Chiral colorimetric recognition of amino acids based on silver nanoparticle clusters

Materials and reagents:

All chemicals and solvents unless otherwise specified were analytical grade, and distilled water were used throughout. $AgNO_3$ and $NaBH_4$ were purchased from Shanghai Chemical. Factory China. All amino acids were obtained from Beijing Chemical Corp. (Beijing, China) and standards were dissolved in distilled water and stored at room temperature.

Characterization:

The morphology and size of L-Arg-ZnTPPS-Ag NPs were characterized by transmission electron microscopy (TEM) by a Philips TecnaiG2 TEM using an accelerating voltage of 200kV. The UV-visible (UV-*vis*) absorption spectra were taken at room temperature on a UV-2501 spectrophotometer (SHIMADZU CORPORATION) with a variable wavelength between 200 and 1000 nm using a glass cuvette with 1 cm optical path.

Preparation of L-Arg-ZnTPPS-Ag NPs:

1 mL of 10 mM concentrated aqueous solution of silver nitrate ($AgNO_3$) was added into 96 mL distilled water, then reduced by 12 mg of sodium borohydride ($NaBH_4$) at room temperature to yield colloidal silver particles. Then 1 ml of 1 mM concentrated aquesous solution of sulfonated-substituted zinc tetraphenylporphyrin[1] (ZnTPPS) was added rapidly into solution and stirred for another 2 h at room temperature. The synthesized ZnTPPS-Ag NPs were centrifuged at 3000 rpm for 10 min and dispersed in distilled water. This centrifugation and dispersion procedure was repeated three times. The purified ZnTPPS-Ag NPs (0.1 mM) were used directly in the next step. Then 1 μL of 1 mM L-Arg was added into 100 ml ZnTPPS-Ag NPs, the color of nanoparticle solution turn golden yellow to brown yellow, then the reaction mixture was centrifuged at 3000 rpm for 10 min for three times, the dispersed in distilled water to get L-Arg-ZnTPPS-Ag NPs.

Colorimetric test:

The colorimetric tests of L-Arg-ZnTPPS-Ag NPs responding to *D*-His and *L*-His were operated as follows: 0.5 mL of 10^{-3} M solution of various amino acids was added to 1.5 mL of L-Arg-ZnTPPS-Ag NPs and after combining 10 min, the solutions were test.

Supplementary figures

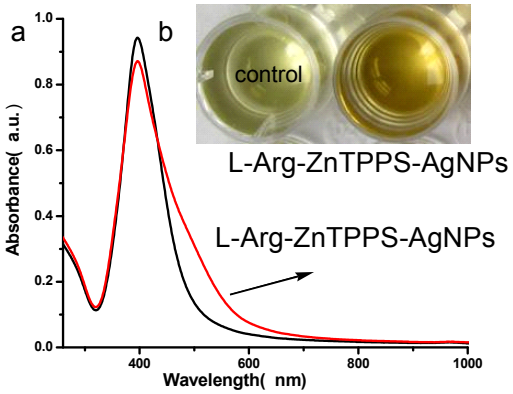

Fig. S1 (a) UV-*vis* spectra of ZnTPPS-Ag NPs and L-Arg-ZnTPPS-Ag NPs (b) Photographic images of ZnTPPS-Ag NPs and L-Arg-ZnTPPS-Ag NPs solutions.

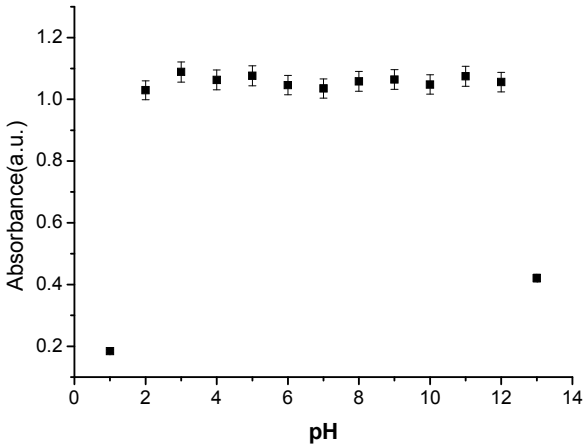

Fig. S2 The stablity of silver nanoparticle clusters (L-Arg-ZnTPPS-Ag NPs) solution with various pH value.(The wavelength is 400 nm)

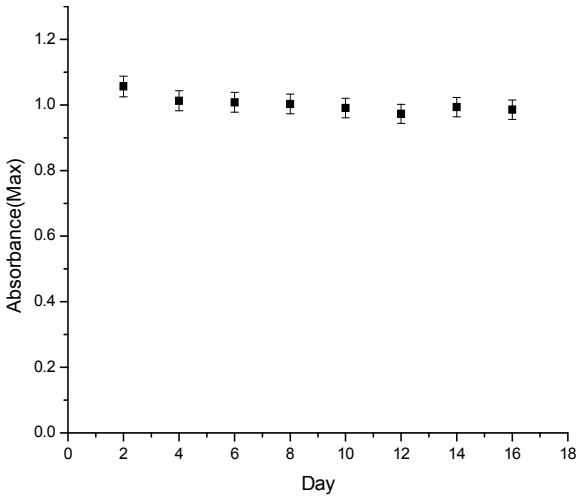

Fig. S3 The stablity of silver nanoparticle clusters (L-Arg-ZnTPPS-Ag NPs) solution stored at room temperature for 16 days.

Fig. S4 The color changed of L-Arg-ZnTPPS-Ag NPs solutions after adding different amino acids (control, His, Phe, Tyr, Met and Glu)

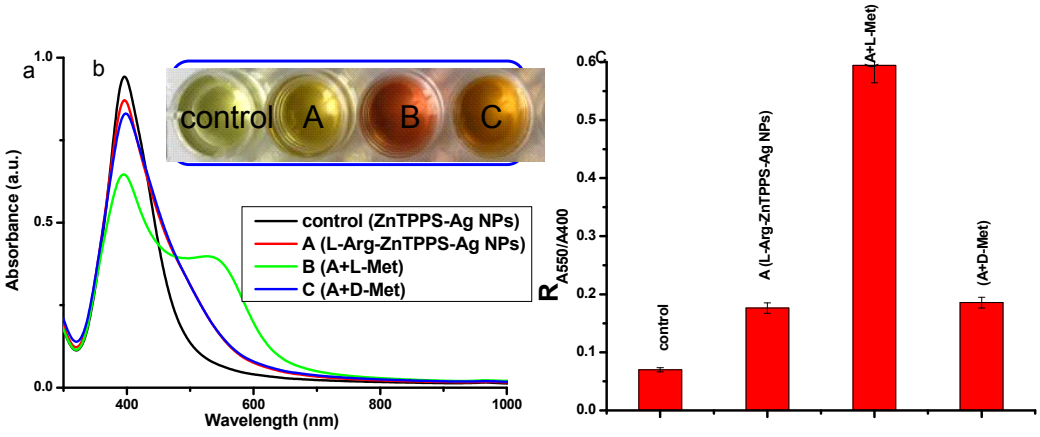

Fig. S5 L-Arg-ZnTPPS–Ag NPs response to D- or L-Met in the item of (a) UV-*vis* absorption spectra, (b) Photographic images and (c) the value of A_{550}/A_{400}. It's operated as follows: 0.5 mL of 1 mM solution of D- or L-Met was added to 1.5 mL

L-Arg-ZnTPPS–Ag NPs solutions and mixed for 10 min before measuring, respectively

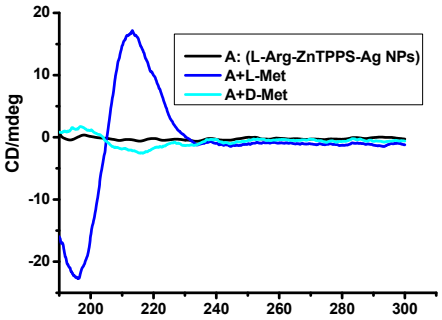

Fig. S6. CD spectra of L-Arg-ZnTPPS-Ag NPs solutions after adding D-Met and L-Met and

References

[1] J. Petersson, M. Eklund, J. Davidsson, L. Hammarstrom, *J. Am. Chem. Soc.* **2009**, *131*, 7940.