# Supporting Information for

# Practical immune-barometer sensor for trivalent Chromium Ions detection using gold core platinum shell nanoparticles Probes

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## 1. The amount of mAb-MBs added optimization

The procedures of optimized the amount of anti-Cr(III)-EDTA mAb - MBs were as follows: For positive control, 1 μL, 2 μL, 4 μL, 6 μL and 8 μL anti-Cr(III)-EDTA mAb - MBs were mixed with 100 μL 20 ng. $mL^{-1}$Cr(III) solution in 0.5 mM EDTA reagent diluent. Then, 5 μL Cr(III)-EDTA-BSA-Au@PtNPs were added into the solution. For negative control, 1 μL, 2 μL, 4 μL, 6 μL and 8 μL anti-Cr(III)-EDTA mAb - MBs were mixed with 100 μL PBS buffer and 5 μL Cr(III)-EDTA-BSA-Au@PtNPs were added. After washing, 200 μL of 30% $H_2O_2$ were added and measured the pressure change by barometer. The ratio of negative and positive values with different amount of anti-Cr(III)-EDTA mAb - MBs was calculated.

## 2. Au@PtNPs labeled Cr(Ⅲ)-EDTA-BSA optimization

1 μL, 2 μL, 3 μL, 4 μL, 5μL and 6 μL 1mg/mL Cr(III)-EDTA -BSA were used to label 1 mL Au@PtNPs respectively. For positive control, 4 μL anti-Cr(III)-EDTA mAb - MBs were mixed with 100 μL 20 ng. mL-1 Cr(III) solution in 0.5 mM EDTA reagent diluent. Then, 5 μL Cr(III)-EDTA-BSA-Au@PtNPs were added into the solution. Cr(III)-EDTA-BSA-Au@PtNPs were added into the solution. For negative control, 4 μL anti-Cr(III)-EDTA mAb - MBs were mixed with 100 μL PBS buffer and 5 μL Cr(III)-EDTA-BSA-Au@PtNPs were added. After washing, 200 μL of 30% H2O2 were added and measured the pressure change by barometer. The ratio of negative and positive values with different amount of mAb labeled Au@PtNPs was calculated.

## 3. enzyme-linked immunosorbent assay (ELISA) for Cr(III) detection

In a typical experimental procedure, 100 μL of 10 μg/mL Cr(Ⅲ) antibody was first bound to a 96-well microplate well and incubated overnight at 4℃. Then, each well was washed three times with 300 μL Wash Buffer (0.05% Tween20 in PBS) and the remaining wash buffer was removed by inverting 96-well microplate well to blot it against clean paper towels each time. After that, 300 μL 1% BSA in PBS was added to block each well, incubated for 1 h at room temperature, and washed three times. A 100-μL aliquot of Cr (Ⅲ) solution (0, 0.5, 1, 2, 4, 8, 16, 32, 64, 128 and 256 ng/mL) in 0.5 mM EDTA Reagent Diluent was added to the well. Subsequently, 100 μL of 0.2 μg/mL Cr(Ⅲ)-EDTA-BSA -HRP was added and incubated for 1 h at room temperature. After repeated washing three times, 100 μL TMB substrate was add each well, incubated for 10 min in the dark at room temperature, and then 50 μL of 2 M $H_2SO_4$ were added to stop the reaction. The result was analyzed by ultraviolet–visible spectrophotometer.

## Result

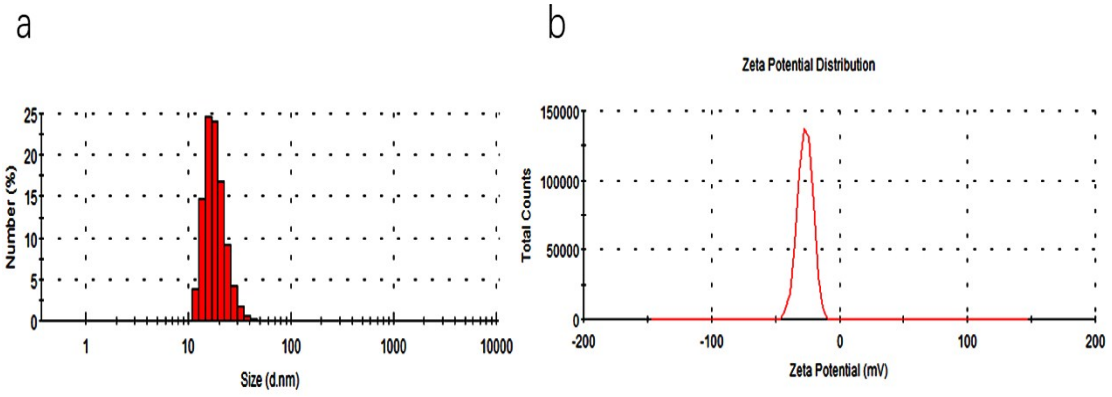


Fig. S1. a). The size distribution of Au@PtNPs by DLS. b). The zeta potential of Au@PtNPs.

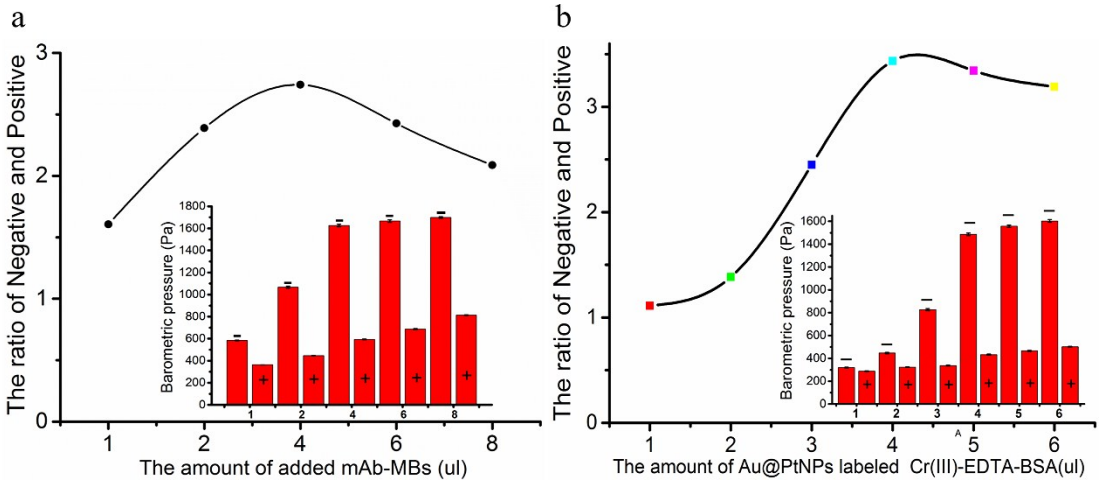


Fig. S2. a). Optimized the amount of added mAb-MBs optimization. b) Optimized the amount of Au@PtNPs labeled Cr(III)-EDTA-BSA.

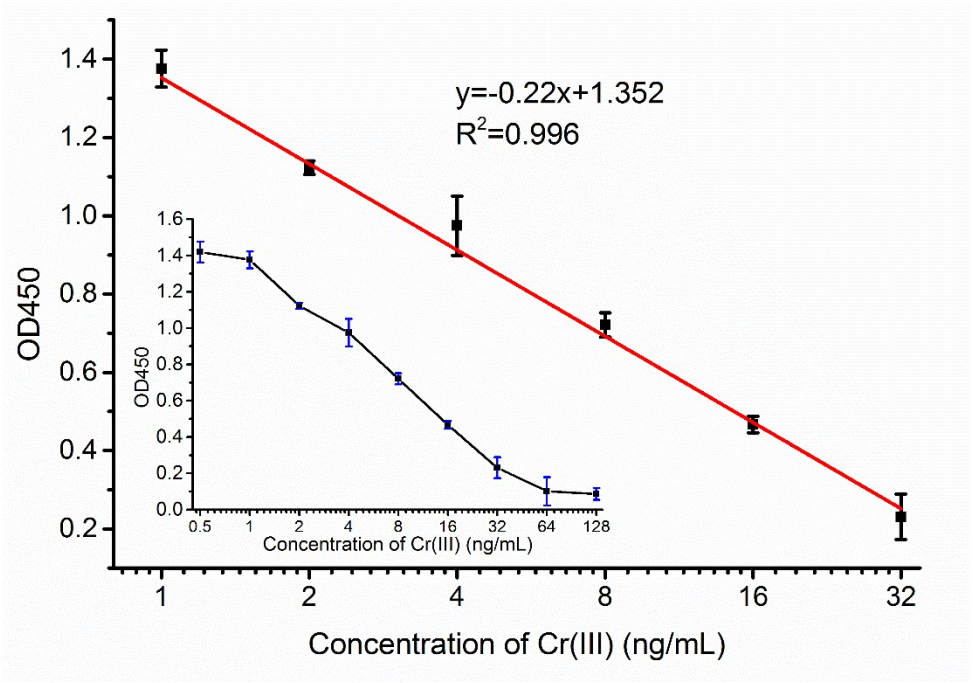


Fig. S3). The dynamic range and calibration curve of ELISA for Cr(III) detection ($R^2$=0.996). Each value presents the mean from 3 independent experiments (n = 3).

Table S1. Intra-Assay and Inter-Assay Precision.

| | Spiked concentrations (ng. $mL^{-1}$) | Measured Value (Mean, ng. $mL^{-1}$) | SD | CV (%) |
|---|---|---|---|---|
| Intra-Assay Precision | 2.5 | 2.536 | 0.091 | 3.6 |
| Inter-Assay Precision | 2.5 | 2.452 | 0.213 | 8.7 |
| Intra-Assay Precision | 10 | 10.397 | 0.551 | 5.3 |
| Inter-Assay Precision | 10 | 9.762 | 1.093 | 11.2 |
| Intra-Assay Precision | 20 | 19.51 | 0.936 | 4.8 |
| Inter-Assay Precision | 20 | 19.14 | 1.971 | 10.3 |

Notes: CV (%) is calculated from SD /Mean. (n = 3). SD: Standard deviation. CV: Coefficient of variation