Supplementary Information

Figure S1. The UV spectrum of 10 nm and 20 nm AgNPs.

![UV spectrum graph](image1)

Figure S2. Hydrodynamic diameters of 10 nm AgNPs-S2, 20 nm AgNPs-S1 and asymmetric AgNP dimers

![Hydrodynamic diameters graph](image2)
**Figure S3.** The UV signals under different concentrations of Pb$^{2+}$(0, 0.05, 0.1, 0.5, 1, 2, 5 and 10 ng·mL$^{-1}$), and the mix of 10 nm and 20 nm AgNPs without assembly are shown.

**Figure S4.** Hydrodynamic diameters at different concentrations of Pb$^{2+}$(0.05, 0.1, 0.5, 1, 2, 5 and 10 ng·mL$^{-1}$).
Figure S5. CD spectral change on the determination of Pb$^{2+}$ and other metal ions (Mn$^{2+}$, Zn$^{2+}$, Mg$^{2+}$, Fe$^{2+}$, Ca$^{2+}$, Hg$^{2+}$, Cu$^{2+}$) at a concentration of 5 ng·mL$^{-1}$. The control was of AgNP assemblies excluding metal ions.