Supporting information

Highly Sensitive and Selective Detection of Silver (I) in Aqueous Solution with Silver(I)-specific DNA and Sybr Green I

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Experimental Section

SG (10000×) was purchased from invitrogen inc. When in use, it was diluted to 250× with DMSO, then to 10×(1.96×10^{-6} M) with water to make a stock solution. 1.625×10^{-8} M SSO was first incubated for 15 min with different amount of Ag^+ in 10 μL of 100 mM MOPS buffer containing 500 mM $NaNO_3$, pH 6.90 and one amount of MilliQ–H_2O to 100μL reaction solution. Then 5 μLof 10×SG was added to the solution. After incubating for 2 min,the mixture was added one amount MilliQ–H_2O to 800μL detection solution and used for the fluorescence study at ex497nm.

To study the quenching of Ag^+, Cu^{2+} and Hg^{2+} to SG, 2 μL Ag^+(10 mM), Cu^{2+}(10 mM) and Hg^{2+}(10 mM) were respectively added into 10 μL SG(100×) for fluorescence study. The fluorescence spectra were shown in Fig. S1, indicating that metal ions such as Ag^+, Cu^{2+} and Hg^{2+} could quench the fluorescence of SG.

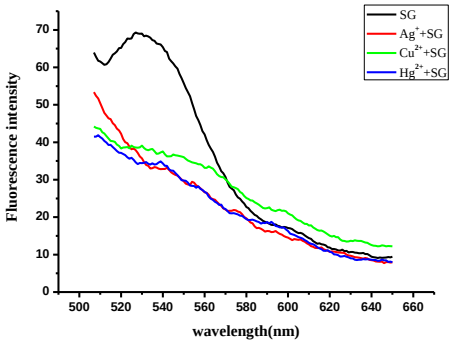

Fig. S1 The quenching of Ag^+, Cu^{2+} and Hg^{2+} to SG

We used SG-SSO as a probe and illustrated the formation of Ag^+-hairpin structure by measuring fluorescence intensity at 530 nm every minute. As shown in Fig. S2, the Ag^+-hairpin structure forms immediately once the silver ion is added.

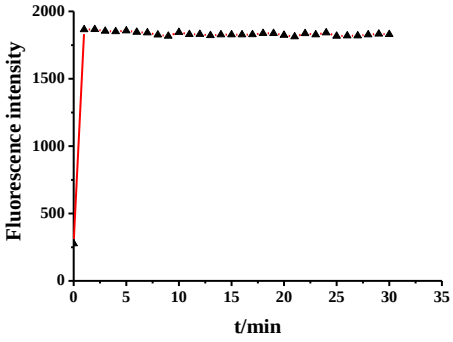

Fig. S2 Fluorescence intensity change against time after adding Ag^+ into SG–SSO.

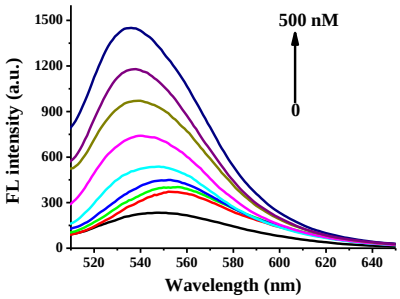

Fig. S3 The fluorescence spectra of solutions containing SSO with different concentration of Ag^{+} (0, 1, 5, 10, 30, 50, 80, 100, 500 nM) [SSO] = 1.625×10^{-8} M and [SG]=1.225×10^{-7} M. A buffer of 100 mM MOPS, 500 mM $NaNO_3$, pH 6.90 was used.

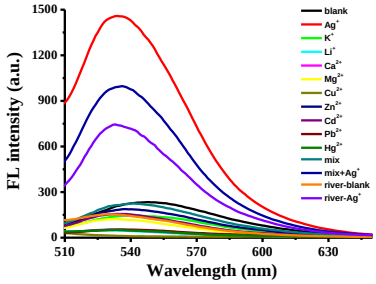

Fig. S4 The fluorescence spectra of SSO in the absence or presence of 500 nM Ag^{+}, 20 mM K^{+}, 50 mM Na^{+}, 100 mM Li^{+}, 10 mM Ca^{2+}, 10 mM Mg^{2+}, 100 μM Cu^{2+}, 100 μM Zn^{2+}, 100 μM Cd^{2+}, 100 μM Pb^{2+}, 100 μM Hg^{2+}, respectively. [SSO]=1.625×10^{-8} M and [SG]= 1.225×10^{-7} M. Mixed sample (K^{+}, Na^{+}, Li^{+}, Ca^{2+}, Mg^{2+}, Cu^{2+}, Zn^{2+}, Cd^{2+} and Pb^{2+}, each 1 μM) and real sample (river water) in the absence or presence of Ag^{+} (500 nM) were detected.

Table S1 Comparison between the current method and other methods by using C–Ag^{+}–C interaction

Methods	Linear range	LOD	Ref.
A graphene-based fluorescent nanoprobe for silver(I) ions	Not indicated	5 nM	a
Un-labeled C-rich ssDNA probe and controlled assembly of MWCNTs	10 to 500 nM	1.3 nM	b
Oligonucleotide-immobilized oscillator	Not indicated	10 nM	c
Oligonucleotide-based fluorogenic probe	50 to 700 nM	32 nM	d
Nucleic acid functionalized CdSe/ZnS quantum dots	Not indicated	1 μM	e
DNA SWCNT-based fluorescent sensor	0–150 nm	1 nM	f
Light scattering technique of DNA-functionalized AuNPs	200-9000 nM	50 nM	g
Silver(I)-specific DNA and Sybr Green I	1nM to 100 nM	1nM	Current work

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