## **Supporting Information**

# Facile preparation Ag nanoparticles by using uric acid and their application in colorimetric detection and catalysis

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| Materials  | Analytes         | Calibration range                                       | Detection<br>limit                         | References |
|--|------------------|---|--|------------|
| fluorescent sensor by combining a<br>novel monoazacryptand type of<br>fluorophore and micelles | Ba <sup>2+</sup> | 1.0 × 10 <sup>-6</sup> M, - 1.0 ×<br>10 <sup>-2</sup> M | 0.24 mM                                    | 1          |
| silver nanoparticles with 6-<br>mercaptonicotinic acid and<br>melamine                         | Ba <sup>2+</sup> | 10 µM to 370 µM   | 80.21 nM                                   | 2          |
| 11-mercaptoundecylphosphonic<br>acid functionalized gold<br>nanoparticles                      | Ba <sup>2+</sup> | 20–120 µМ   | 43.27 μM                                   | 3          |
| G-quadruplex-based fluorescent biosensor   | Ba <sup>2+</sup> | 0–600 nM  | 4 nM                                       | 4          |
| chemosensor organic<br>nanoparticles   | Sr <sup>2+</sup> | 30–300 µМ   | 184 μM                                     | 5          |
| Polyamine based ratiometric fluorescent chemosensor  | Sr <sup>2+</sup> | 0 μM to 1.5 μM  | 9 nM                                       | 6          |
| Chemo-Paper-Sensor   | Sr <sup>2+</sup> | 500 ppm to 100 ppb                                      | 200 ppb                                    | 7          |
| imaging optical fiber microsphere sensor   | Sr <sup>2+</sup> | $6.7 \times 10^{-7}$<br>M to 6.7 ×10 <sup>-4</sup> M    | $3 \times 10^{-8}$ to $8 \times 10^{-8}$ M | 8          |
| UA-Ag NPs  | Ba <sup>2+</sup> | 1 nM-50 μM  | 52.1 nM                                    | This work  |
| UA-Ag NPs  | Sr <sup>2+</sup> | 0.003-1 μM  | 27.5 nM                                    | This work  |

# $\begin{array}{c} \textbf{Table S1} \ Comparison \ between \ proposed \ sensor \ and \ previously \ reported \ literature \\ values \ for \ Ba^{2+} \ and \ Sr^{2+} \ ions \ detection. \end{array}$

#### **Reference:**

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| Species of<br>ions      | $\mathrm{Cd}^{2+}$ | Cu <sup>2+</sup> | Mn <sup>2+</sup> | Ni <sup>2+</sup> | Fe <sup>2+</sup> | Zn <sup>2+</sup> | Pb <sup>2+</sup> | Cr <sup>3+</sup> | Hg <sup>2+</sup> | Ba <sup>2+</sup> | Sr <sup>2+</sup> |
|-------------------------|--------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|
| Concentration<br>(nM/L) | 265.1              | 278.9            | 879.7            | 403.0            | 172.4            | 891.1            | _                | _                | _                | _                | _                |



**Fig. S1** The selectivity of detection: (a) UV-vis spectra of UA-Ag NPs with 50  $\mu$ M of metal ions, (b) The A<sub>520/A410</sub> values of UA-Ag NPs with 50  $\mu$ M of different metal ions and corresponding photo images of all samples (A520 and A410 represented the absorbance of UA-Ag NPs at 520 nm and 410 nm, respectively).



**Fig. S2** The sensitivity of detection for  $Ba^{2+}$  (a) The LSPR spectra of UA-Ag NPs with various concentrations of  $Ba^{2+}$  (0.001–50  $\mu$ M), (b) Corresponding photo images of UA-Ag NPs with various concentrations of  $Ba^{2+}$ .



**Fig. S3** The sensitivity of detection for  $Sr^{2+}$ , (a) The SPR spectra of UA-Ag NPs with various concentrations of  $Sr^{2+}$  (0.001–50  $\mu$ M), (b) Corresponding photo images of UA-Ag NPs with various concentrations of  $Sr^{2+}$ .



**Fig. S4.** The UV-vis characteristic peaks of freshly prepared 4-nitrophenol and 4-nitrophenolate ion aqueous solution at 317 and 400 nm, respectively.



**Fig. S5.** (a) Absorption spectra of aqueous mixture solutions of -NTP and NaBH<sub>4</sub> at different concentrations of 4-NTP. (b) Plot of the peak absorbance against the concentration of 4-NTP.

Table S3 The reduction of nitrophenols in the presence of different quantity of UA-

| Nitrophenols            | Amount of nitrophenols | Amount of<br>NaBH4 | Rate constant (K)                     |
|-------------------------|------------------------|--------------------|---------------------------------------|
| 2-nitrophenol<br>(2-NP) | 0.01 M, 90 uL          | 0.5 M , 600 μL     | 7.3×10 <sup>-2</sup> s <sup>-1</sup>  |
| 3-nitrophenol<br>(3-NP) | 0.01 M, 150 uL         | 0.5 M, 1 mL        | 1.76×10 <sup>-2</sup> s <sup>-1</sup> |
| 4-nitrophenol<br>(4-NP) | 0.01 M, 25 uL          | 0.5 M, 200 μL      | $1.6 \times 10^{-2} \text{ s}^{-1}$   |

## Ag NPs as catalyst.