Supplementary material

A highly sensitive colorimetric sensing platform based on silver nanocomposites for alkaline phosphatase

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S1 Materials

$AgNO_3$ and sodium hydroxide were obtained from Shanghai Chemical Reagent Co., Ltd. (Shanghai. China). Amino acids were purchased from Sangon Biotech Co., Ltd. (Shanghai, China). Analytical grade $CHCl_3$, HCl, Tris, and methanol were supplied by Tianjin Kermel Chemical Reagent Co., Ltd (Tianjin, China). ALP was purchased from Sigma (Shanghai, China). ALP (alkaline phosphatase), ascorbic acid 2-phosphate (AA2P), horseradish peroxidase (HRP), acetylcholinesterase (AChE), human Serum Albumin (HSA), and immunoglobulin G (IgG) were purchased from Sangon Biotech Co., Ltd. (Shanghai, China). All the reagents were used as received without further treatment. The deionized water was prepared by Lakecore ultrapure water system (OKP-S210, Shanghai laikie instrument Co., Ltd. Shanghai, China) and used throughout the experiment. Human serum was supported by the first hospital of additional of Lanzhou University and treated follow the in accordance with the ‘Guide of the Care and Use of Laboratory Animals’ approved by the Ethics Committee of Experimental Animals of Lanzhou University.

S2 Instrumentations

UV-Vis spectra were recorded by an UV-Vis spectra analyzer (PerkinElmer, USA). The detection of ALP was carried out on an enzyme analyzer, LeiDu RT-6100, (Shenzhen. China). The optical photographs were taken by a Huawei mobile phone digital camera (Shenzhen. China). Transmission electron microscope (TEM) was used to monitor CQDs-silver NPs, which was carried out on an H-7500 (Hitachi, Japan) operating at a 80 kV accelerated voltage. The enzyme operation was performed in Shi-

ping constant temperature shaker (Shanghai. China). (transfer in SI)

S3 Synthesis of CQDs and CQDs-silver NPs

The CQDs were synthesized by hydrothermal treatment with dried Lily flower as references [*Anal. Chem., 86, 6689-6694; Sens. Actuators B Chem., 260, 808–815.*]. The obtained solid CQDs was stored in refrigerator at 4^{o}C. The used solid CQDs for preparation CQDs-silver NPs was dissolved in pure water. CQDs-silver NPs synthesis was processed as the follow: At first, a certain amount of $AgNO_3$ (3μL, 10 mM), CQDs (10 μL, 0.80 mg mL^{-1}), and pure water (167 μL) were added into one tube, and later on, a certain volume of NaOH (20 μL,0.1 M) was added into the above tube, and finally, the mixture was incubated to grow CQDs-silver NPs at a high temperature 50 ^{o}C for 30 minutes.

S4 The preparation of the goji berry extract

The air-dried goji berry (0.3 kg) was powdered and extracted three times with 60% ethanol aqueous at 60^{o}C (12 h every times). Evaporation of solvent (under vacuo) gave the condensed extract solution 300 mL. Following, the condensed extract was submitted to D101 column, eluting with a water-ethanol gradient system (pure water, 3:7, 6:4, 9:1, v/v, and pure ethanol). The eluting fractions were respectively marked as A, B, C, D, and E, and then dried under vacuo.

S5 Screening of ALP inhibitors from *Lycium barbarum*

In detail, 20 μL of goji extracts (ranging from 0 to 120 μg/mL) was added; and then, 1 U L^{-1} ALP and 1.0 mM AA2P was added into the enzyme cell and incubated at 37 °C for 30 min, after the enzyme reaction, various of reagents including $AgNO_3$ (3.0 μL, 10 mM), CQDs (10 μL 0.80 mg mL^{-1}), NaOH (20 μl, 0.1 M) was added into the above

solution at 50 °C for 30 min for Ag NPs preparation. Finally, the resulting solutions were analyzed at wavelengths of 405 nm and 630 nm.

S6 Assay of human serum sample.

1.0 μl, serum and 1.0 mM AA2P was added into the enzyme cell and incubated at 37 °C for 30 min, after the enzyme reaction, various of reagents including $AgNO_3$ (3.0 μL, 10 mM), CQDs (10 μL 0.80 mg mL^{-1}), NaOH (20 μl, 0.1 M) was added into the above solution at 50 °C for 30 min for Ag NPs preparation. Finally, the resulting solutions were analyzed at wavelengths of 405 nm and 630 nm.

Figure S1. The TEM image of CQD

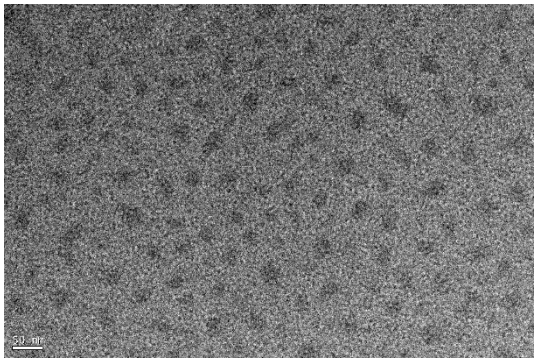

Figure S2. The TEM images of Ag NPs (at the absence of AA, scale bar 20 nm) a, Ag NPs(at the presence of AA) b (scale bar 50 nm) and C (scale bar 20 nm), the photo of Ag NPs preparation by different conditions d.

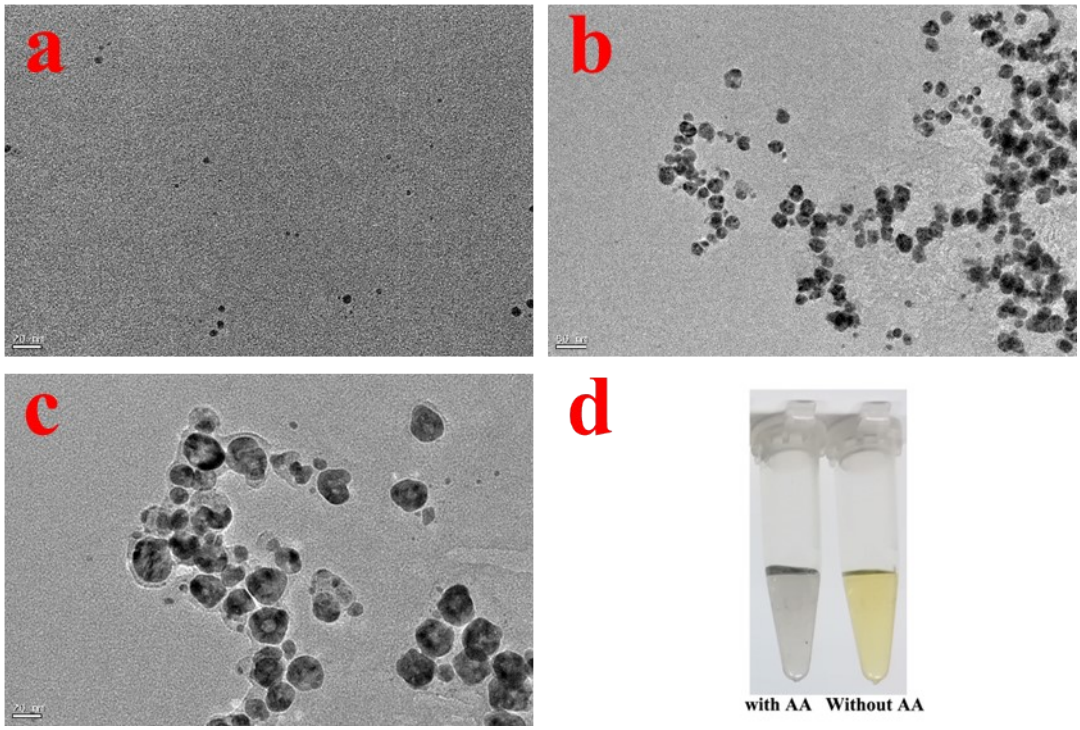

Figure S3. The photos of Ag NPs: blank, A, at the presence of AA, B, addition 1mM AA into blank C, and 5 mM AA addition into blank, D.

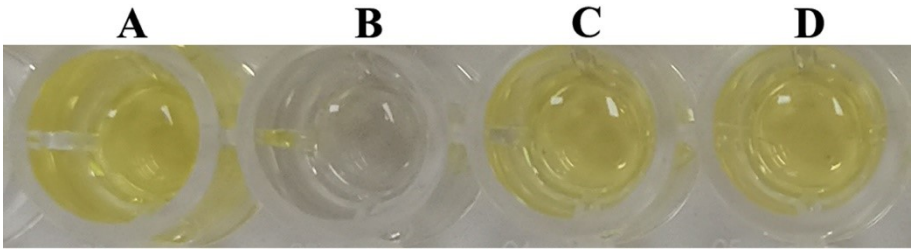

Figure S4. The screening of ALP inhibitors from goji berry extracts.

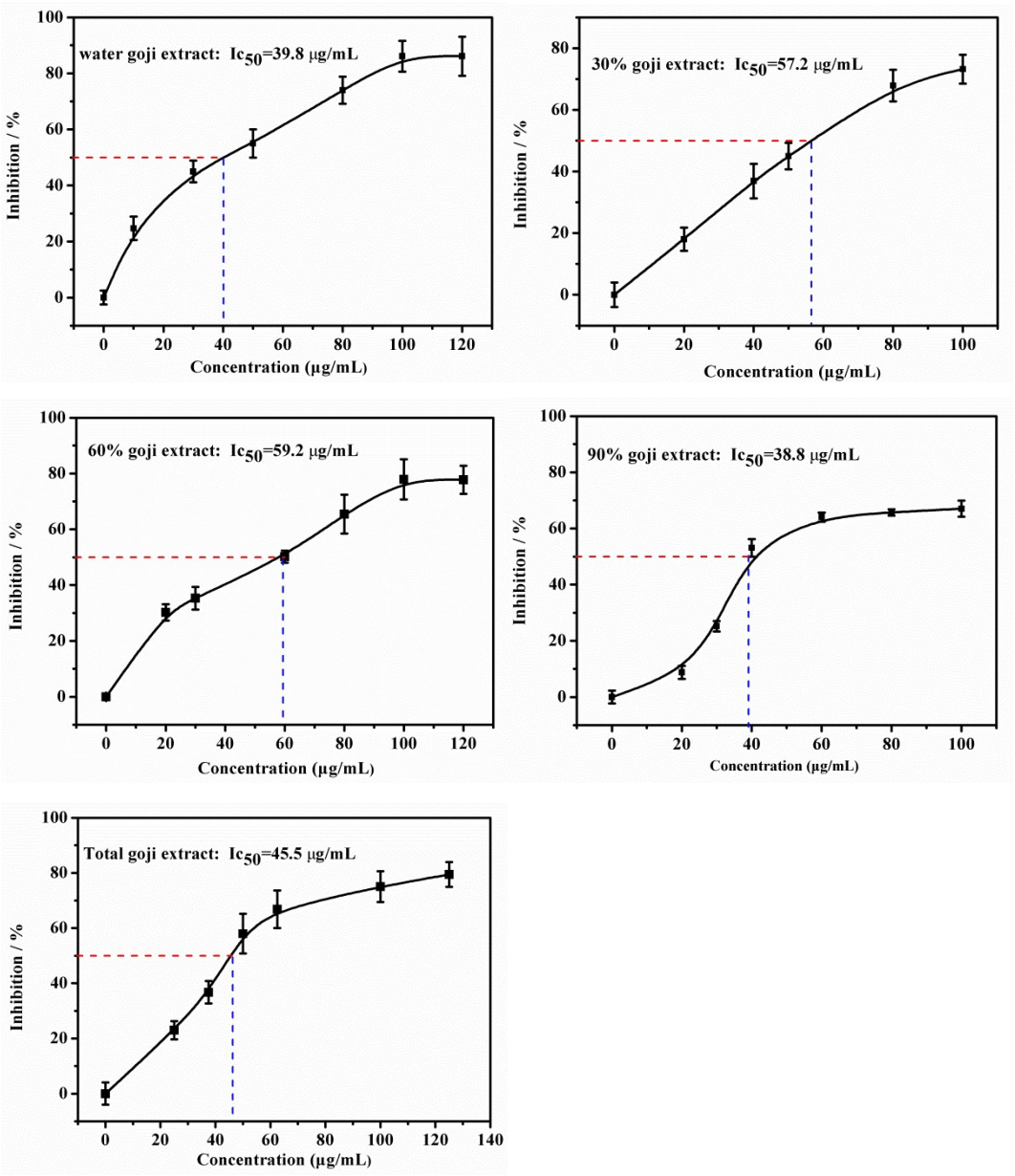

Table S1. The assay of ALP in serum samples.

Samples	Founded(U/L)	RSD(*n*=3)
1	102.37	1.78
2	58.59	2.89