

Electronic Supplementary Information for:

Thiol-based non-injection synthesis of near-infrared Ag₂S/ZnS core/shell quantum dots

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The quantum yield (QY) measurement

The QY of the as-prepared QDs were measured using indocyanine green (ICG) as a reference standard (QY =13% in DMSO). The absorption spectra of the ICG and QDs solutions at different concentrations were recorded, the optical densities at their excitation wavelength were below 0.1 to avoid self-absorption effects. Then, the fluorescence spectra of these samples were recorded at the same under identical conditions. The QY was calculated according to the following equation:

$$\Phi_{QD} = \Phi_{Dye} \left(\frac{Grad_{QD}}{Grad_{Dye}} \right) \left(\frac{\eta_{QD}^2}{\eta_{Dye}^2} \right)$$

Where Φ_{Dye} is the fluorescence QY of ICG, $Grad$ is the gradient from the plot of integrated fluorescence intensity vs absorbance at excitation wavelength (600 nm), and η_{QD} and η_{Dye} are the refractive indexes of the solvents for ICG and Ag₂S quantum dots, respectively.

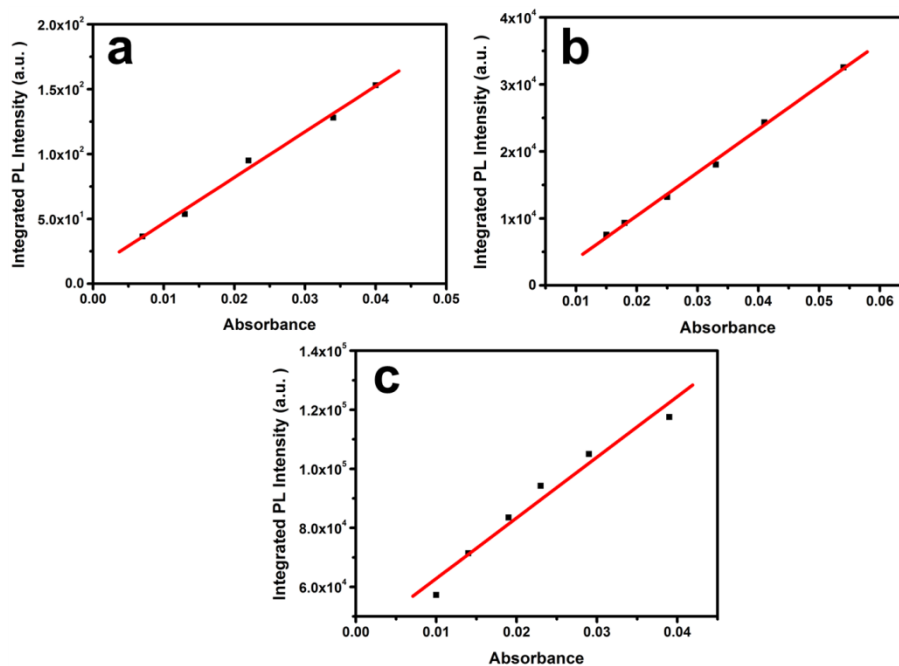


Fig. S1 Integrated fluorescence intensity vs. optical density (absorbance) of (a) Ag₂S QDs and (b) Ag₂S/ZnS QDs in chloroform and (c) ICG in DMSO.

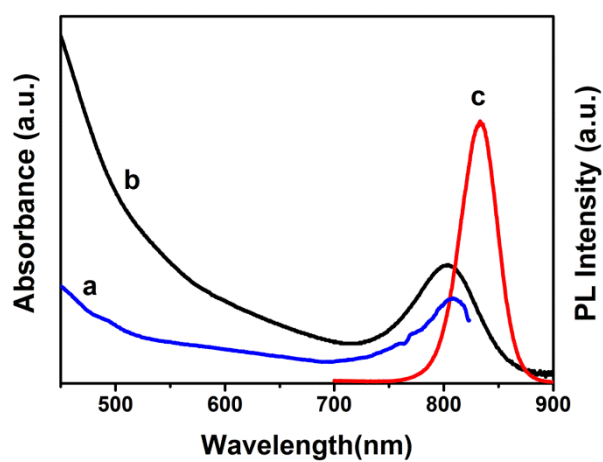


Fig. S2 The excitation spectrum (a), absorption spectrum (b) and PL spectrum (c) of the Ag₂S/ZnS QDs.

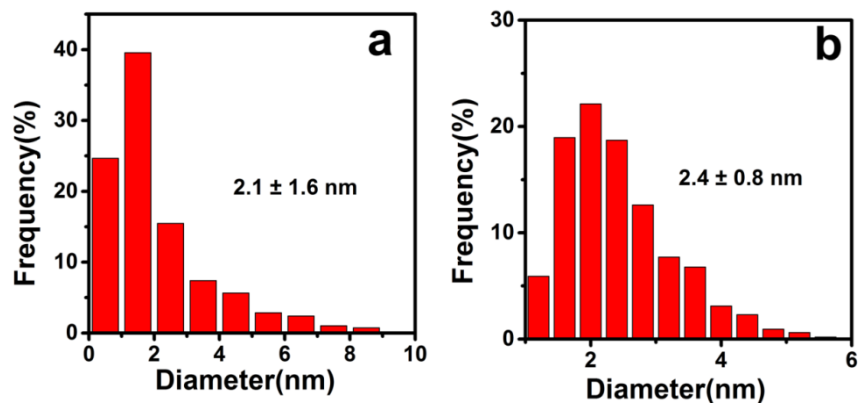


Fig. S3 The size distribution histograms of the Ag₂S (a) and Ag₂S/ZnS QDs. The size distribution histograms were obtained by measuring the diameter of about 1000 particles in TEM image.

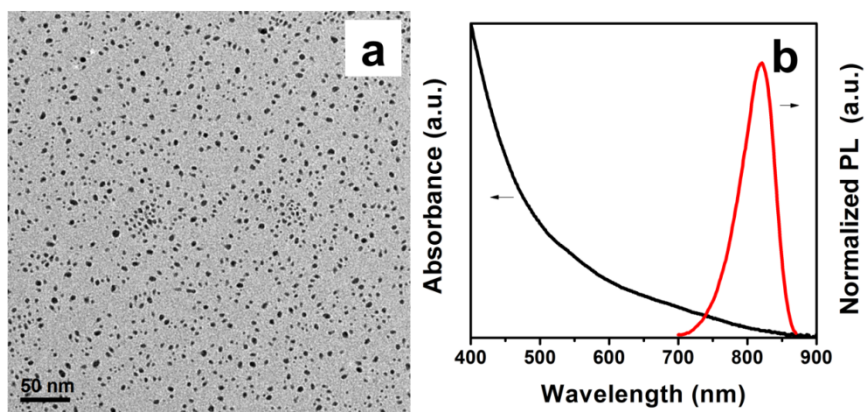


Fig. S4 The TEM image (a), absorption spectrum (b, black line) and PL spectrum (b, red line) of the Ag₂S QDs synthesized using 1-Dodecanethiol (CH₃(CH₂)₁₀CH₂SH) as both ligand and sulfur source.

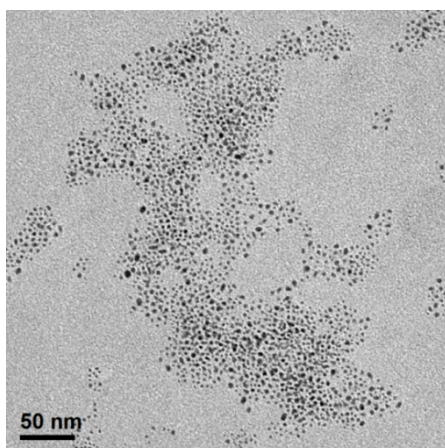


Fig. S5 The TEM image of the Ag₂S QDs synthesized using 1-Hexadecanethiol (CH₃(CH₂)₁₄CH₂SH) as both ligand and sulfur source.

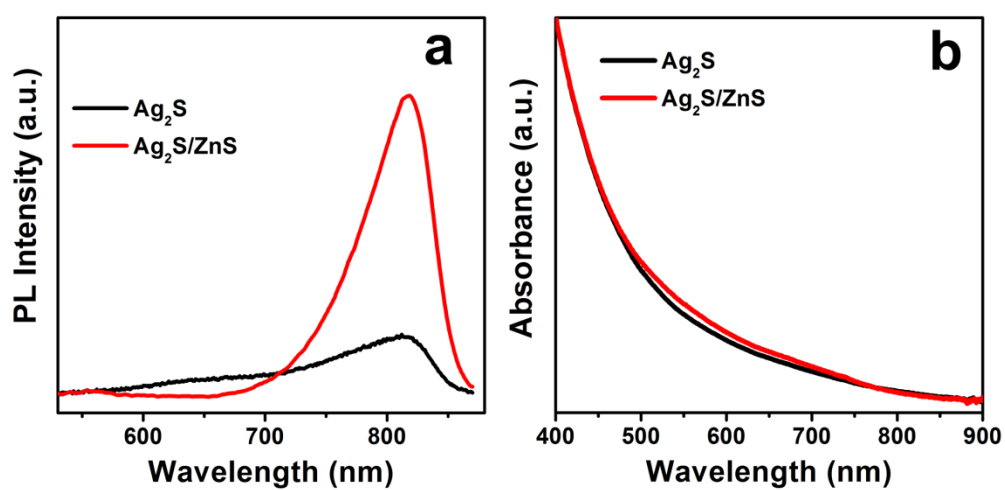


Fig. S6 The PL spectra (a) and the corresponding absorption spectra (b) of the Ag₂S and Ag₂S/ZnS QDs synthesized using 1-Hexadecanethiol (CH₃(CH₂)₁₄CH₂SH) as both ligand and sulfur source.

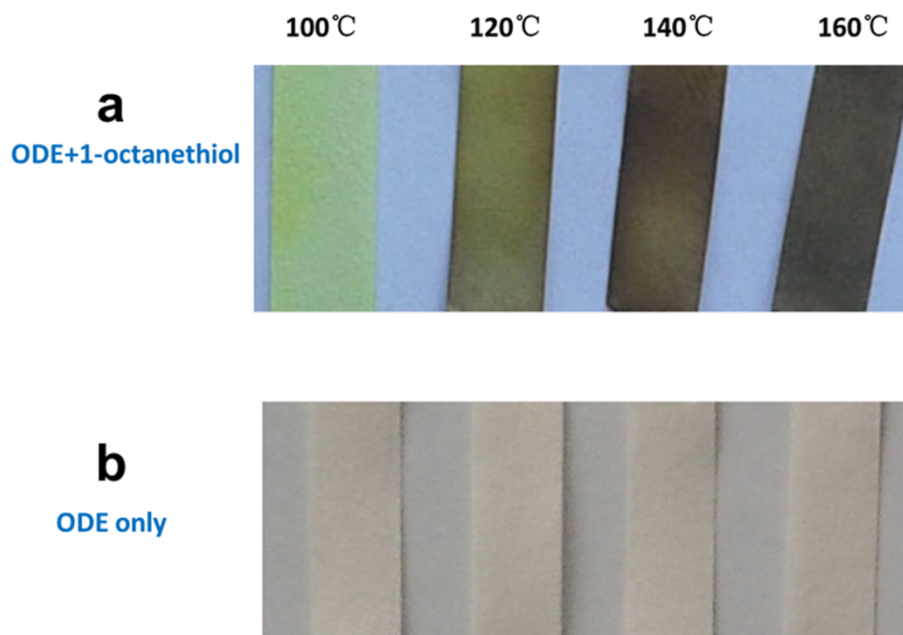


Fig. S7 Photographs of $\text{Pb}(\text{Ac})_2$ testing papers for the H_2S detection after exposed to the reaction atmosphere for 30 min under different temperatures; (a) ODE and 1-octanethiol in the reaction flask; (b) Only ODE in the reaction flask.

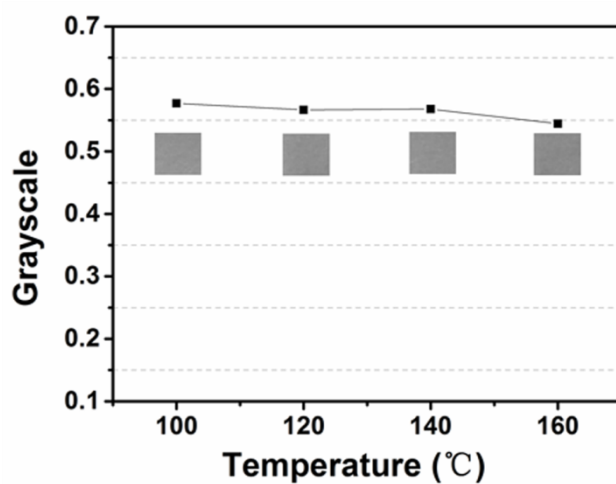


Fig. S8 Photographs and grayscale plot of $\text{Pb}(\text{Ac})_2$ testing papers for the H_2S detection after exposed to the reaction atmosphere for 30 min under different temperatures (Only ODE in the reaction flask).

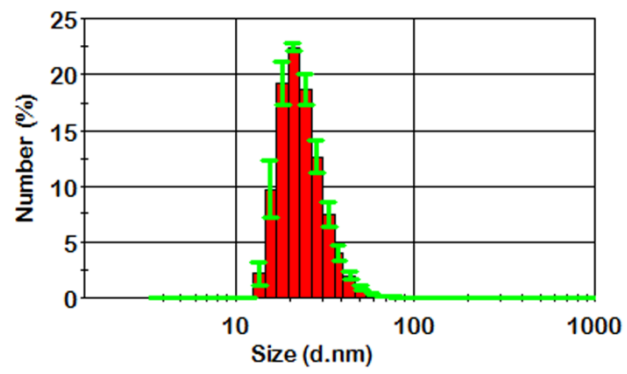


Fig. S9 Hydrodynamic size of the water-soluble Ag₂S/ZnS QDs measured by DSL.