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Electronic Supplementary Information

The chitosan-capped silver nanoparticles as highly selective colorimetric probe for visual detection of aromatic ortho-trihydroxy phenols

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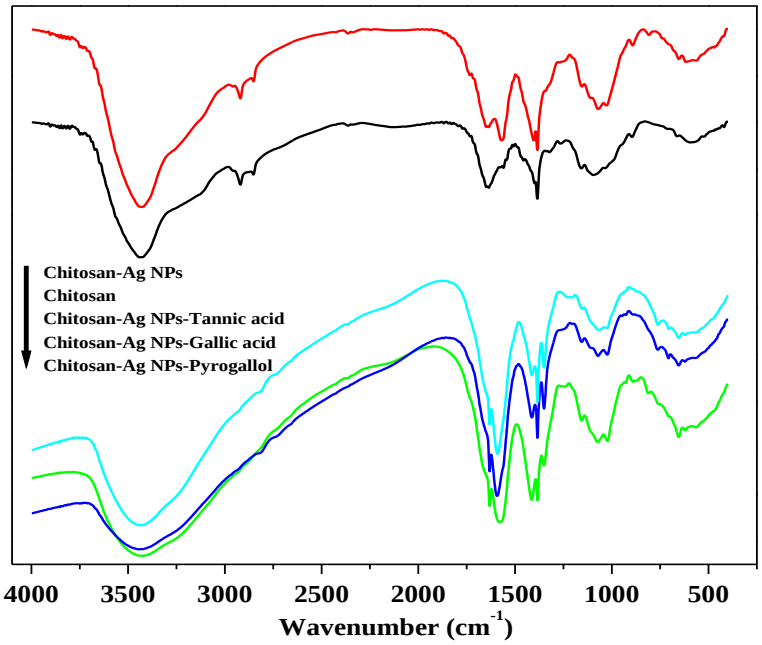

Fig. S1. FT-IR spectra of the chitosan, Ch-Ag NPs, Ch-Ag NPs-tannic acid, Ch-Ag NPs-gallic acid, and Ch-Ag NPs-pyrogallol.

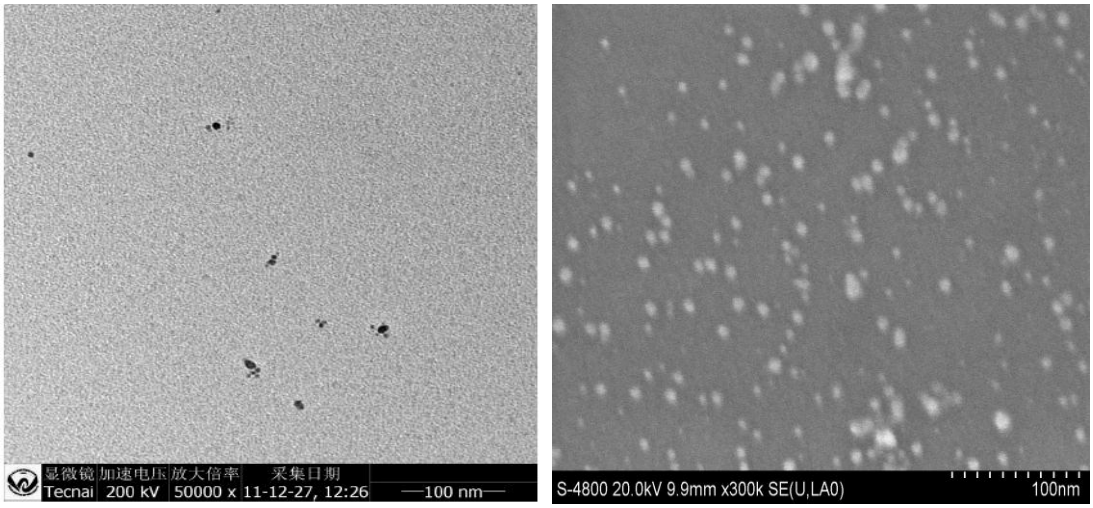

Fig. S2. TEM (left) and SEM (right) images of the Ch-Ag NPs.

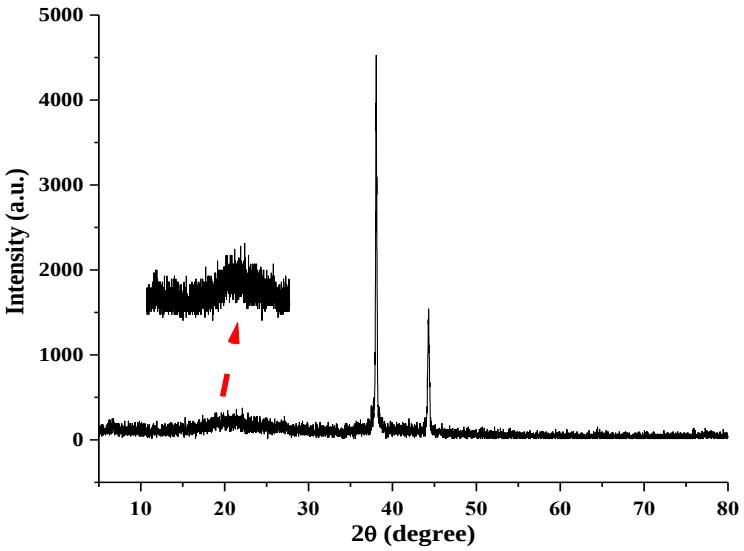

Fig. S3. XRD patterns of the Ch-Ag NPs.

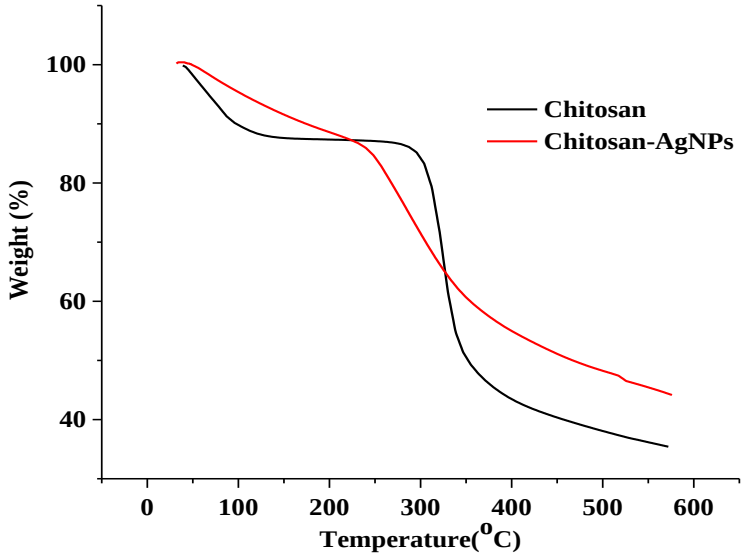

Fig. S4. TGA curves of chitosan and Ch-Ag NPs.

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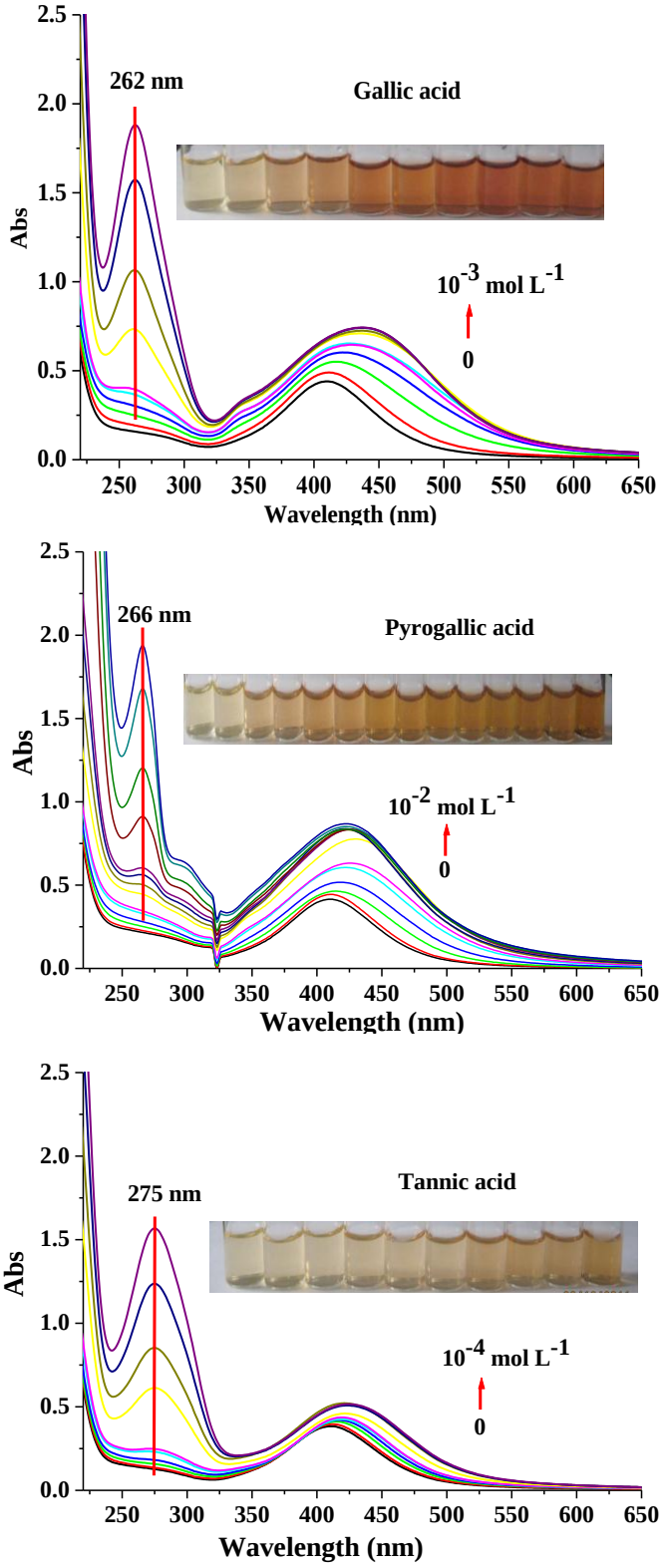

Fig. S5. The UV-visible absorption spectra of Ch-Ag NPs colloidal solution in the presence of different concentrations of targets phenols. Inset: photographic images.

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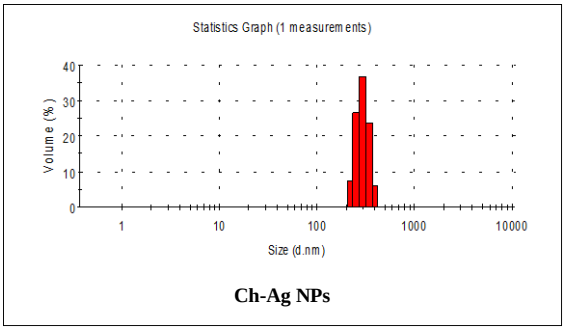
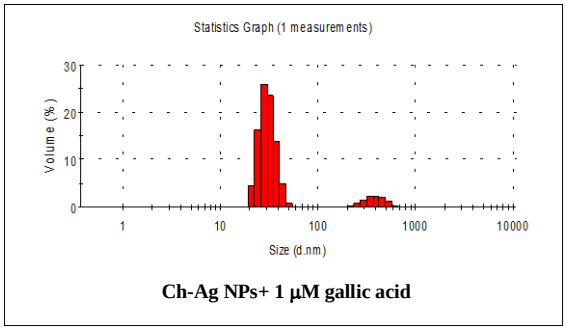
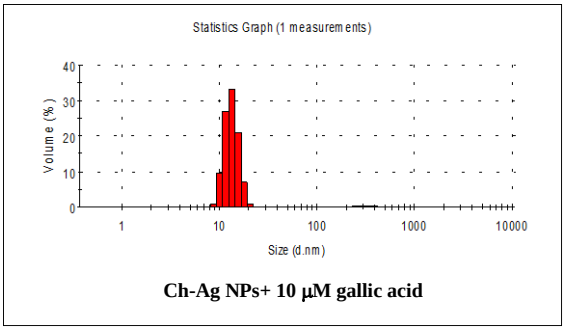


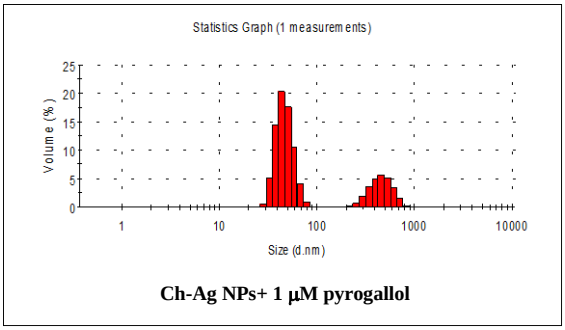
Ch-Ag NPs



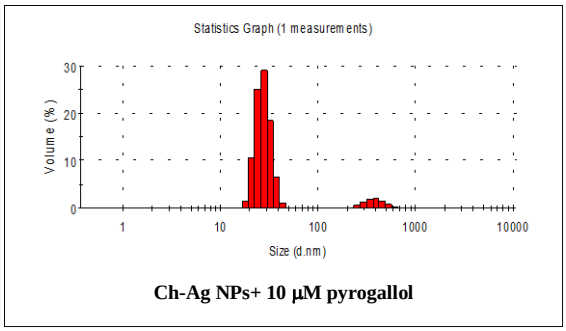
Ch-Ag NPs+ 1 μM gallic acid



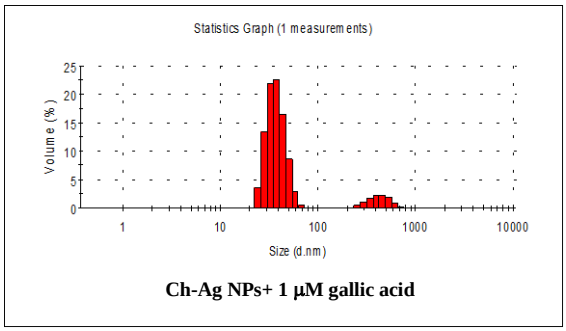
Ch-Ag NPs+ 10 μM gallic acid



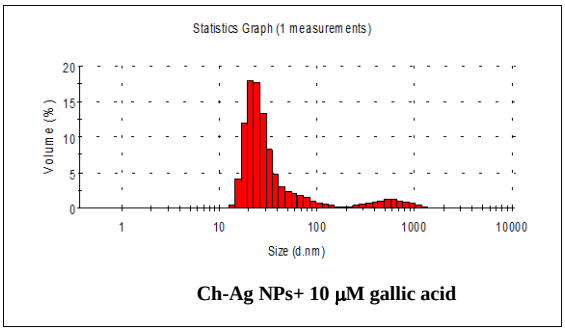
Ch-Ag NPs+ 1 μM pyrogallol



Ch-Ag NPs+ 10 μM pyrogallol



Ch-Ag NPs+ 1 μM gallic acid



Ch-Ag NPs+ 10 μM gallic acid

Fig. S6. Hydrodynamic diameter distributions of the Ch-Ag NPs in the absence and presence of different concentrations of targets.

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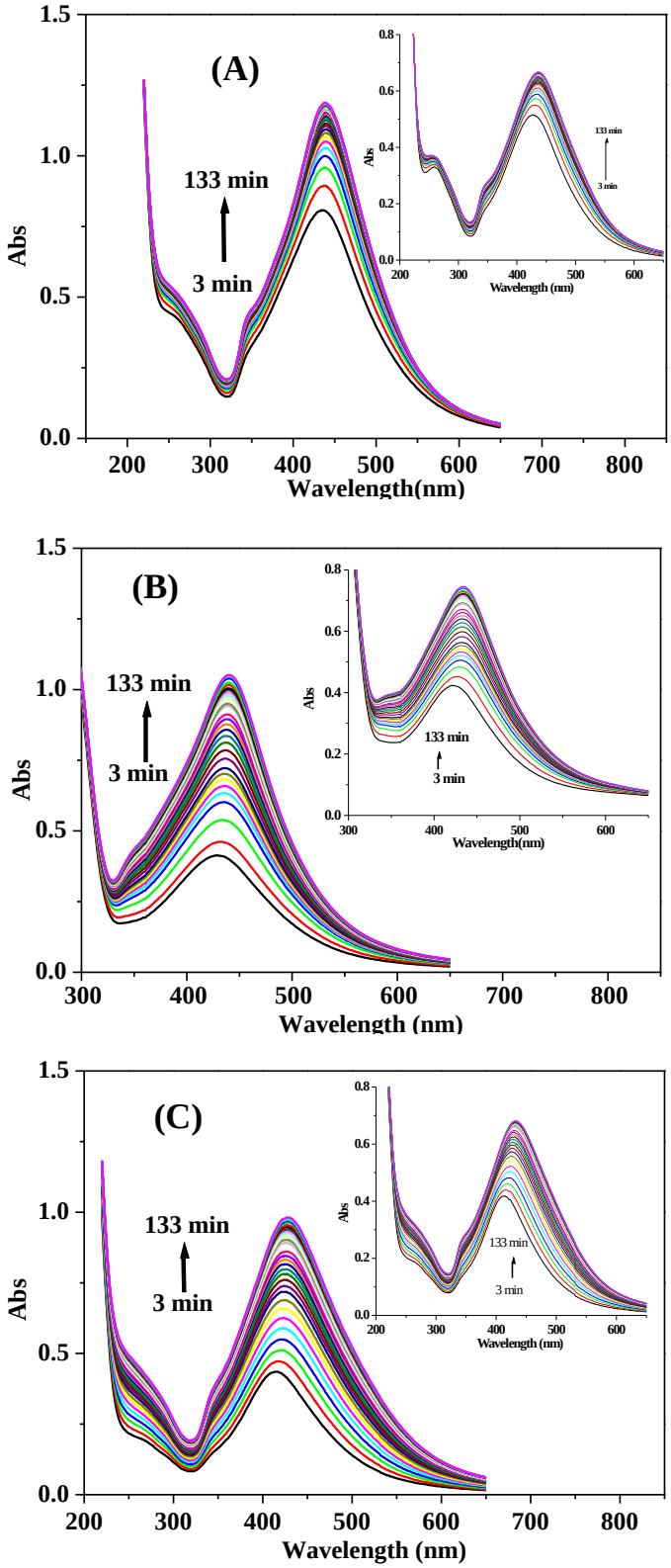

Fig. S7. The UV-visible absorption spectra of Ch-Ag NPs colloidal solution with $AgNO_3$ in the presence of gallic acid (A), tannic acid (B), and pyrogallol (C). Insets highlight the UV-visible absorption spectra of Ch-Ag NPs colloidal solution in the presence of target without $AgNO_3$. Reaction conditions: 2 mL 1×10^{-4} M Ch-Ag NPs +0.25 mL 4×10^{-4} M $AgNO_3$ or water + 0.25 mL 2×10^{-4} M target compound.

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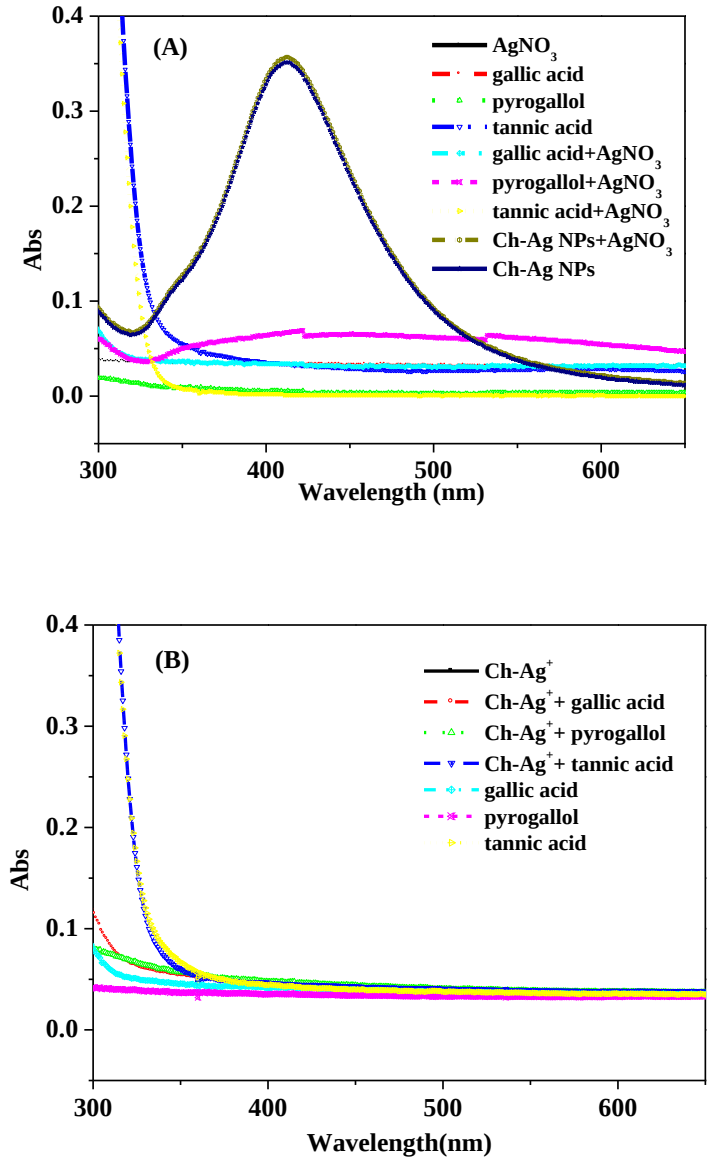

Fig. S8. (A) The UV-visible absorption spectra of Ch-Ag NPs and three targets with and without $AgNO_3$. Reaction conditions: 2 mL 1×10^{-4} M Ch-Ag NPs or 0.25 mL 2×10^{-4} M target compound +0.25 mL 4×10^{-4} M $AgNO_3$ or water. The final volume was 2.5 mL.

(B) The UV-visible absorption spectra of Ch-Ag^+ with and without three targets. Reaction conditions: 2 mL 1×10^{-4} M Ch-Ag^+ +0.50 mL 1×10^{-4} M target compound or water. The final volume was 2.5 mL.

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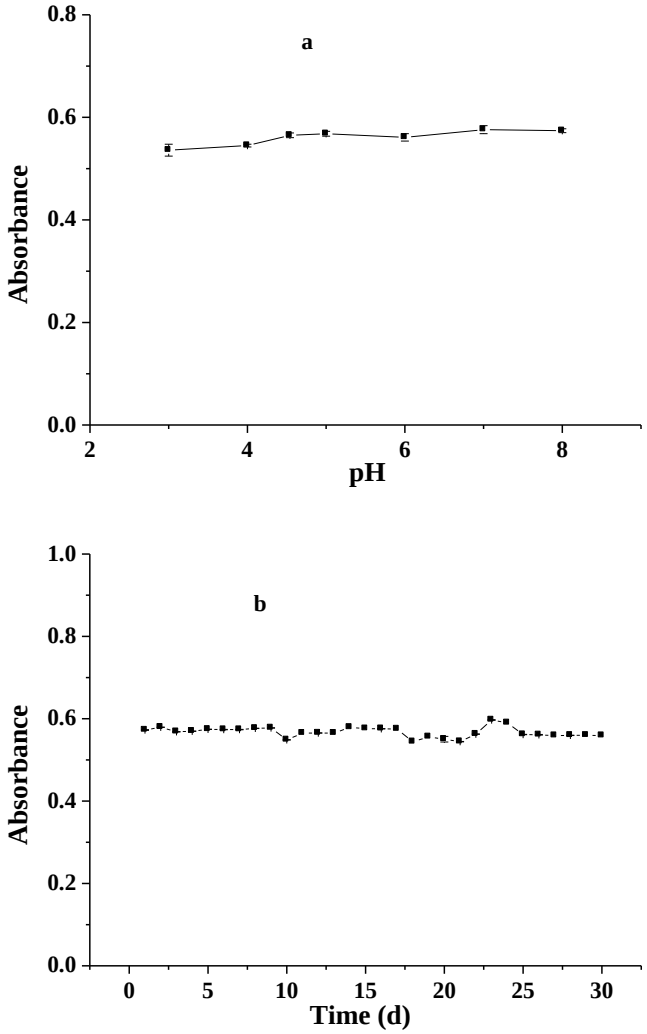


Fig. S9. Variations of absorbance of Ch-Ag NPs at 411 nm with pH (a) and time (b).

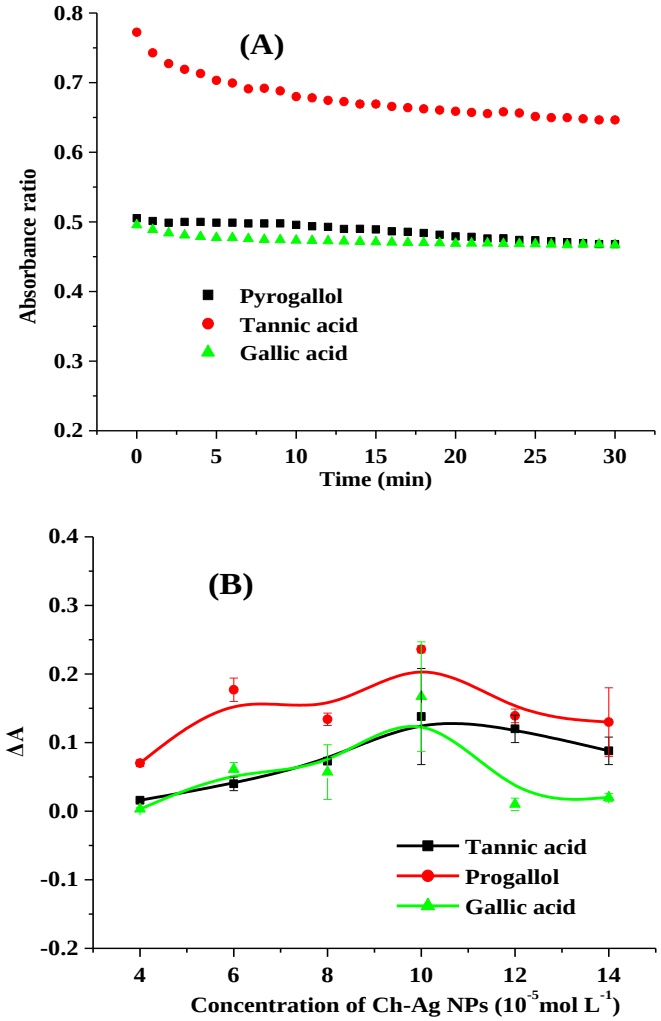
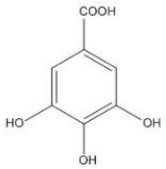
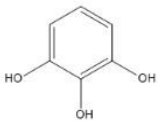


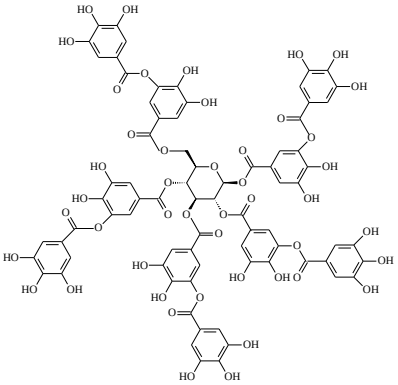
Fig. S10. (A) Effect of reaction time. Reaction conditions: 2 mL 1×10^{-4} M Ch-Ag NPs with 0.5 mL 1×10^{-4} M target compound. The absorbance ratios for gallic acid, pyrogallol and tannic acid are A_{262}/A_{437}, A_{266}/A_{430}, and A_{275}/A_{434}, respectively. **(B)** Effect of Ch-Ag NPs concentration.



gallic acid

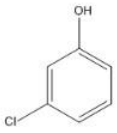


pyrogallol

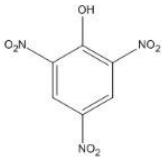


tannic acid

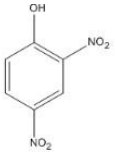
p-aminobenzoic acid



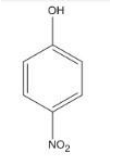
pentachlorophenol



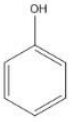
2,4,6-trinitrophenol



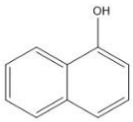
2,4-dinitrophenol



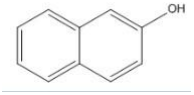
p-nitrophenol



phenol

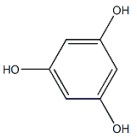


1-naphthol

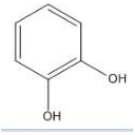


β-naphthol

p-aminophenol

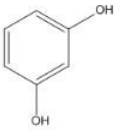


phloroglucin



catechol

hydroquinone



m-dihydroxy-benzene

Fig. S11. The chemical structure of tannic acid, gallic acid, pyrogallol, *p*-amino benzoic acid, pentachlorophenol, 2,4,6-trinitrophenol, 2,4-dinitrophenol, *p*-nitrophenol, 1-naphthol, *β*-naphthol, *p*-aminophenol, catechol, hydroquinone, *m*-dihydroxy-benzene, phloroglucin and phenol.

Table S1. The results of the target determination in tap water and river water samples

	Tap water samples			River water samples		
Targets	Added (μM)	Found[a] (μM)	Recovery (%)	Added (μM)	Found (μM)	Recovery (%)
Gallic acid	0	n.d	-	0	n.d[b]	-
	10	9.9±0.3	99.0	10	9.5±0.1	95.4
	30	29.3±0.1	97.7	30	29.1±0.1	97.0
	50	49.2±0.1	98.4	50	48.4±0.1	96.9
Pyrogallol	0	n.d	-	0	n.d	-
	10	9.94±0.01	99.4	10	9.85±0.01	98.5
	30	30.2±0.02	100.5	30	29.4±0.2	98.1
	50	50.0±0.01	100.0	50	46.8±0.1	93.6
Tannic acid	0	n.d	-	0	n.d	-
	1	1.04±0.02	103.8	1	0.99±0.01	99.1
	3	2.91±0.01	97.0	3	2.98±0.01	99.3
	5	5.28±0.01	105.6	5	5.00±0.01	100.0

[a] Average ± standard deviation (n = 3). [b]not detected.