

Supporting Information

Decorating CdTe QD-Embedded Mesoporous Silica Nanospheres with Ag NPs to Prevent Bacteria Invasion for Enhanced Anticounterfeit Applications

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Synthesis of solid SiO₂ NSs

Solid silica nanospheres (denoted as SiO₂ NSs) were synthesized according to the well-known stöber method.^{S1} 25 ml of TEOS were rapidly added into a mixture of ethanol (40 mL), deionized water (50 mL), and ammonium aqueous solution (28 %, 30 mL). The mixture was then stirred at room temperature for 12 h. The resulting solid SiO₂ NSs were centrifugally separated from the suspension, washed with deionized water and ethanol, and dried in a vacuum.

Synthesis of MPA-modified CdTe QDs

The preparation of 3-mercaptopropionic acid (MPA)-capped CdTe QDs was performed according to previous reports.^{S2} In detail, NaHTe solution was added to nitrogen saturated CdCl₂ aqueous solution in the presence of MPA as a stabilizing agent. The ratio of [CdCl₂]/[MPA]/[NaHTe] was fixed at 2/5/1. The resulting mixture was refluxed at 100 °C for about 1 h to control the growth of the CdTe QDs. Ultimately, MPA modified CdTe QDs were obtained and stored at 4 °C in dark for further use.

Synthesis of individually dispersed Ag NPs

The individually dispersed Ag NPs were prepared with a chemical reduction method.^{S3} In brief, ice-cooled sodium borohydride (NaBH₄, 0.1 mol/L, 60 mL) was added to an aqueous solution containing AgNO₃ (0.1 mol/L, 40 mL) and sodium citrate (0.1 mol/L, 10 mL) under vigorous stirring. After 1 min, the stirring was stopped, and the reaction solution was allowed to stand for 2 h to produce individually dispersed Ag NPs.

Figures

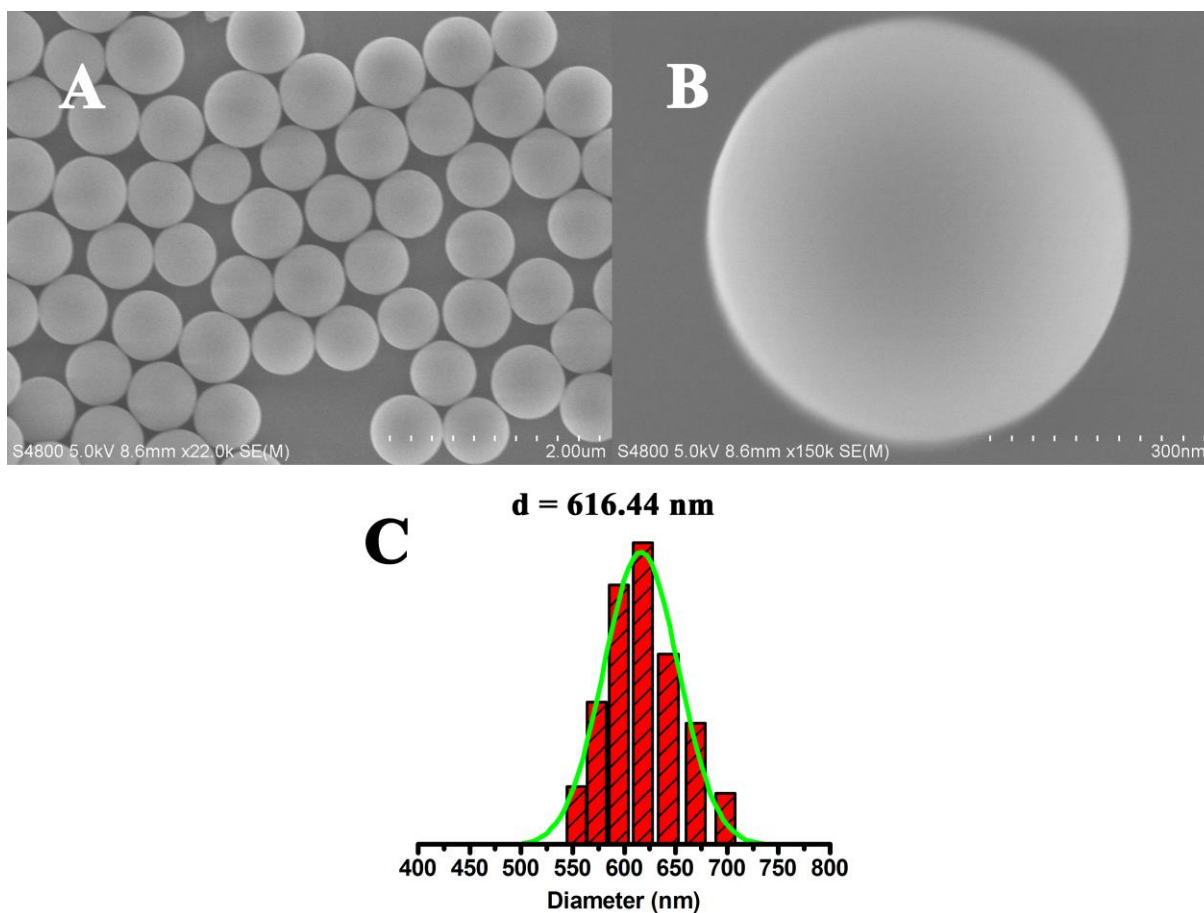


Figure S1. SEM images (A and B) and size distribution (C) of solid SiO_2 NSs.

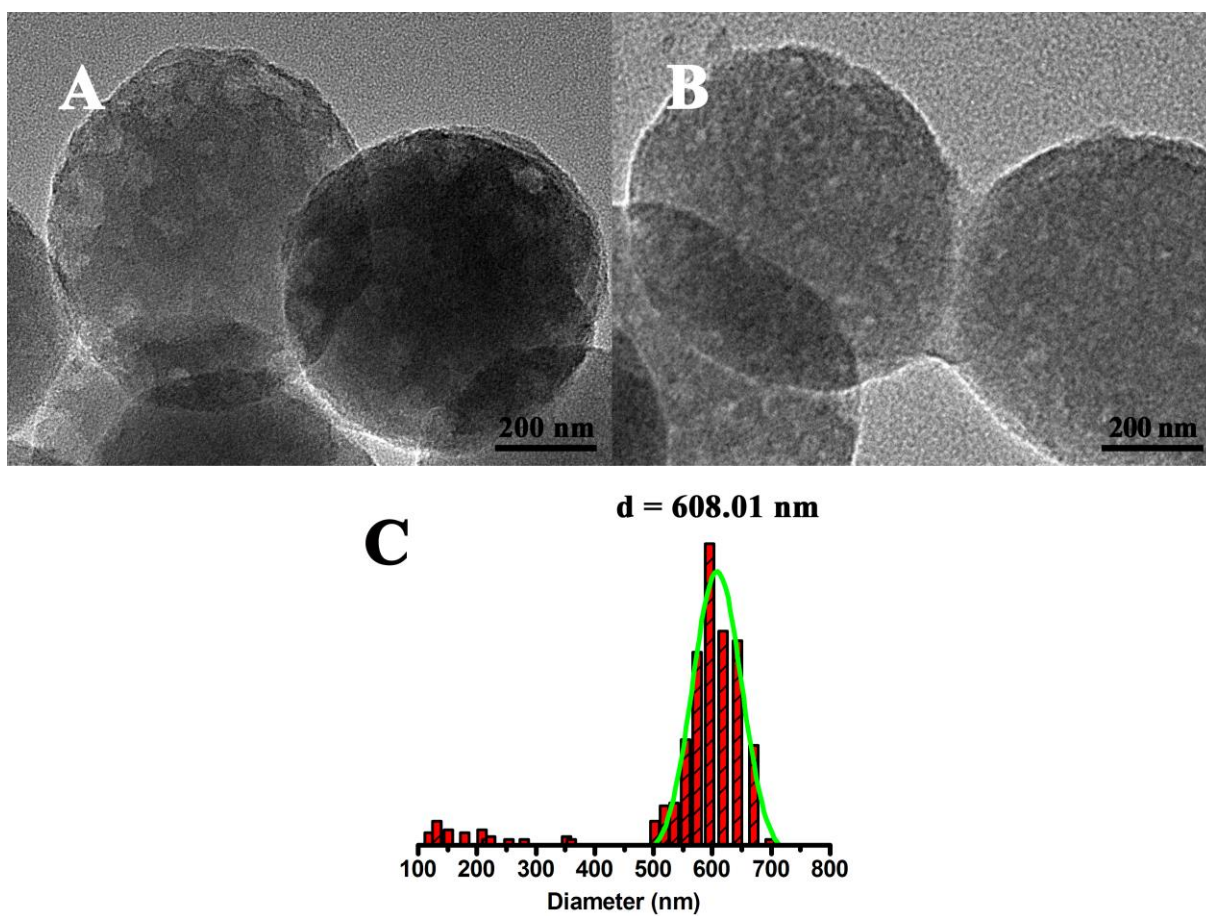


Figure S2. TEM images (A and B) and size distribution (C) of m-SiO₂ NSs.

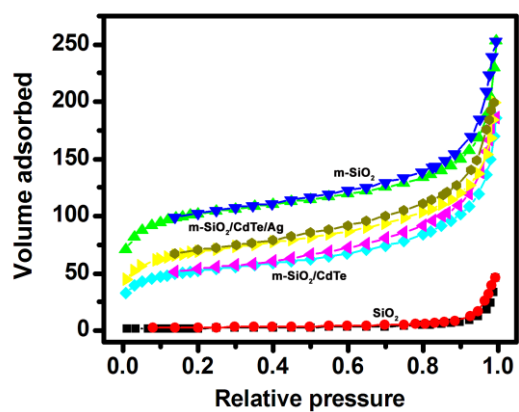


Figure S3. Nitrogen adsorption-desorption isotherm of solid SiO₂ NSs, m-SiO₂ NSs, m-SiO₂/CdTe NSs, and m-SiO₂/CdTe/Ag NSs.

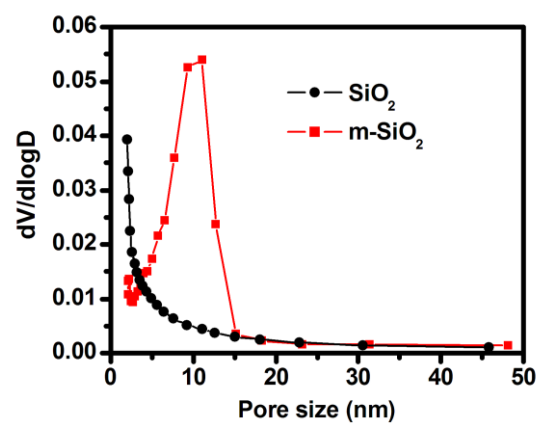


Figure S4. BJH pore-size distribution curves of solid SiO_2 NSs and m- SiO_2 NSs.

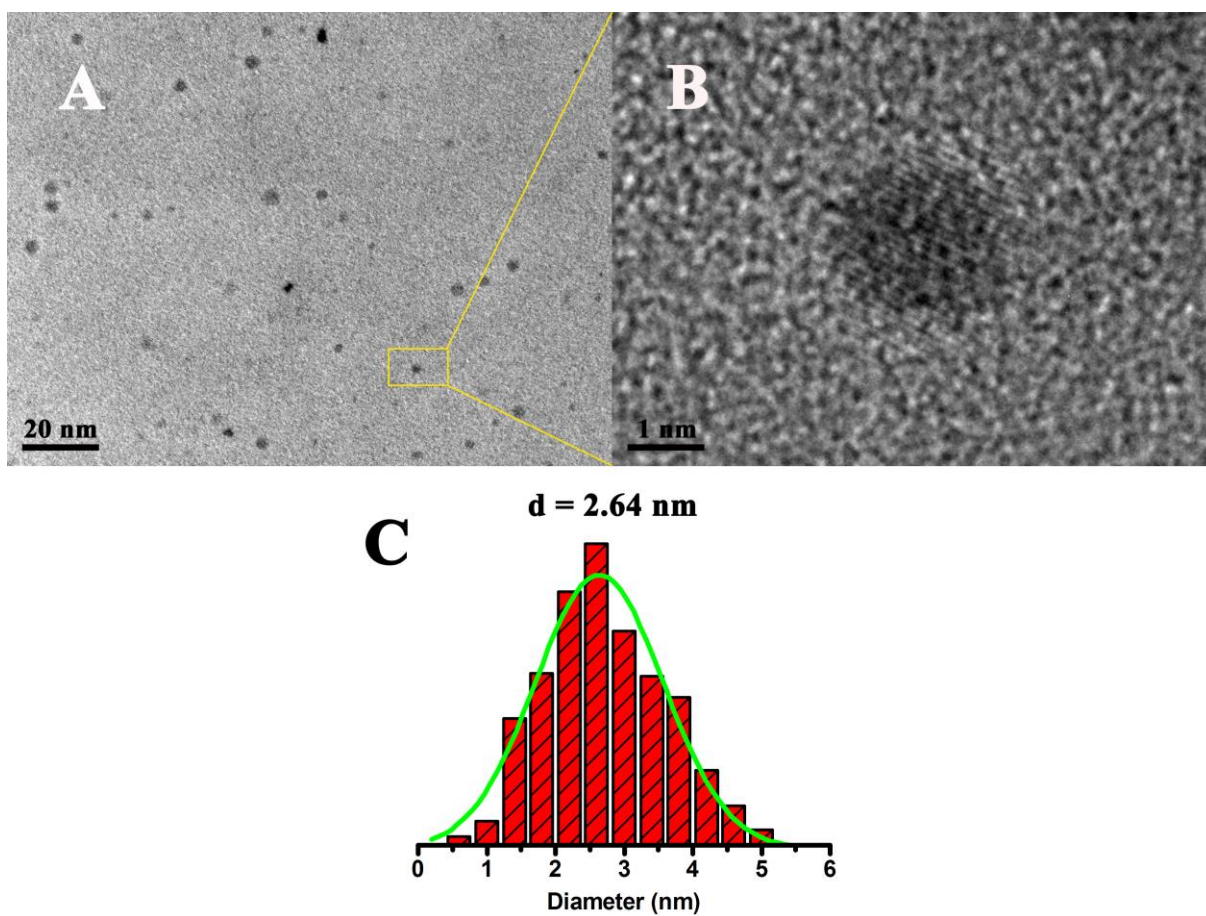


Figure S5. TEM image (A), HRTEM image (B), and size distribution (C) of CdTe QDs.

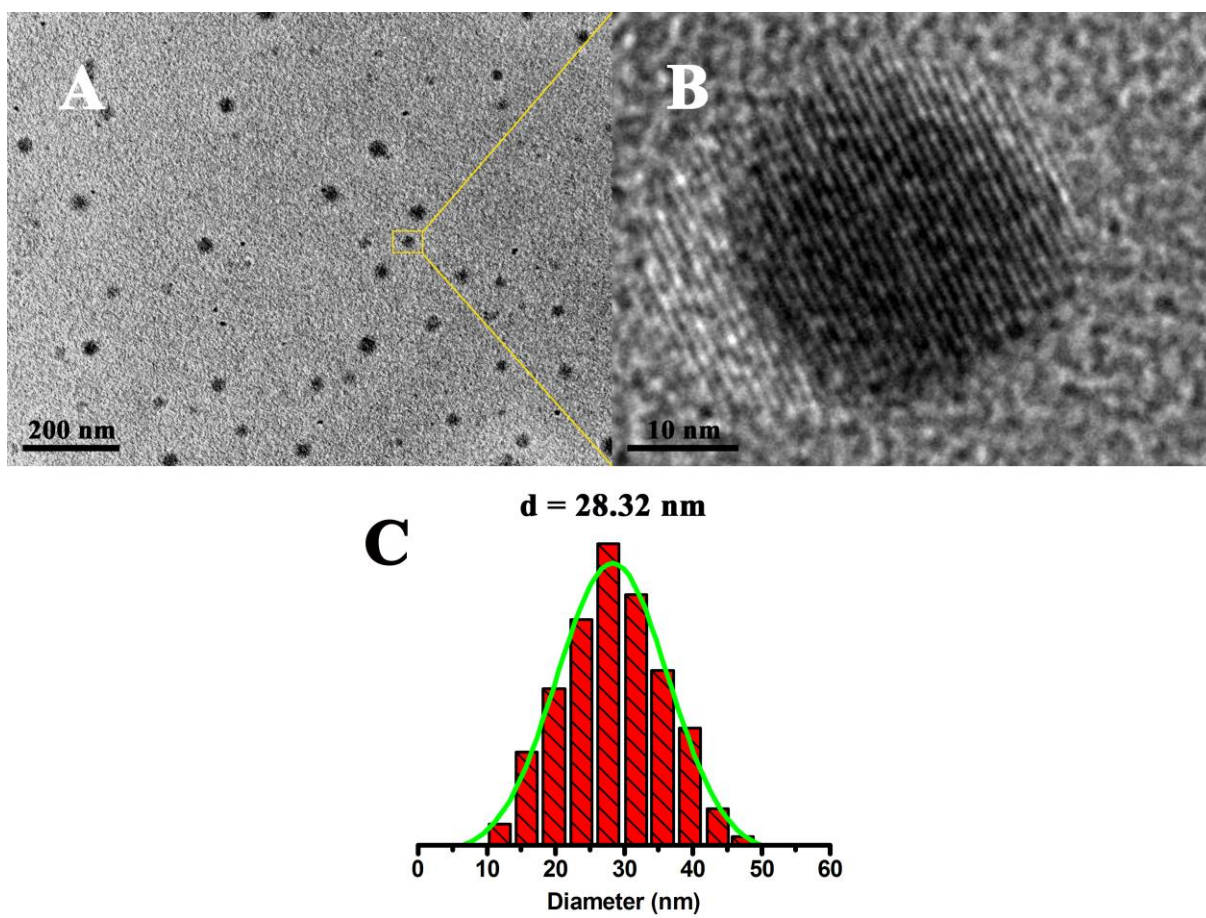


Figure S6. TEM image (A), HRTEM image (B), and size distribution (C) of Ag NPs.

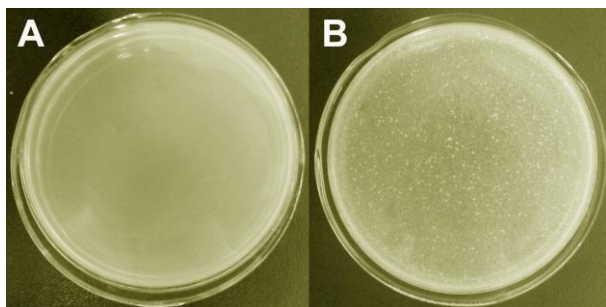


Figure S7. Photographs showing the bacterial culture plates of *E. coli* treated with Ag NPs with incubation time of 24 h (A) and 5 days (B).

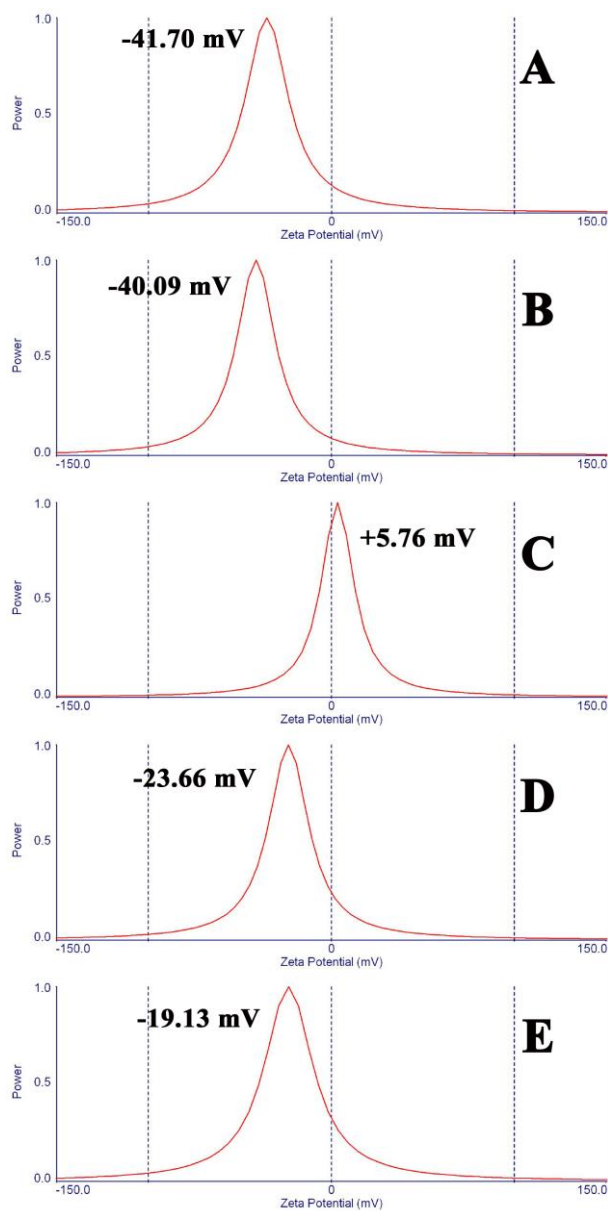


Figure S8. Zeta potential of m-SiO₂ NSs (A), CdTe QDs (B), Ag NPs (C), *E. coli* (D), and *S. aureus* (E).

References

- (S1) Stöber, W.; Fink, A.; Bohn, E. Controlled Growth of Monodisperse Silica Spheres in the Micro Size Range. *J. Colloid Interface Sci.* **1968**, *26*, 62-69.
- (S2) Wang, Y.; He, X.; Li, W.; Zhang, Y. Fabrication of QDs-Silica-Au NCs Ternary Hybrid Sphere-Based Fluorescence Bar codes by a Post-Encoding Method. *J. Mater. Chem. C* **2013**, *1*, 2202-2208.
- (S3) Chen, K.; Pu, Y.; Chang, K.; Liang, Y.; Liu, C.; Yeh, J.; Shih, H.; Hsu, Y. Ag-Nanoparticle-Decorated SiO₂ Nanospheres Exhibiting Remarkable Plasmon-Mediated Photocatalytic Properties. *J. Phys. Chem. C* **2012**, *116*, 19039-19045.