

Electronic Supplementary Material

Robust colorimetric detection based on anti-aggregation of gold nanoparticles for bromide in rice samples

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Section 2.2 The concentration of AuNPs was calculated as follows, with the spectrum of 2.5-folds diluted AuNPs solution (Fig. S1).

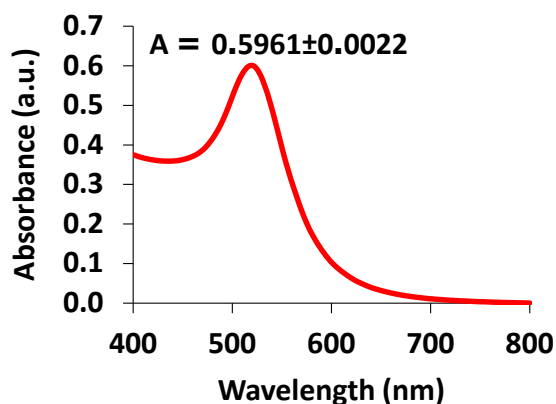


Fig. S1 UV-Vis absorption spectrum of AuNPs solution that is 2.5-folds diluted.

$$A = \epsilon bc$$

$$c = \frac{0.5961}{1 \times 2.70 \times 10^8}$$

$$c = 2.2078 \text{ nM}$$

Thus, the initial concentration of AuNPs is equal to 5.52 nM (2.2078×2.5 -folds dilution)

Where A is the absorbance of AuNPs solution.

ϵ is the extinction coefficient of AuNPs at 520 nm which is equal to $2.70 \times 10^8 \text{ M}^{-1} \text{ cm}^{-1}$ [23].

b is cell pathlength that is equal 1 cm.

c is the concentration of gold nanoparticles.

[23] D. Liu, Z. Wang and X. Jiang, *Nanoscale*, 2011, **3**, 1421–1433.

The stability of gold nanoparticles after several days for detection of bromide ion was investigated. The AuNPs were synthesized, stored in the dark at 4 °C and used for detection of 2.50 μM Br⁻ standard within 4 months. The sensitivity of Br⁻ detection represented as the absorbance ratio of A₅₁₉/A₆₇₃ was recorded (Fig. S2). We measured the absorbance response of Br⁻ detection in total of 8 times during 4 months. As shown in Fig. S2, the sensitivity remained stable and no significant difference of the absorbance ratio between 8 measurements in 4 months (*P*>0.05). Thus, it was proved that the stability of AuNPs after several days for Br⁻ detection can be last at least 4 months.

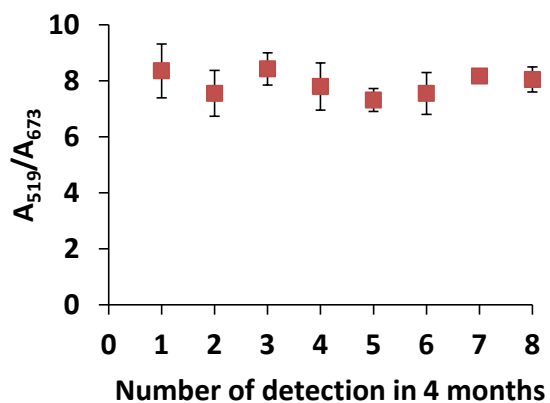


Fig. S2 The absorbance ratio (A_{519}/A_{673}) of 2.50 μM Br⁻ after using the synthesized AuNPs suspension stored in the dark at 4 °C in 4 months.

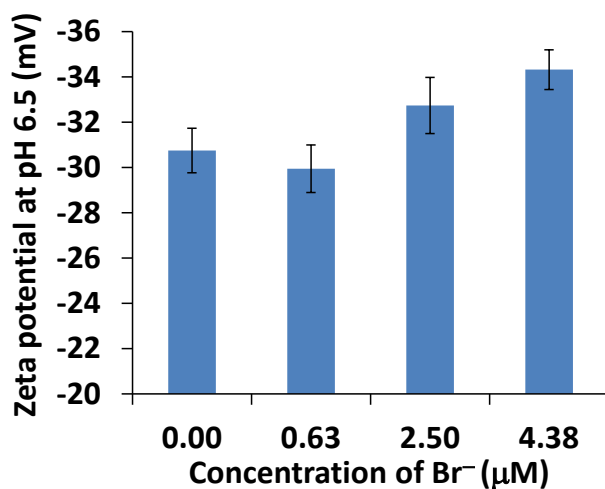


Fig. S3 Zeta potential of AuNPs at pH 6.5 in the presence of 0.63, 2.50 and 4.38 μM Br⁻.

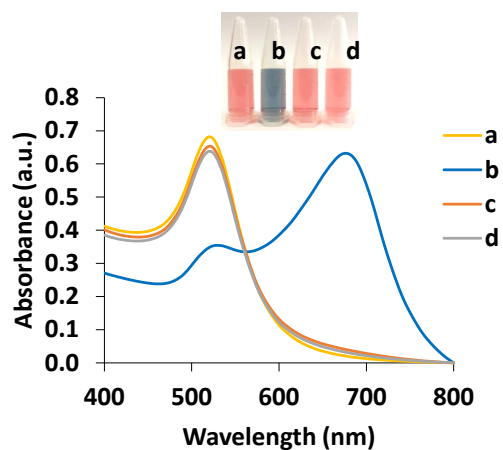


Fig. S4 UV-Vis absorption spectra of (a) AuNPs, (b) AuNPs+50 μM Cr^{3+} , (c) AuNPs+50 μM Fe^{3+} and (d) AuNPs+50 μM Al^{3+} prepared in 10 mM phosphate buffer (pH 7.0). Inset is the corresponding photograph of a-d.

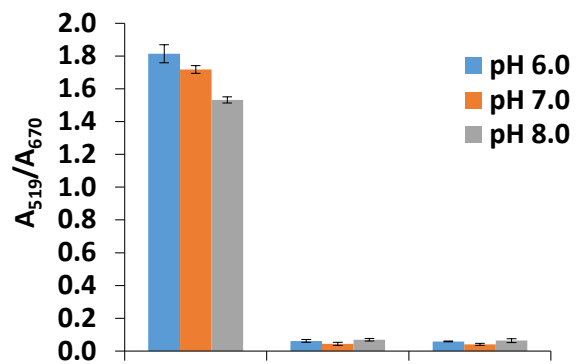


Fig. S5 Effect of pH of phosphate buffer on aggregation of AuNPs in the presence of Cr^{3+} , Fe^{3+} and Al^{3+} .

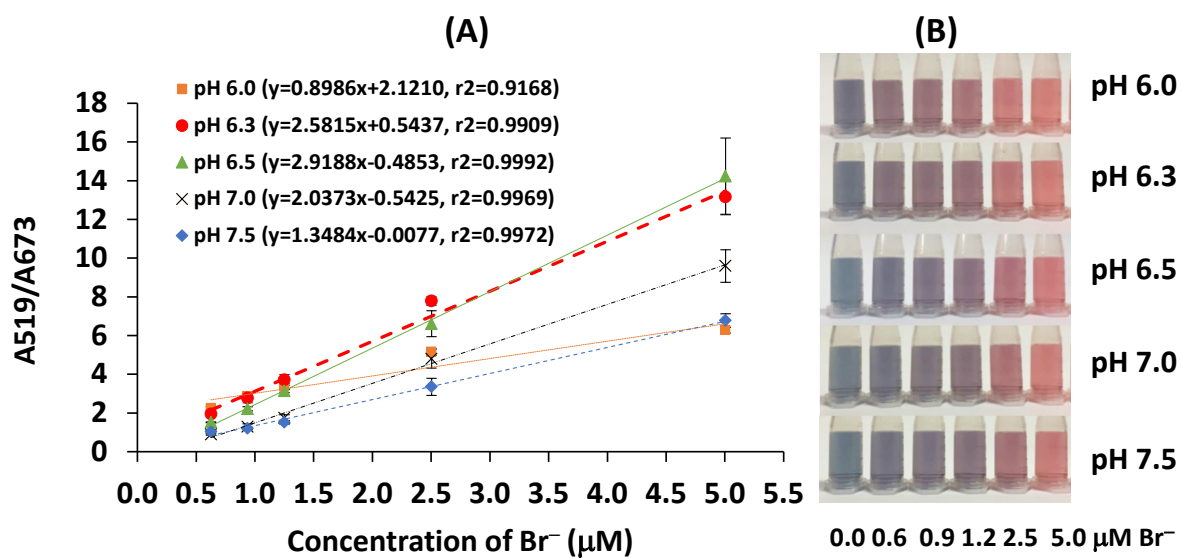


Fig. S6 (A) The effect of pH of phosphate buffer on the linearity curve of Br^- concentration ranged from 0.62–5.01 μM and (B) the corresponding solution color at each pH.

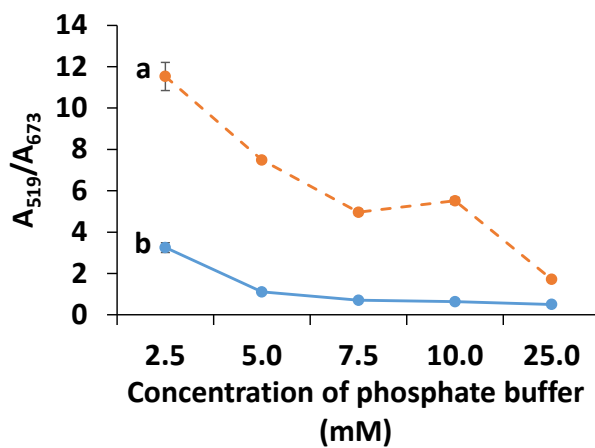


Fig. S7 The effect of phosphate buffer concentration (pH 6.5) (a) Analyte signal ($0.25 \mu\text{M Br}^-$) and (b) Blank signal (no Br^-).

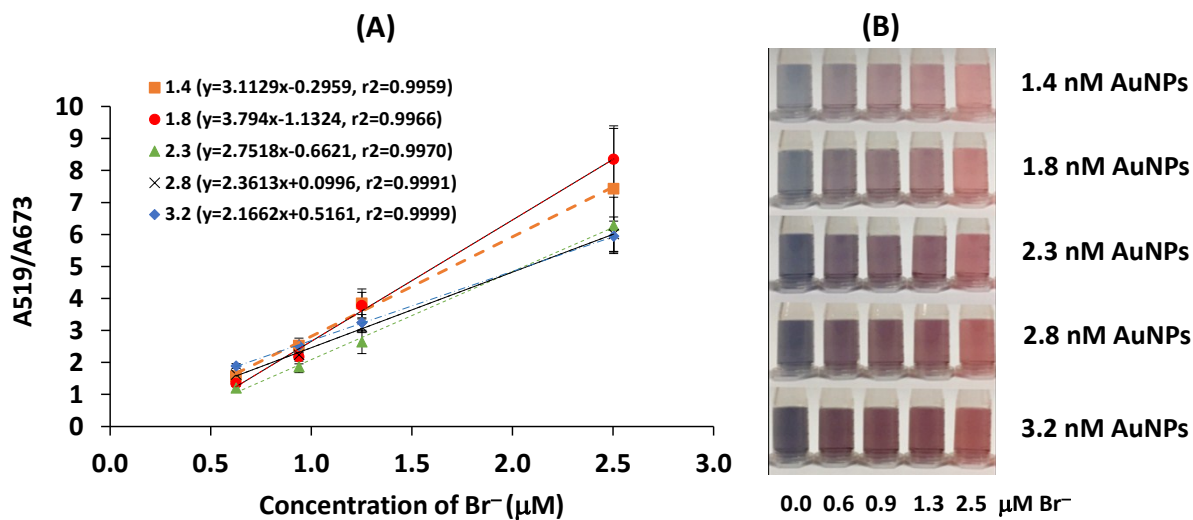


Fig. S8 (A) The effect of concentration of AuNPs on the linearity curve of Br^- concentration ranged from 0.63–2.50 μM and (B) the corresponding solution color at each AuNPs.

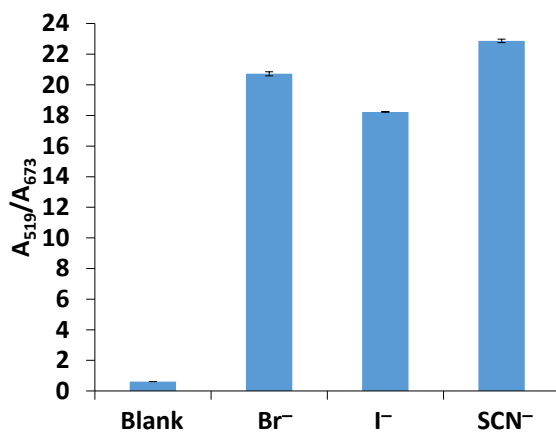


Fig. S9 Effect of 5 M of I^- and SCN^- on selectivity of the detection of 5 M Br^- .

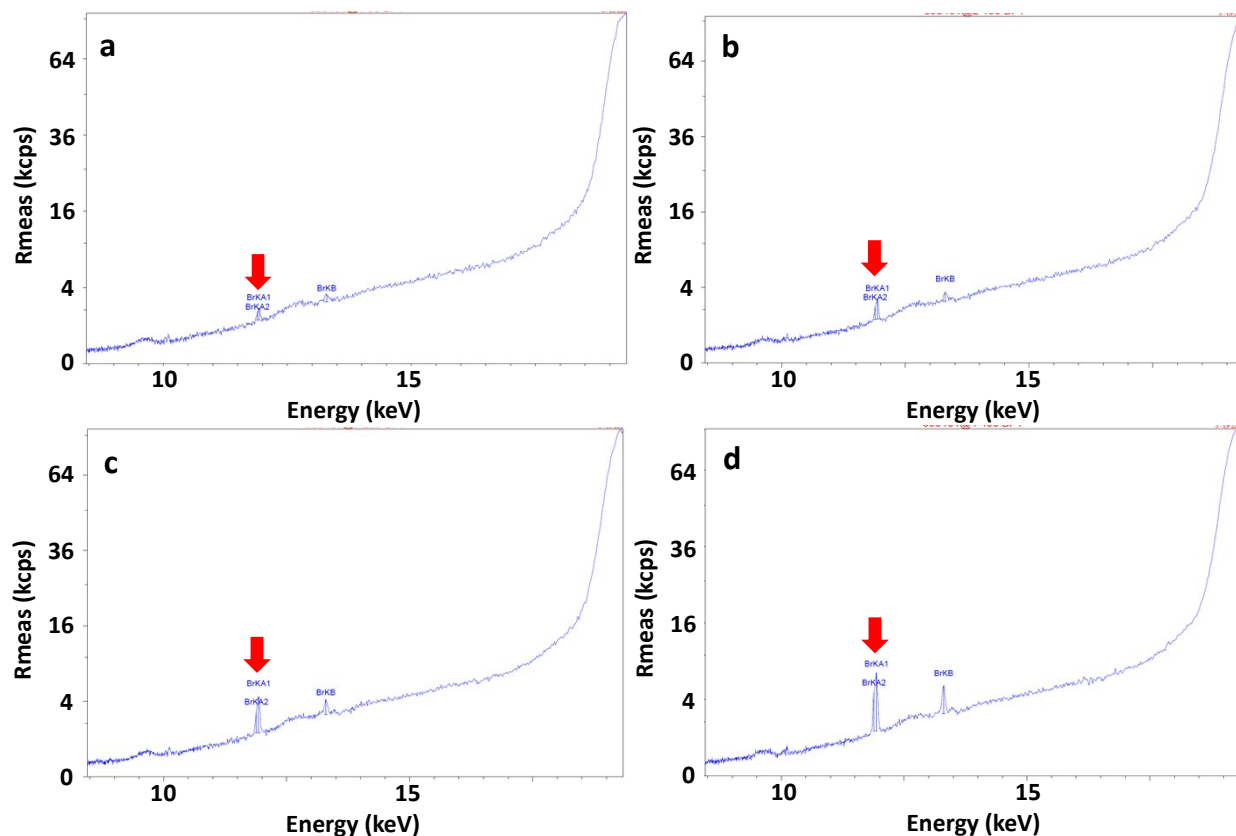


Fig. S10 XRF spectra of sample solutions spiked with (a) 50, (b) 100, (c) 200 and (d) 400 M Br⁻.

Table S1 Comparison of metals detected in rice sample which prepared by different digestion method followed by inductively coupled plasma-optical emission spectrometry (ICP-OES) (n = 3)

Metal	Sample 1 (mg kg ⁻¹) ^a	Sample 2 (mg kg ⁻¹) ^b	Sample 3 (mg kg ⁻¹) ^c
Al	0.0016 ± 0.0001	0.0028 ± 0.0000	1.0808 ± 0.0228
Ca	0.0068 ± 0.0001	0.0067 ± 0.0002	25.4417 ± 0.4185
Cr	0.0005 ± 0.0000	0.0003 ± 0.0000	0.0211 ± 0.0000
Cu	Not detected	Not detected	0.2564 ± 0.0077
Fe	Not detected	Not detected	0.6846 ± 0.0033
K	13.0542 ± 0.0520	13.5542 ± 0.0764	90.5528 ± 6.2761
Mg	0.0455 ± 0.00012	0.0547 ± 0.0007	24.9431 ± 0.3996
Mn	Not detected	Not detected	1.1388 ± 0.0203
Ni	Not detected	Not detected	0.0266 ± 0.0009
P	1.0049 ± 0.0147	0.9815 ± 0.0113	192.3577 ± 3.2884
Se	0.0002 ± 0.0000	0.0002 ± 0.0001	0.3111 ± 0.0156
Zn	Not detected	Not detected	2.3366 ± 0.0235

^arice sample (2.0 g) prepared by digesting with 1% potassium hydroxide in 50% ethanol and ashing for 4 h.

^brice sample (2.0 g) prepared by digesting with 1% potassium hydroxide in 50% ethanol and ashing for 8 h.

^crice sample (1.2 g) prepared by acidic digesting with hydrogen peroxide and hydrochloric acid.