System	Mechanism	Response time	Linear range	Detection limit	Real sample	Ref
MIPs-SERS	photoionization	10 min	10-1000 μgL^{-1}	6 μgL^{-1}	milk	1
MIP and PSI	electron transfer	24 h	10-1000 μgL^{-1}	0.60 μgL^{-1}	apple banana grape	2
MI-meso SnO_2	electron transfer	6 h		54 μgL^{-1}	sewage water	3
MIP/HPSNs-NH_2	electron transfer		0.1–25 nM	1.17×10^{-2} nM	bean sprout	4
Sn_3O_4@CFP@ MIPs	photoionization		0.05-100 nM	1.08×10^{-2} nM	bean sprout	5
MI-PANI-FSA-C-dots/PGE	electron transfer		6.0-165.0 nM 6.0-155.0 nM	0.001 nM 0.002 nM	L-ascorbic D-ascorbic	6
TiO_2 NTs	electron transfer		0.5-13.0 μM	10 nM	endo-crine disruptors	7
Paper@QDs@ NBD@NIPs	FRET	30 min	0.56-80 μM	80 nM	soybean sprout and lake water	This work

(1) Hua M. Z.; Feng S. L.; Wang S.; Lu X. N. Rapid detection and quantification of 2,4-dichlorophenoxyacetic acid in milk using molecularly imprinted polymers-surface-enhanced Raman spectroscopy. *Food Chem.* **2018**, 258, 254–259.
(2) Pereira I.; Rodrigues M. F.; Chaves A. R.; Vaz B. G. Molecularly imprinted polymer (MIP) membrane assisted direct spray ionization mass spectrometry for agrochemicals screening in foodstuffs. *Talanta.* **2018**, 178, 507–514.
(3) Tang B.; Shi H. J.; Fang Z. Y.; Shao G. H. Preferential electrocatalytic degradation of 2,4-dichlorophenoxyacetic acid on molecular imprinted mesoporous SnO2 surface. *Chem. eng. J.* **2018,** 334, 882–890.
(4) Wang H. M.; Xu Q.; Wang J. Dendrimer-like amino-functionalized hierarchical porous silica nanoparticle: A host material for 2,4-dichlorophenoxyacetic acid imprinting and sensing. *Biosens. Bioelectron*. **2018**, 100, 105–114.
(5) Wang J.; Xu Q.; Xia W. W.; Shu X.; Jin D. Q.; Zang Y.; Hu X. Y. High sensitive visible light photoelectrochemical sensor based on in-situ prepared flexible Sn3O4 nanosheets and molecularly imprinted polymers. *Sens. Actuator B-Chem.* **2018**, 271, 215–224.
(6) Pandey I,; Jha S. S. Molecularly imprinted polyaniline-ferrocene-sulfonic acid-Carbon dots modified pencil graphite electrodes for chiral selective sensing of D-

Ascorbic acid and L-Ascorbic acid: A clinical biomarker for preeclampsia. *Electrochim. Acta.* **2015**, 182. 917–928.
(7) Shi H. J.; Zhao G. H.; Liu M. C.; Zhu Z. L. A novel photoelectrochemical sensor based on molecularly imprinted polymer modified TiO_2 nanotubes and its highly selective detection of 2,4-dichlorophenoxyacetic acid. *Chem. Commun.* **2011**, 13, 1404–1407.