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Supplementary Information Portable Upconversion-based Hydrogel Sensors for Visual Quantitative Detection of HOCl

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Figure S1. (a) TEM images of core UCNPs. (b) TEM images of core-shell UCNPs. (c) Size distributions of core UCNPs. (d) Size distributions of core-shell UCNPs.



Figure S2. (a) XRD of PAA-UCNPs, core UCNPs, core-shell UCNPs. (b) Fourier-transform infrared (FTIR) spectra of Bare-UCNPs, OA-UCNCs, and PAA-UCNCs.



Figure S3. (a) Optimization of detection conditions for upconversion nanoprobe (pH). (b) Dynamic response of the upconversion nanoprobe with the addition of 100 μ M HOC1.



Figure S4. (a) The change of fluorescence intensity of UCNPs at different time. (b) The intensity ratio of F_{654}/F_{540} changed with different time.



Figure S 5. (a) The change of fluorescence intensity of UCNPs at different temperature. (b) The intensity ratio of F654/F540 changed with different temperature.



Figure S6. The degree of UCL variation of UCNPs-Carmine at 540 nm and 653 nm at different concentrations of HOCl.



Figure S7. Kinetic study of the upconversion sensor with the addition of 20 μM HOC1.



Figure S8. (a) UV-vis spectra of upconverted nanoprobes after addition of HOCl and various representative analytes (300 μ M). (b) UCL of upconverted nanoprobes after addition of HOCl and various representative analytes (300 μ M).



Figure S9. Portable testing kit for HOCl determination.



Figure S10. Kinetic study of the upconversion hydrogel sensor with the addition of 20 μM HOC1.



Figure S11. (a) The intensity ratio of G/R changed with different temperature. (b) The intensity ratio of G/R changed with different time.

Materials	Methods	LOD	Ref.
RBH1-UCNPs	Fluorometry	0.32 μΜ	[1]
AIE-based fluorescent nanoprobe	Fluorometry	0.41 µM	[2]
naphthalimide-based fluorescent probe	Fluorometry	57 nM	[3]
Nitrogen-doped carbon dots	Fluorometry	3.4 µM	[4]
Fluorescein-based probe	Fluorometry	0.5 μΜ	[5]
Eu-BDC-NH ₂ /DPA	Fluorometry	37 nM	[6]
CyH-UCNPs	Fluorometry	0.9 μΜ	[7]
Zr-UiO-66 MOF	Fluorometry	1.22 µM	[8]
APBA-ARSCDs	Fluorometry	4.47 μΜ	[9]
UCNCs-PB	Fluorometry	1.12 µM	[10]
UCNPS- Carmine	Colorimetry	1.03 µM	This work
UCNPS- Carmine	Fluorometry	0.30 µM	This work

Table S1. Comparison of various methods for HOCl sensing.

Тар	Detection(µM)	$Added(\mu M)$	$Found(\mu M)$	Recovery(%)	RSD(%)
water					
1	2.92	10	13.51	106.0	0.09
2	2.92	20	23.40	102.4	0.11
3	2.92	30	33.07	100.5	0.26
4	2.92	40	40.07	92.9	0.45
5	2.92	50	53.40	101.0	0.35

Table S2. Detection of HOCl in tap water by the hydrogel-based portable sensing platform.

Table S3. Comparison of upconversion hydrogel portable sensing platform with HPLC-MS/MS method for HOCl detection.

Samples	Found in samples (µM)		
Tap water	The upconversion-based hydrogel sensor (n=3)	HPLC-MS/MS (n=3)	
1	13.51	12.04	
2	23.40	23.06	
3	33.07	34.42	
4	40.07	42.04	
5	53.40	52.07	

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