

Supplementary Material (ESI) for Analyst
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Supporting Information

**Click Synthesis of Podands Triazole-linked Gold Nanoparticles as Highly
Selective and Sensitive Colorimetric Probes for Lead (II) ions**

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Synthesis of 2-azidoethanol (AZE)

A suspension of 2-chloroethanol (1.61 g, 0.02 mol) and NaN₃ (2.60 g, 0.04 mmol) in DMF (20 mL) was stirred for 5 h at 90 °C. The mixture was cooled and then diluted with ethyl acetate (20 mL) and washed with water (3 × 10 mL). The organic phase was dried over magnesium sulphate, filtered and the solvent was removed under reduced pressure to afford the product 2-azidoethanol (AZE). IR: 2110(-N₃), 2935, 2874(-CH₂-) cm⁻¹.

Synthesis of 2-(2-(2-aminoethoxy)ethoxy)ethanol (AEE)

To a stirring solution of 2-(2-(2-azidoethoxy)ethoxy)ethanol (175 mg, 1 mmol) in fresh THF at room temperature was added PPh₃ (577 mg, 2.2 mmol). The mixture was stirred for 5 h and then added water (0.02 mL). 1 M HCl was used to regulate the solution until the value of pH is 2. The solution was extracted by Et₂O (3 × 10 mL). Then the aqueous layer was regulated to pH=11 by 1 M NaOH solution. The solution was extracted by Et₂O (3 × 10 mL) and the combined organic layers were dried over K₂CO₃ and then concentrated under reduced pressure to afford the colorless liquid product 2-(2-(2-aminoethoxy)ethoxy)ethanol (AEE). IR: 3366, 3216(-NH₂), 2871, 1120(C-O) cm⁻¹.

Preparation of AZE-Au NPs

2-azidoethanol (0.5 mL, 10⁻³ M) was added to PA-Au NPs colloids (100 mL) in the condition of mixture of CuSO₄ and sodium ascorbic stirring for 3 h at 60°C, then the 2-azidoethanol modified Au NPs (AZE-Au NPs) were obtained. The synthesized

AZE-Au NPs were purified by centrifugation and redispersion in water twice. The particle concentration of the Au NPs (ca. 68.18 nM) was determined.¹

Preparation of AEE-Au NPs

100 mL aqueous solution of HAuCl₄ (1 mL, 8.9 mg/mL) and 2-(2-(2-aminoethoxy)ethoxy)ethanol (10⁻³ M, 0.5 mL) which had been ultrasonic with CS₂ stoichiometry, were mixed stirring for 20 min, then the HAuCl₄ was reduced by fresh sodium borohydride solution (NaBH₄, 1 mL, 4 mg/mL). After addition of NaBH₄, stirred the gold colloidal solution for 2 h at room temperature to obtain 2-(2-(2-aminoethoxy)ethoxy)ethanol modified Au NPs (AEE-Au NPs). The synthesized AEE-Au NPs were purified by centrifugation and redispersion in water twice. The particle concentration of the Au NPs (ca. 62.73 nM) was determined.¹

Supplementary figures

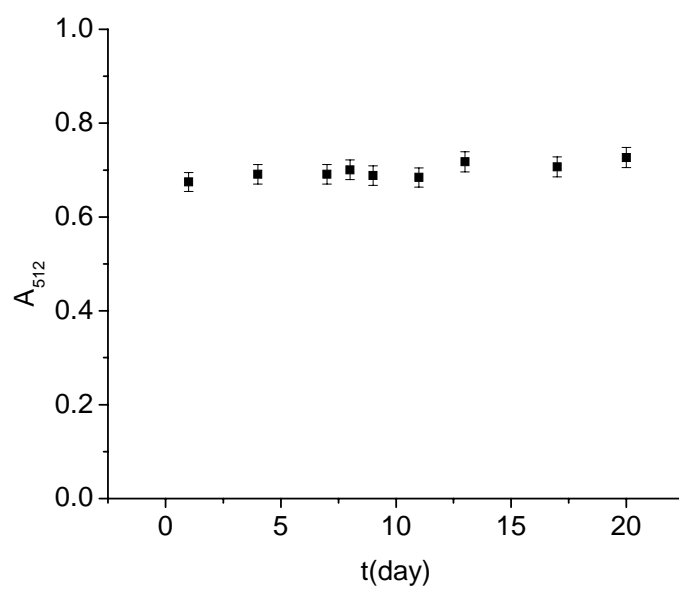


Fig. S1 UV-vis absorption values of OEG-Au NPs at 512 nm by days.

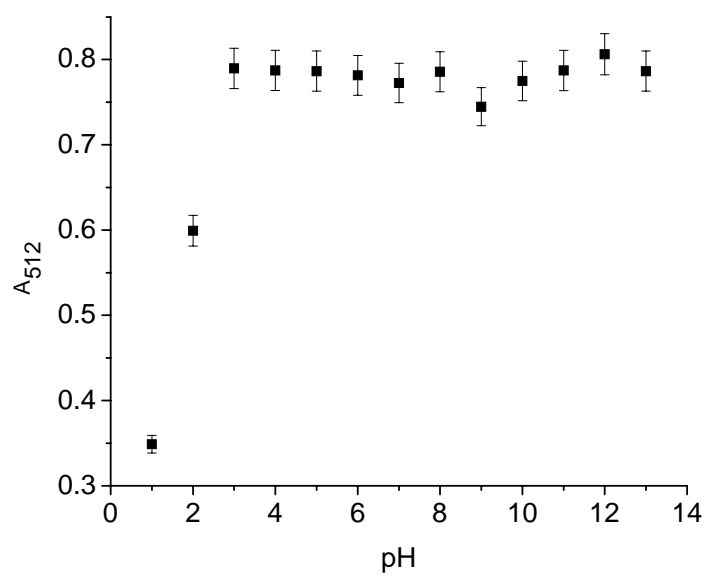


Fig. S2 UV-vis absorption values of OEG-Au NPs affected by different pH at 512 nm.

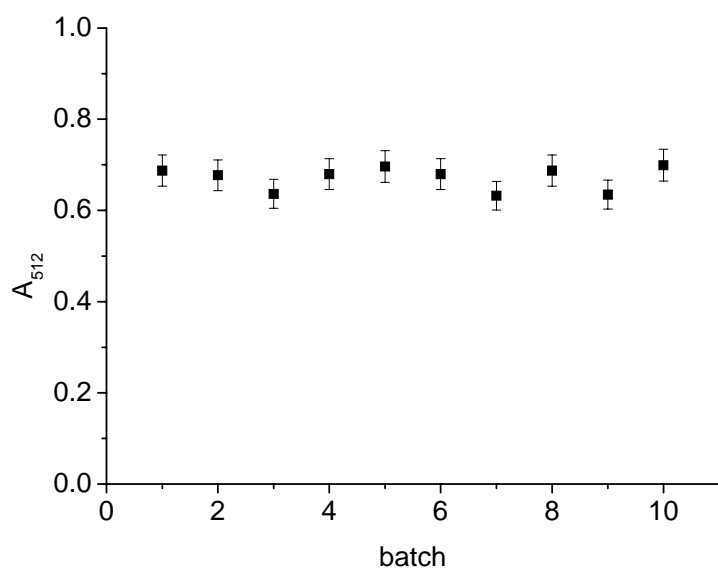


Fig. S3 UV-vis absorption values of 10 batches of OEG-Au NPs at 512 nm.

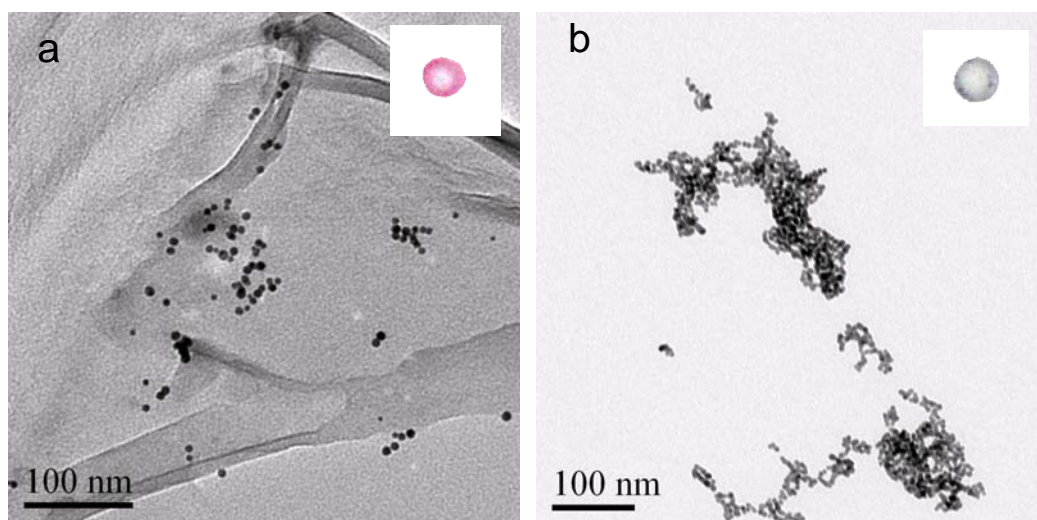


Fig. S4 TEM images and the colours of dispersed OEG-Au NPs (a), and addition of Pb^{2+} (b), respectively. The final concentration of Pb^{2+} in the aggregated Au colloid is $14 \mu\text{M}$.

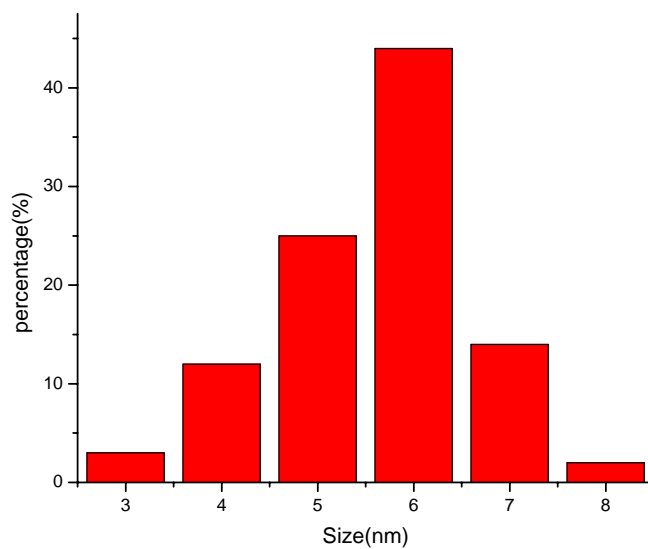


Fig. S5 The size distribution of OEG-Au NPs. 100 particles are measured to get the size distribution.

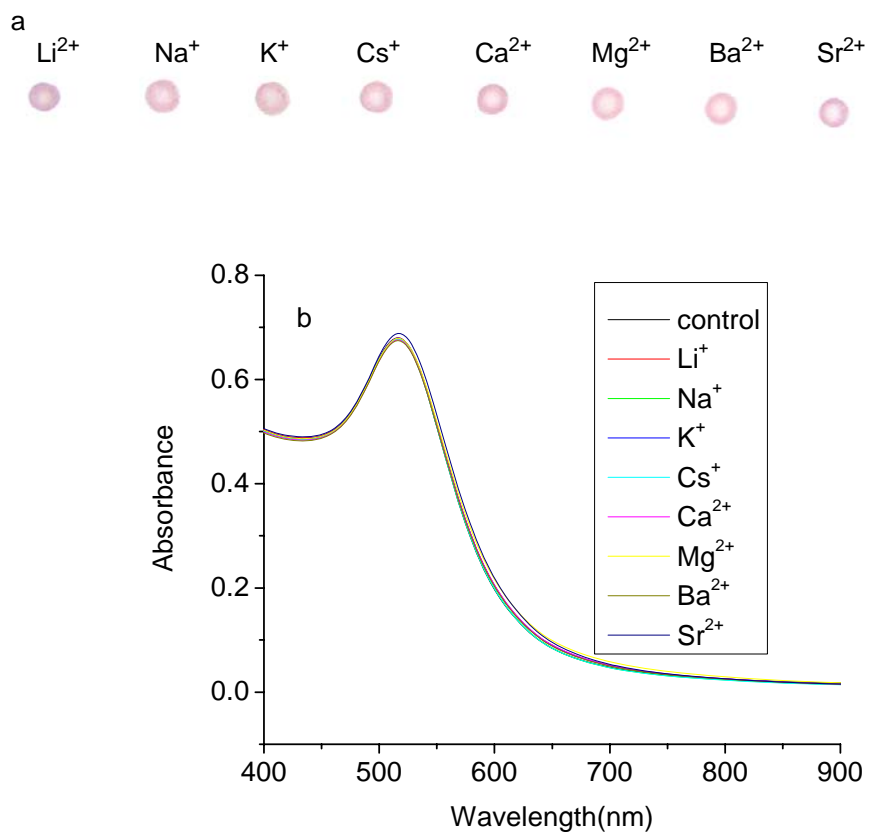


Fig. S6 The colors (a) and UV-vis spectra (b) of 1.5 mL OEG-Au NPs after adding 0.25 mL of 10^{-4} M alkali metal and alkaline earth metal ions.

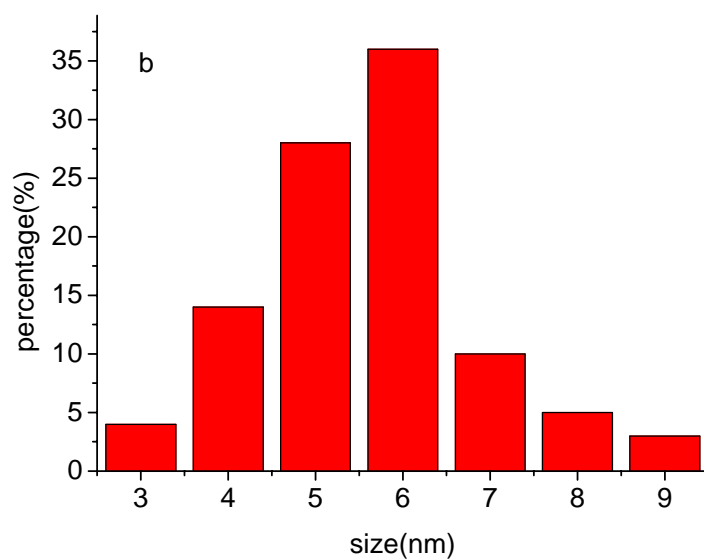
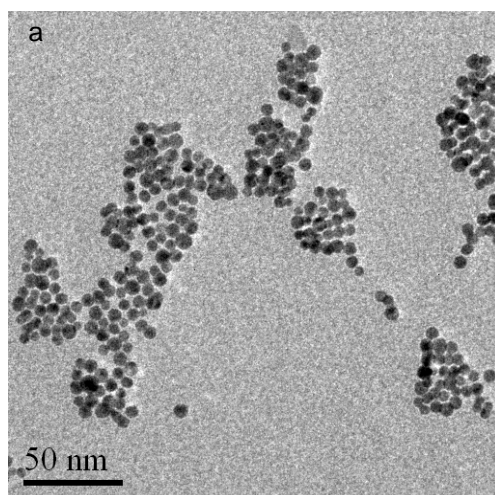


Fig. S7 TEM image (a) and the size distribution (b) of dispersed AZE-Au NPs. 150 particles are measured to get the size distribution.

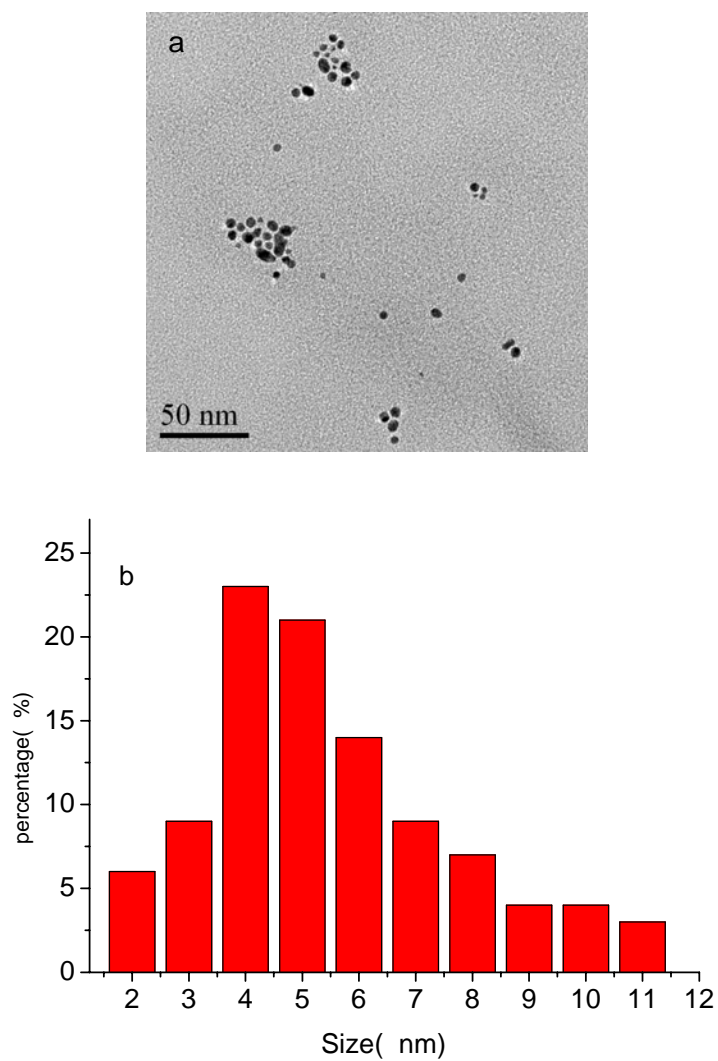


Fig. S8 TEM image (a) and the size distribution (b) of dispersed AEE-Au NPs. 100 particles are measured to get the size distribution.

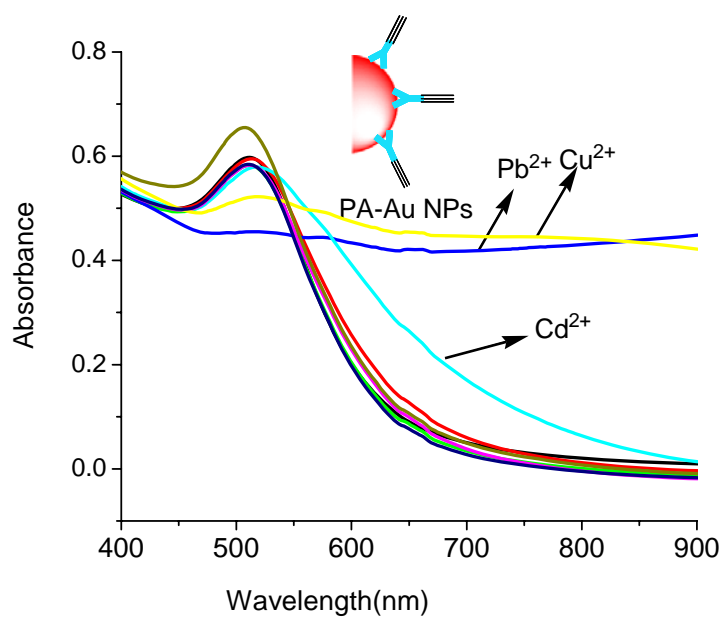


Fig. S9 UV-vis spectra of 1.5 mL PA-Au NPs colloids after adding 0.25 mL of 10^{-4} M transition metal ions.

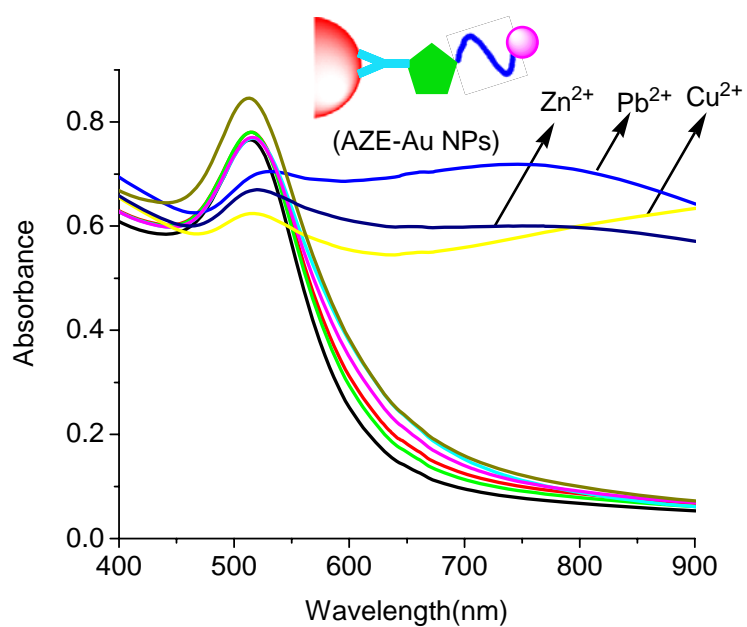


Fig. S10 UV-vis spectra of 1.5 mL AZE-Au NPs colloids after adding 0.25 mL of 10^{-4} M transition metal ions.

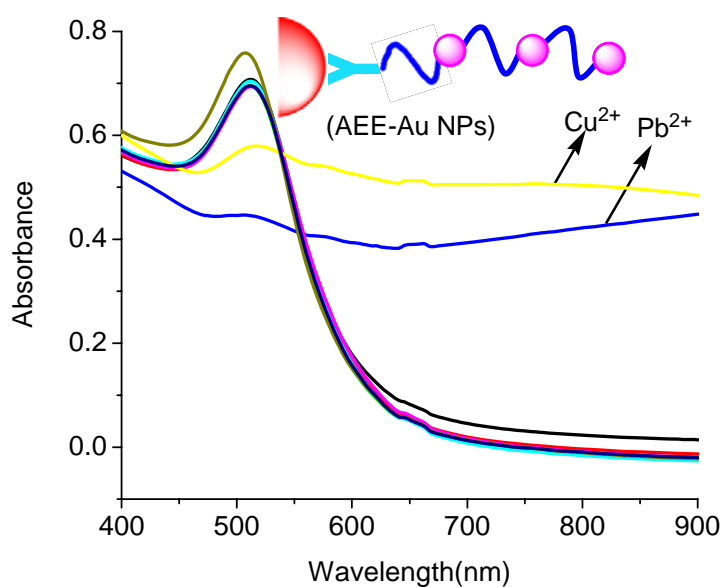


Fig. S11 UV-Vis spectra of 1.5 mL AEE-Au NPs colloids after adding 0.25 mL of 10^{-4} M transition metal ions.

Reference

- 1 M. M. Maye, L. Han, N. N. Kariuki, N. K. Ly, W. B. Chan, J. Luo and C. J. Zhong, *Analytica Chimica Acta*, 2003, **496**, 17-27.