Electronic Supplementary Material (ESI) for RSC Advances.

Supplementary Materials

In situ formation of DNA-templated copper nanoparticles as fluorescent indicator for hydroxylamine detection

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***DNA Sequences were used in this study*:**

Code	Sequence (5'→3'/ 3'→5')	Length (bp)
AT16	ATATATATATATATAT / TATATATATATATATA	**16**
AT22	ATATATATATATATATATATAT / TATATATATATATATATATATA	**22**
AT28	ATATATATATATATATATATATATATATATA / TATATATATATATATATATATATATATATAT	**28**
AT34	ATATATATATATATATATATATATATATATATAT / TATATATATATATATATATATATATATATATATA	**34**
AT40	ATATATATATATATATATATATATATATATATATATAT / TATATATATATATATATATATATATATATATATATA	**40**

Preparation of dsDNA templates:

Firstly, both the oligonucleotide (1 μM) and its complementary strand were mixed together at 1:1 molar ratio in the MOPS buffered solutions (10 mM MOPS, 2 mM $MgCl_2$, 150 mM NaCl, pH 7.5). Then, the mixture was annealed at 95 ℃ for 10 min, and then slowly cooled down to the room temperature (25 ℃).

***Preparation of fluorescent DNA-CuNPs*:**

Firstly, 500 μL MOPS buffered solutions and final concentration of hydroxylamine hydrochloride (2 mM) was mixed in 2 mL EP tubes. Then, after the solution was incubated for 1 min, final concentration of $CuSO_4$ (100 μM) was introduced. Finally, the synthesis of fluorescent DNA-CuNPs were completed within 10 min incubation time at room temperature.

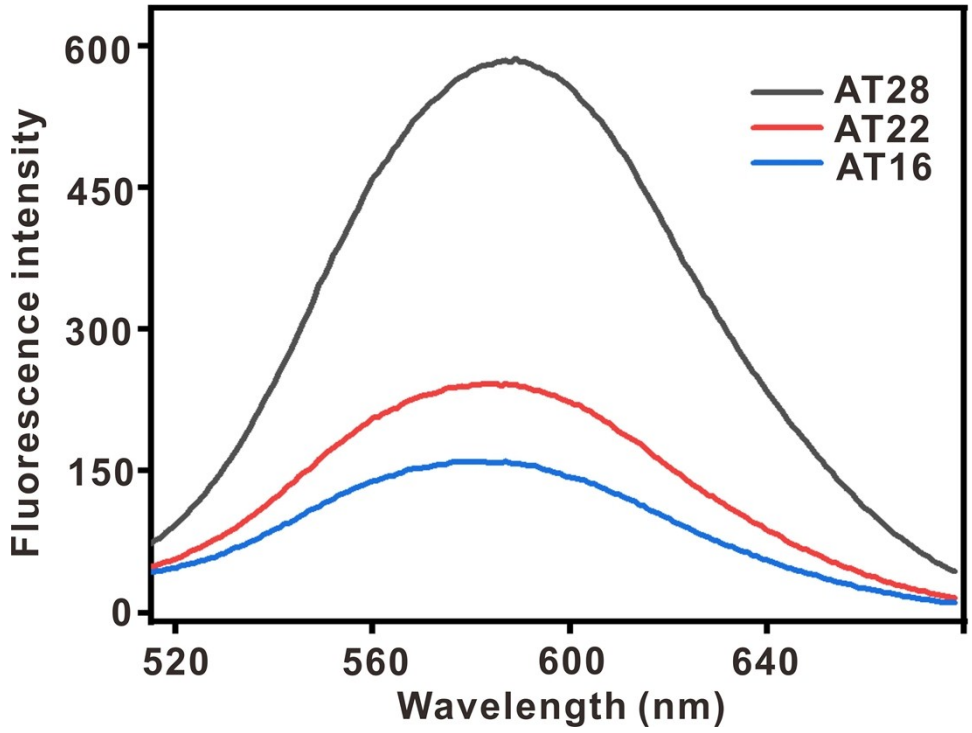

Fig. S1. Fluorescence spectra of CuNPs templated by various AT-rich sequence templates: AT16, AT22, and AT28.

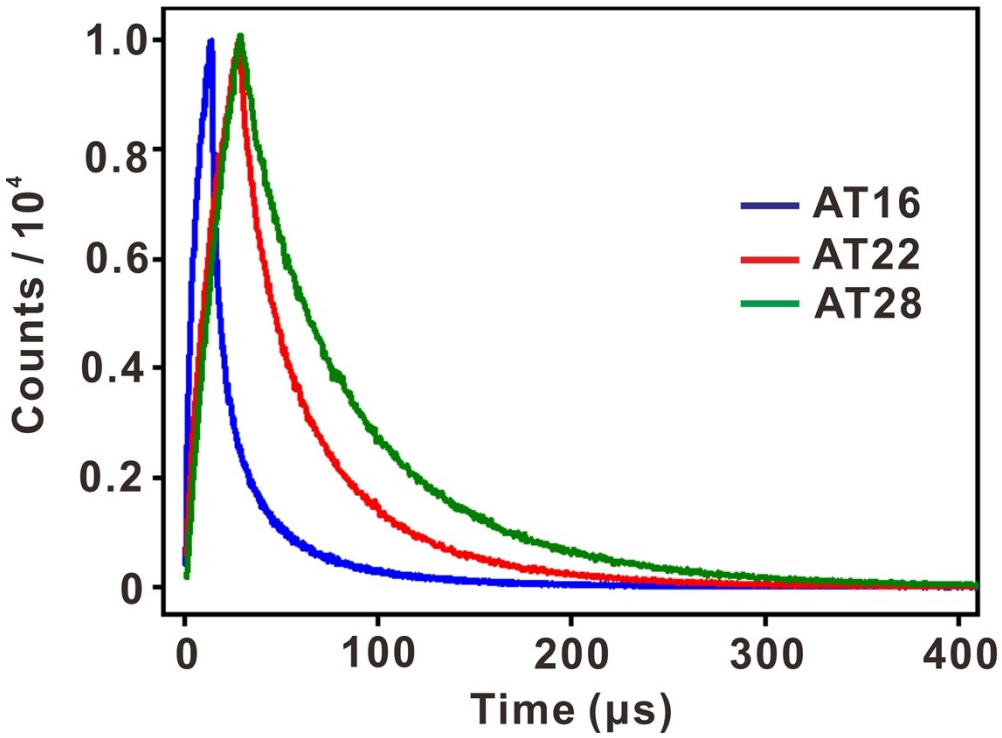

Fig. S2. Fluorescence decay curves of CuNPs templated by AT16, AT22, and AT28.

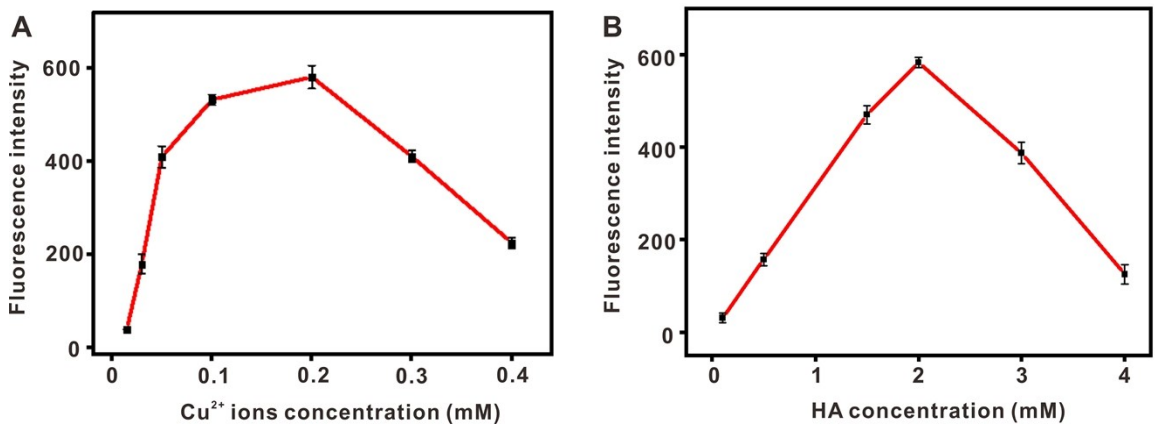

Fig. S3. Effect of the synthetic conditions at λ_{em} = 588 nm (λ_{ex} = 340 nm). A) The concentrations of Cu^{2+} ions were 0.015, 0.03, 0.05, 0.1, 0.2, 0.3, and 0.4 mM, respectively. B) The concentrations of hydroxylamine (HA) were 0.5, 1, 1.5, 2, 2.5, 3, and 4 mM, respectively. The error bars represent the standard deviation of three independent measurements.

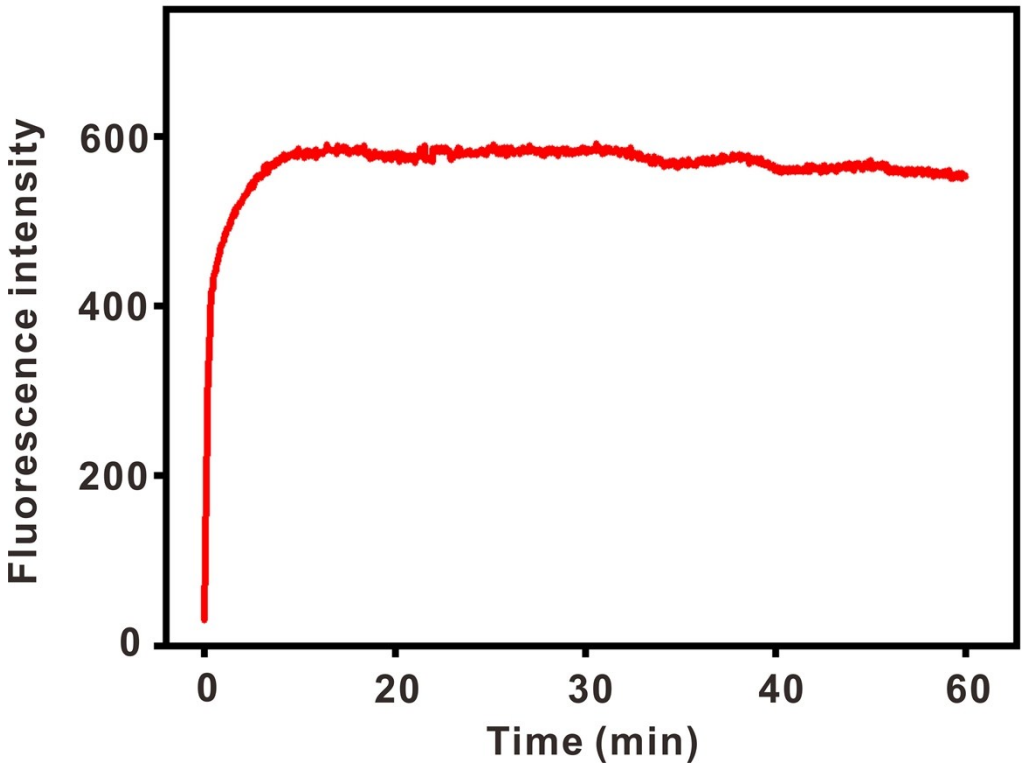

Fig. S4. Time dependence of the fluorescence intensity of AT28-CuNPs (λ_{ex} = 340 nm, λ_{em} = 588 nm) in MOPS buffered solutions.

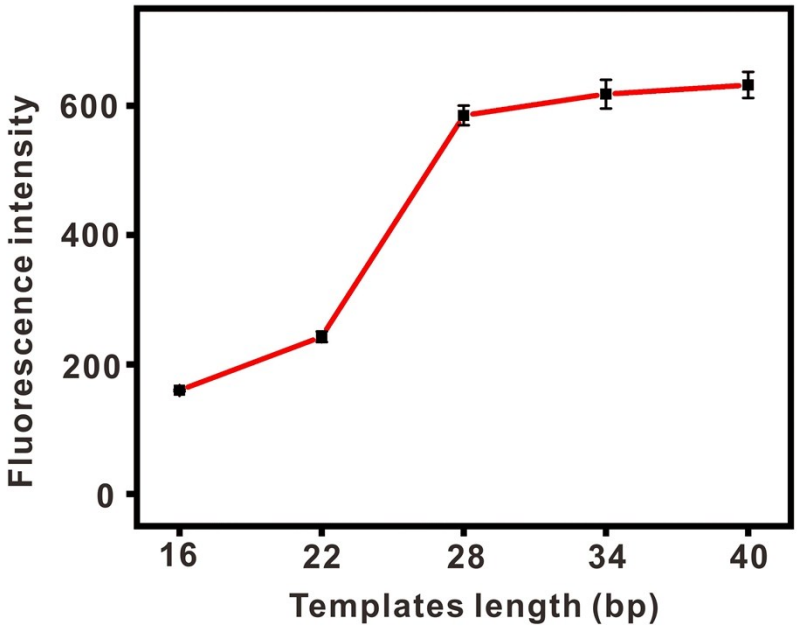

Fig. S5. The fluorescence intensity of CuNPs based on different templates length of AT-rich DNA: AT16, AT22, AT28, AT34, and AT40 (λ_{ex} = 340 nm, λ_{em} = 588 nm) in MOPS buffered solutions.

Table S1. Detection of HA from the local tap water, the local ground water, and the local river water near the factory.

	Samples	**Added** (mM)	**Detected** (mM)	**Recovery** (%)	RSD, n=9 (%)
Tap water	1	0.3	0.289	96.3	3.8
	2	0.8	0.782	97.8	3.5
	3	1.2	1.124	93.7	4.4
Ground water	1	0.3	0.278	92.7	3.7
	2	0.8	0.771	96.4	4.6
	3	1.2	1.108	92.3	5.8
River water	1	0.3	0.278	92.7	5.6
	2	0.8	0.788	98.5	4.8

	3	1.2	1.146	95.5	4.2

Table S2. Comparison of the proposed method with other recent methods for HA detection.

	Method	Detection limits	Response Time	Reference
1	HPLC	0.05 mM	More than 1 h	W. D. Korte, *J. Chromatogr.*, 1992, 603, 145
2	Spectrophotometric determination by flow injection analysis	0.05 mM	More than 1 h	G. C. M. Bourke, G. Stedman, A. P. Wade, *Analytica Chimica Acta*, 1983, 163, 277-280
3	Fluorescent sensor: DNA-CuNPs	0.022 mM	10 min	This work
4	Kinetic spectrophotometric determination	0.58 μM	More than 1 h	A. Afkhami, T. Madrakian, A. Maleki , Anal. Sci., 2006, 22, 329.
5	Ion chromatographic determination	36 nM	More than 1 h	C. Xu, *Modern Agrochemicals*, 2017, 16, 36.
6	GC	14.4 nM	More than 1 h	Y. Seike, R. Fukumori, Y. Senga, H. Oka, K. Fujinaga, M. Okumura, Anal. Sci., 2004, 20, 139.