

Supporting Information:

Fabrication of CdTe Nanoparticles-based Superparticles for an Improved Detection of Cu²⁺ and Ag⁺

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Figure S1. Evolution of the PL emission spectra of MPA-stabilized CdTe NPs during reflux of the precursor solutions at 100 °C for 2 hour (solid), 4 hour (dash), 10 hours (dot), and 18 hours (dash dot). The average size of CdTe NPs with corresponding emission colors was 3.5 nm, 3.8 nm, 4.5 nm, 5.0 nm, which was calculated from TEM images. Inset: fluorescence photographs of NP solutions corresponding to the PL spectra.

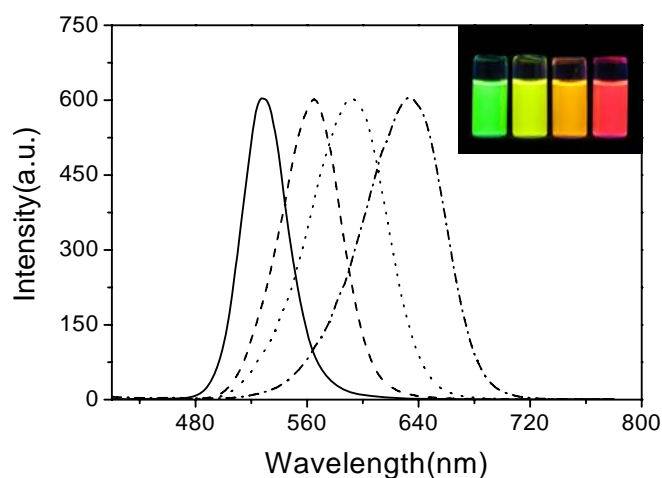


Figure S2. XRD patterns of MPA-stabilized aqueous CdTe NPs and the as-prepared unitary SPs. The corresponding TEM images were indicated in Figure 2.

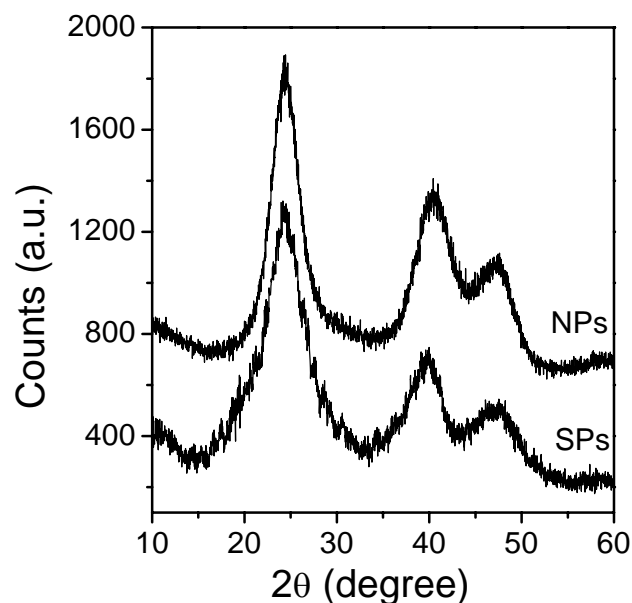


Figure S3. XPS Cd 3d and Te 3d spectra of the as-prepared CdTe SPs.

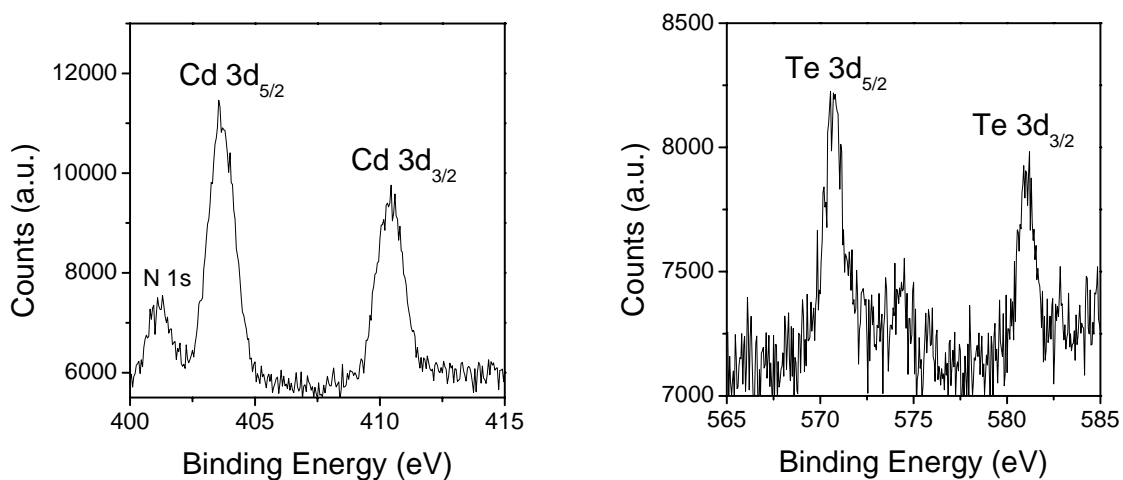


Table S1. The calculated Cd/Te molar ratio of MPA-stabilized CdTe NPs in water, DDAB-stabilized NPs in chloroform, and DTAB-capped SPs in water, which was determined by the XPS measurement.

	MPA-stabilized CdTe NPs	DDAB-stabilized CdTe NPs	DTAB-capped CdTe SPs
Cd/Te	8.2/1	2.0/1	1.7/1

Figure S4. PL spectra of aqueous CdTe NPs in the presence of increasing amounts of Cu^{2+} (a) and Ag^+ (b). The $[\text{Cu}^{2+}]$ from A to H were 0, 4×10^{-10} , 4×10^{-9} , 2×10^{-8} , 4×10^{-8} , 8×10^{-8} , 1.4×10^{-7} , and 4×10^{-7} M. The $[\text{Ag}^+]$ from A to G were 0, 4×10^{-10} , 1×10^{-8} , 4×10^{-8} , 8×10^{-8} , 1.2×10^{-7} , and 2×10^{-7} M.

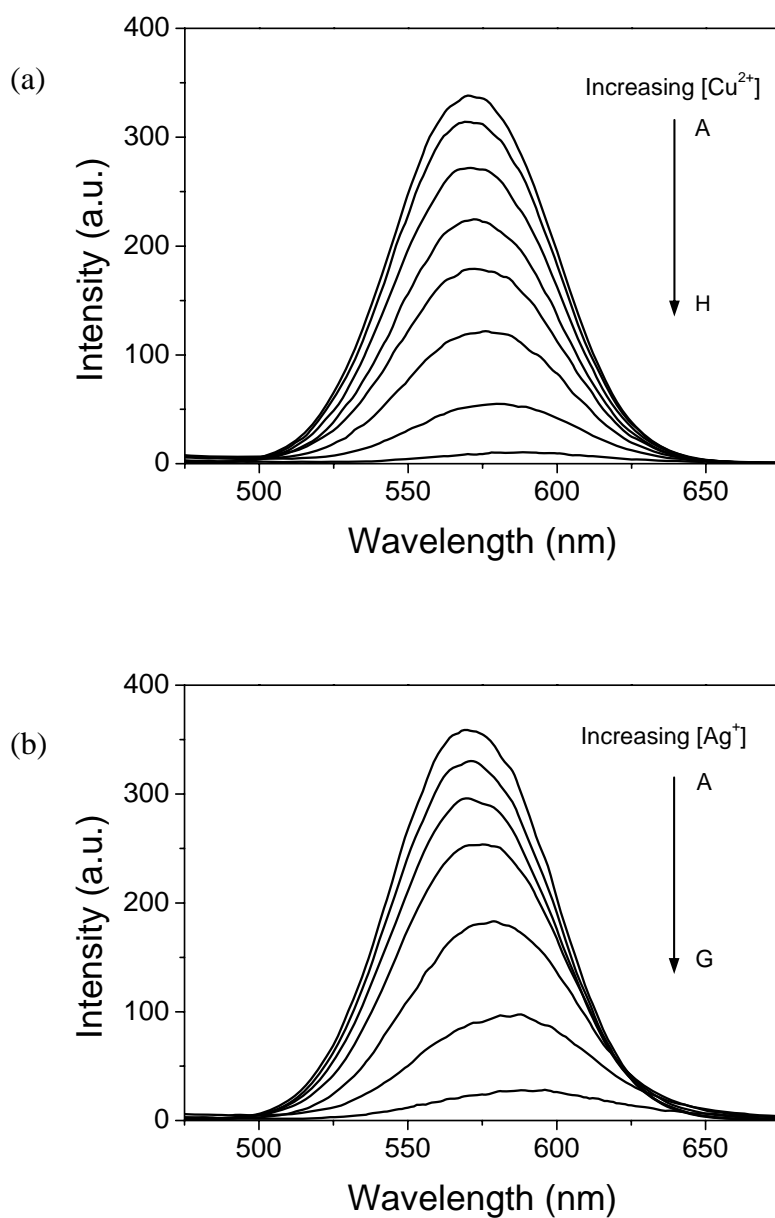


Figure S5. XPS Cu 3d and Ag 3d spectra of the Cu²⁺ and Ag⁺ bound SPs, indicating the formation of CuTe and Ag₂Te.

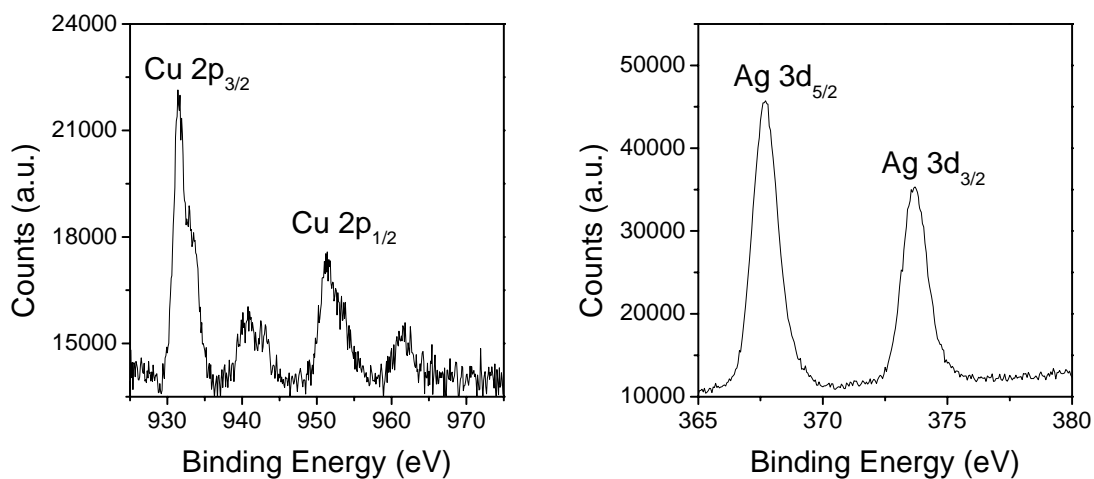


Table S2. The calculated Cu/Cd and Ag/Cd molar ratio of the CdTe SPs in the presence of additional Cu²⁺ or Ag⁺, which was determined by the XPS measurement. To ensure the occurrence of cation exchange reaction, the concentration of Cu²⁺ or Ag⁺ was 2×10^{-3} M, which was excessive to SPs. Note that the samples for XPS measurements had been washed for three times to remove any adsorbed Cu²⁺ or Ag⁺. So, the XPS results firmly proved the formation of CuTe and Ag₂Te in the SPs.

	Cu/Cd	Ag/Cd
molar ratio	0.20/1	0.36/1

Figure S6. Relative PL intensity (I_0/I) of CdTe SPs as a function of $[\text{Cu}^{2+}]$ (a) and $[\text{Ag}^+]$ (b). Nonlinear correlation was revealed. The corresponding PL spectra of CdTe SPs were indicated in Figure 5.

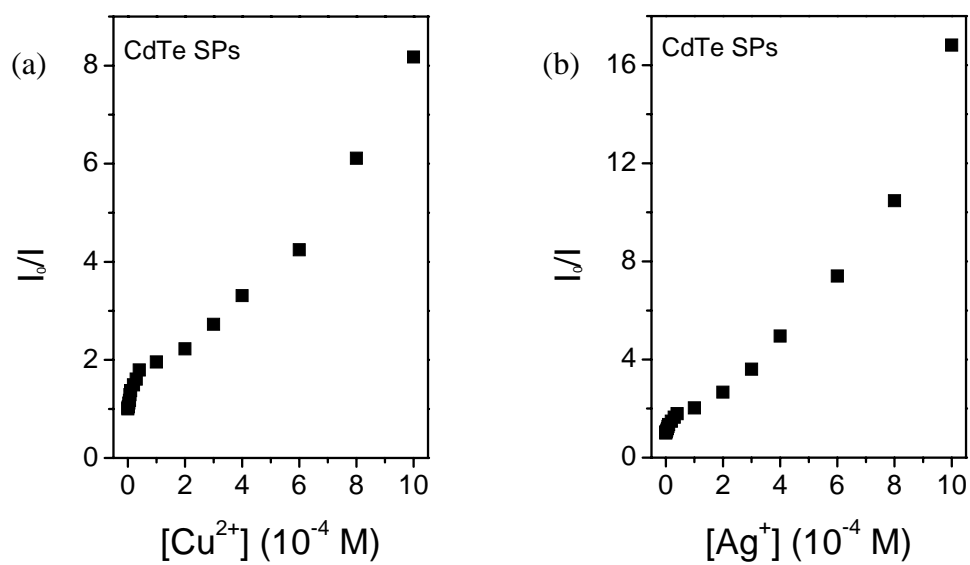
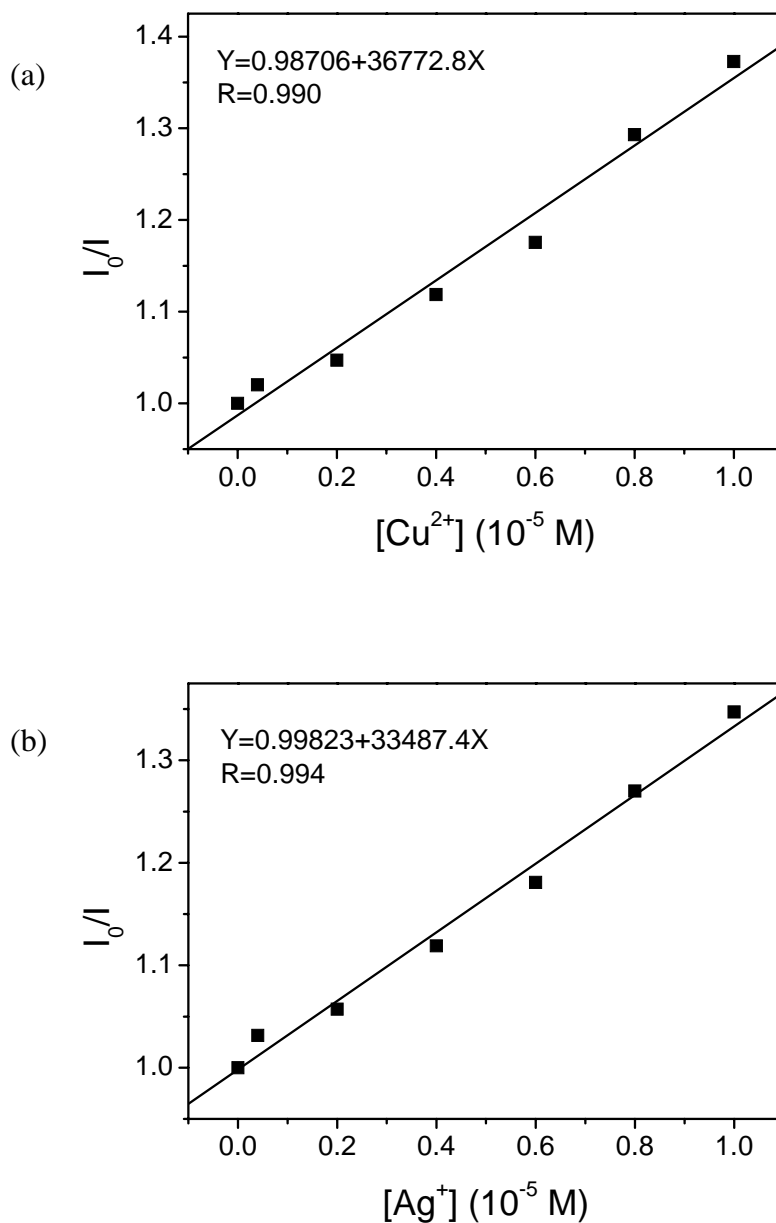


Figure S7. Relative PL intensity (I_0/I) of CdTe SPs as a function of $[\text{Cu}^{2+}]$ (a) and $[\text{Ag}^+]$ (b) at low metal ionic concentration (10^{-7} to 10^{-5} M). The corresponding PL spectra of CdTe SPs were indicated in Figure 5.



Stern-Volmer equation:

$$\frac{F_0}{F} = 1 + K_{sv}[Q]$$

Where F_0 and F are the fluorescence intensities in the absence and presence of quencher, K_{sv} is the Stern-Volmer quenching constant, and Q is the concentration of quencher.

In the detection of Cu^{2+} or Ag^+ , eliminating agents could be also used to avoid the effect of competitive ions (in Figure 7). For example, in practical application, Pb(II) ions in the mixture were eliminated by thioglycolic acid (TGA). TGA cooperated with Pb(II) ions strongly and form Pb-TGA complex, without affecting detected Cu^{2+} and Ag^+ .