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# A highly sensitive colorimetric probe for $\text{Cd}^{2+}$ 、 $\text{Hg}^{2+}$ and ascorbic acid determination based on trithiocyanuric acid-AuNPs

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## Abstract

A highly sensitive and selective colorimetric assay is proposed for the detection of mercury ions ( $\text{Hg}^{2+}$ ), cadmium ions ( $\text{Cd}^{2+}$ ), and ascorbic acid (AA) using trithiocyanuric acid (TMT) functionalized gold nanoparticles (TMT-AuNPs). TMT-AuNPs are dispersed in 40 mM NaCl solution, while the presence of  $\text{Hg}^{2+}$  and  $\text{Cd}^{2+}$  can induce TMT-AuNPs aggregate due to the strong interaction of  $\text{Hg}^{2+}$  and  $\text{Cd}^{2+}$  with TMT. Then the quantitative detection of  $\text{Hg}^{2+}$  and  $\text{Cd}^{2+}$  can be realized in the linear range from  $5 \times 10^{-9}$  to  $1 \times 10^{-6}$  M and  $1 \times 10^{-8}$  to  $3 \times 10^{-7}$  M, with a lower detection limit of 2.8 nM for  $\text{Hg}^{2+}$  and 3.5 nM for  $\text{Cd}^{2+}$  (S/N=3), respectively. To distinguish  $\text{Hg}^{2+}$  from  $\text{Cd}^{2+}$ , a reductive biological small molecule ascorbic acid (AA) was used based on the different redox interaction of AA with  $\text{Hg}^{2+}$  and  $\text{Cd}^{2+}$ . When the mixture of AA and  $\text{Hg}^{2+}$  was added into TMT-AuNPs solution, the state of

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