

Supporting Information

Highly Luminescent Quantum Dots/Mesoporous TiO₂ Nanocomplex Film under Controlled Energy Transfer

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Analysis of the amount of adsorbed QDs in mesoporous TiO₂ film

In the Beer-Lambert equation, A , ϵ , L , and C are the absorbance of QDs, the molar extinction coefficient of the material, the length of sample (film or cuvette, etc.), and the concentration of QDs, respectively. Here, ϵ is defined as the slope of a plot of the absorption concentration of the material and concentration of the material with fixed size of cuvette. The molar extinction coefficient of CdZnS/ZnS QDs obtained by the above method was $30.42 \text{ M}^{-1}\text{cm}^{-1}$ (Fig. S9 and S10, ESI†). Subsequently, the concentration of QD in each sample was estimated by substituting the absorbance and the thickness of each sample into the equation.

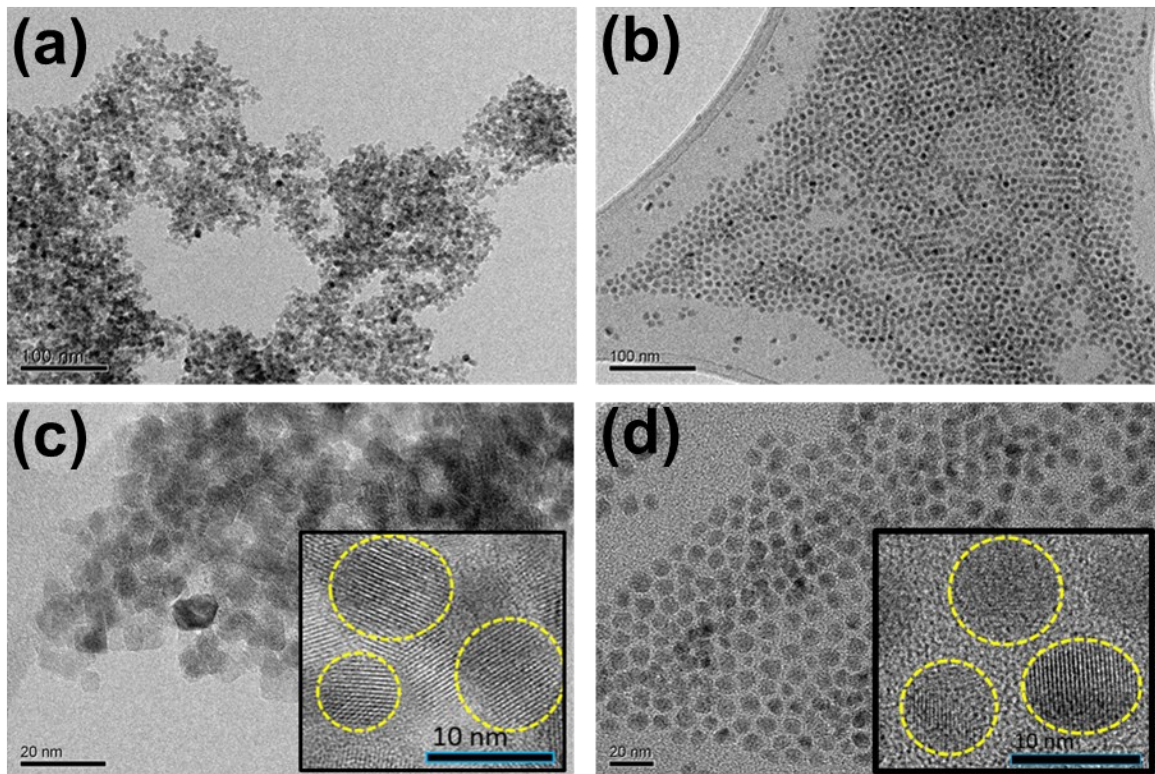


Figure S1. TEM images of TiO₂ nanoparticles (a, c) and CdZnS/ZnS QDs (b, d). Inset: TiO₂ nanoparticles and QDs with high magnification, respectively.

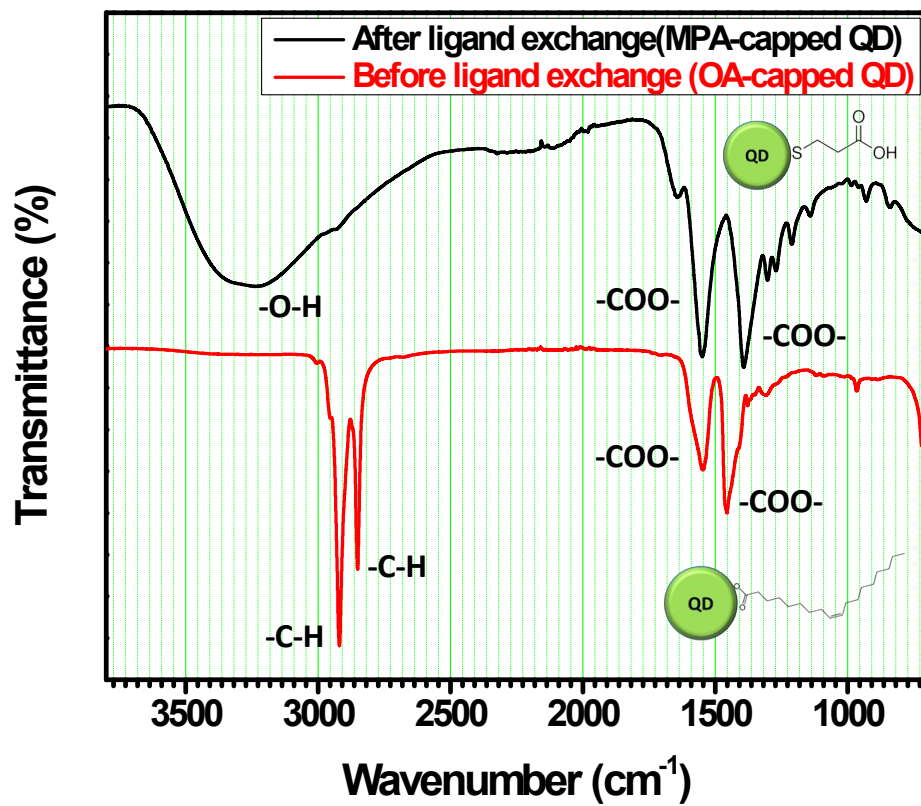


Figure S2. Attenuated total reflection (ATR) spectra before (OA-capped CdZnS/ZnS QD) and after (MPA-capped QD) ligand exchange.

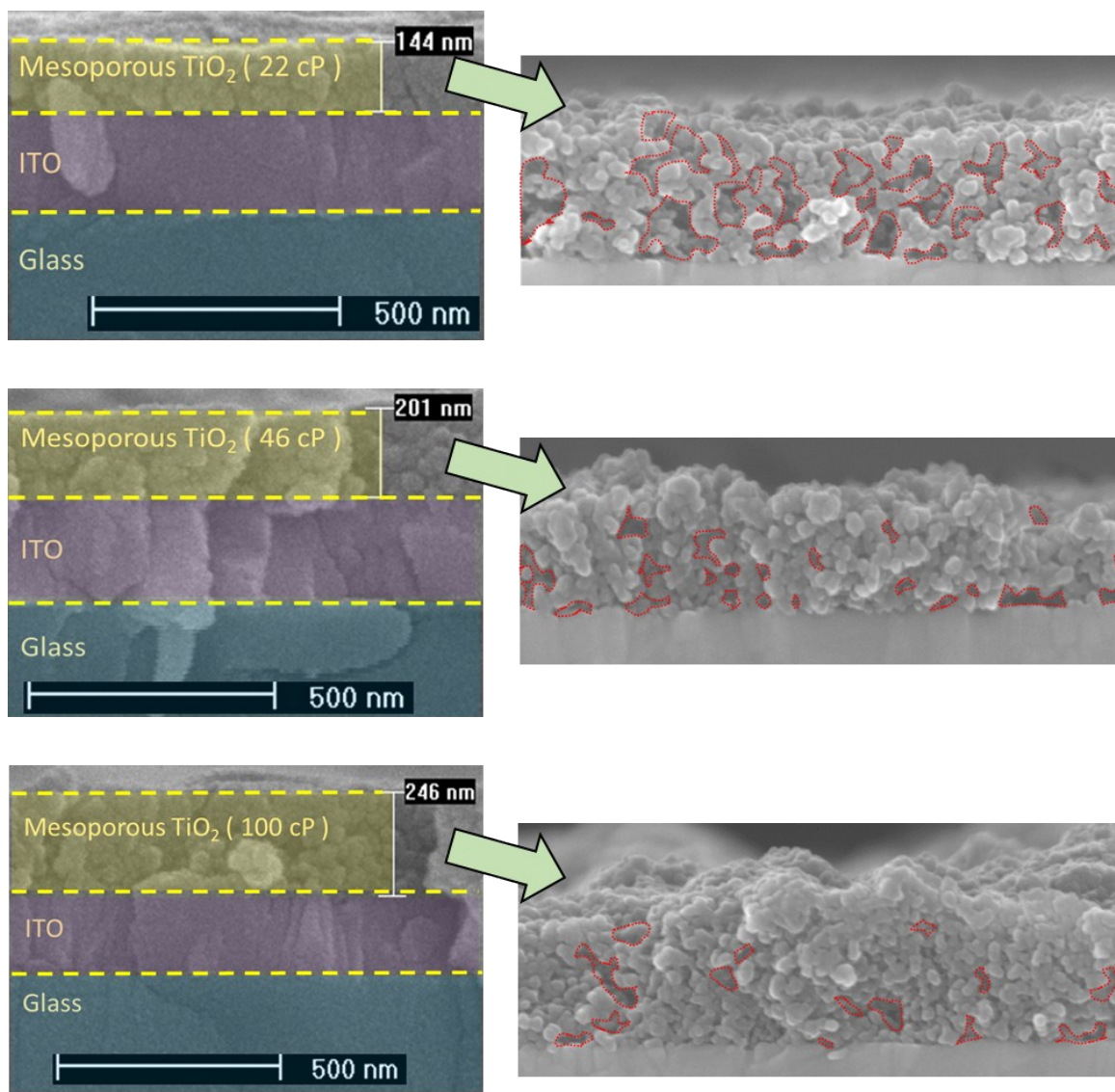


Figure S3. Side views and magnified images of 22 cP, 46 cP and 100 cP mesoporous TiO₂ film using SEM (Inset value: thickness of each film, Red box: pore in the films).

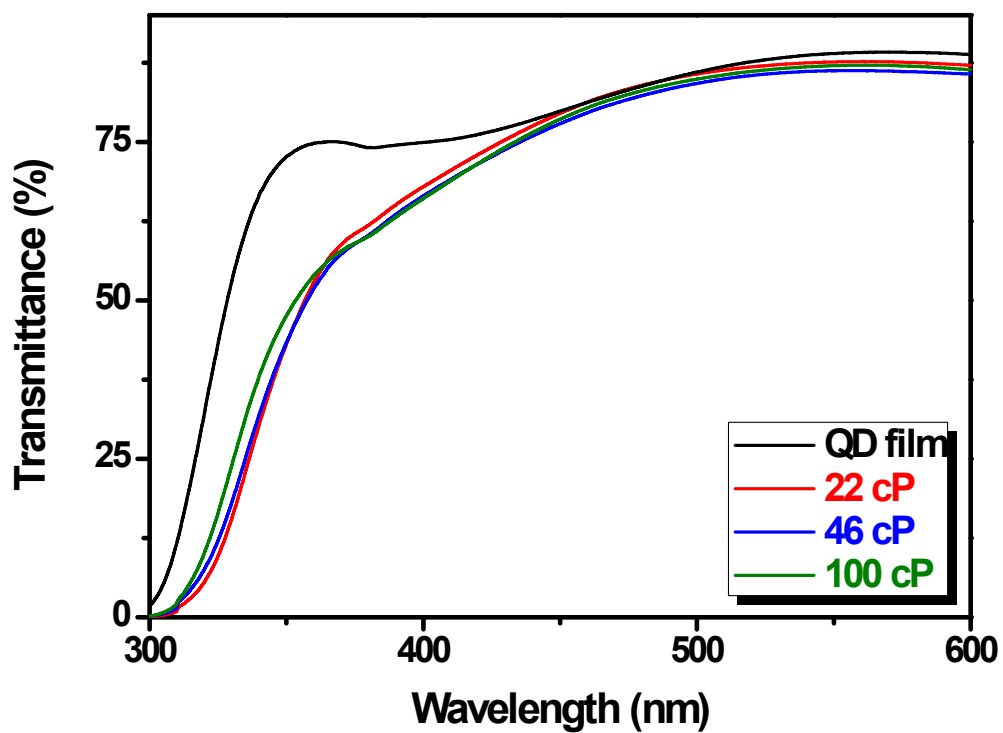


Figure S4. Optical transmittance spectra for CdZnS/ZnS QD-TiO₂ films (22 cP, 46 cP and 100 cP) and ITO glass as a reference sample.

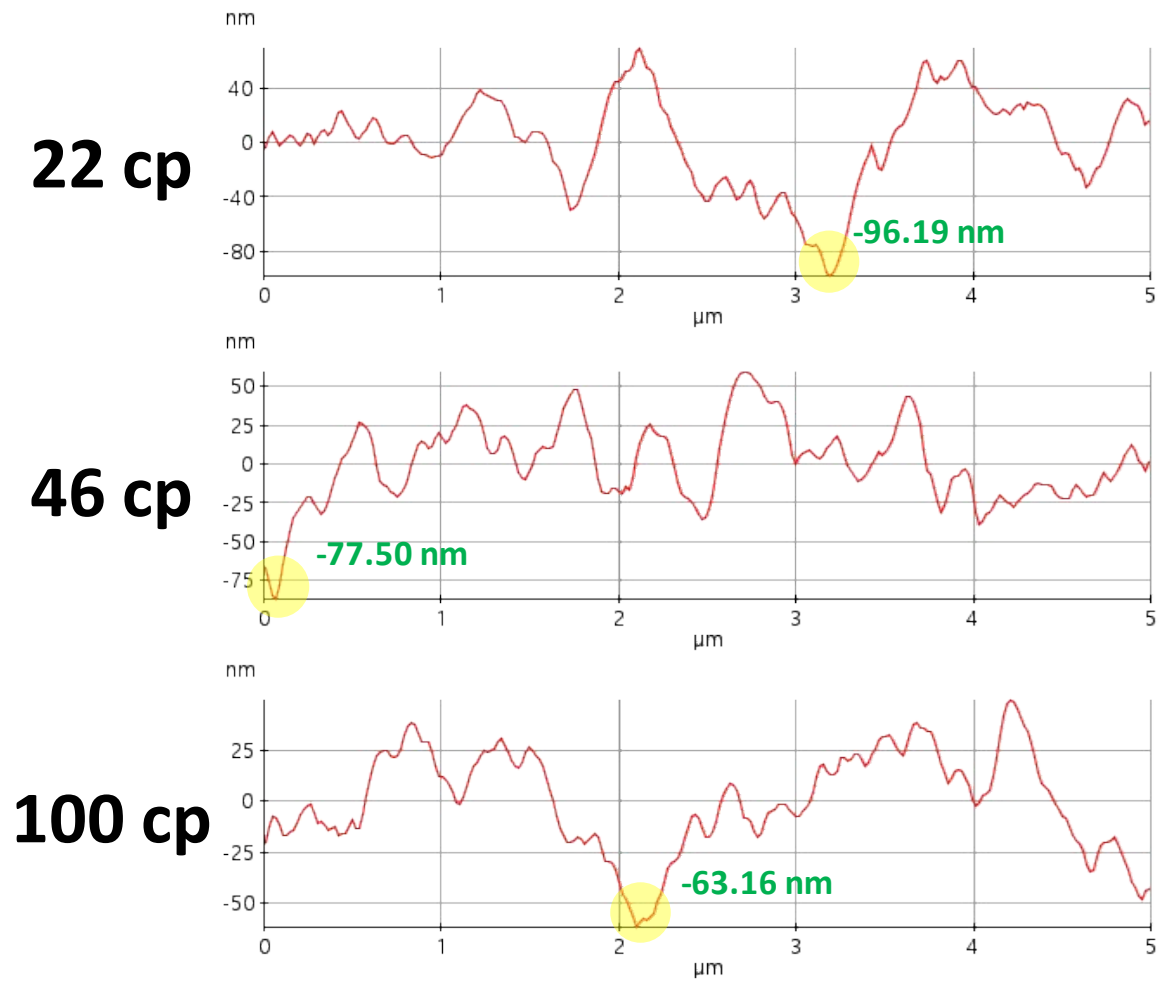


Figure S5. AFM line scan profile of 22 cP, 46 cP and 100 cP QD-TiO₂ films. The inset value in each sample indicates its maximum depth.

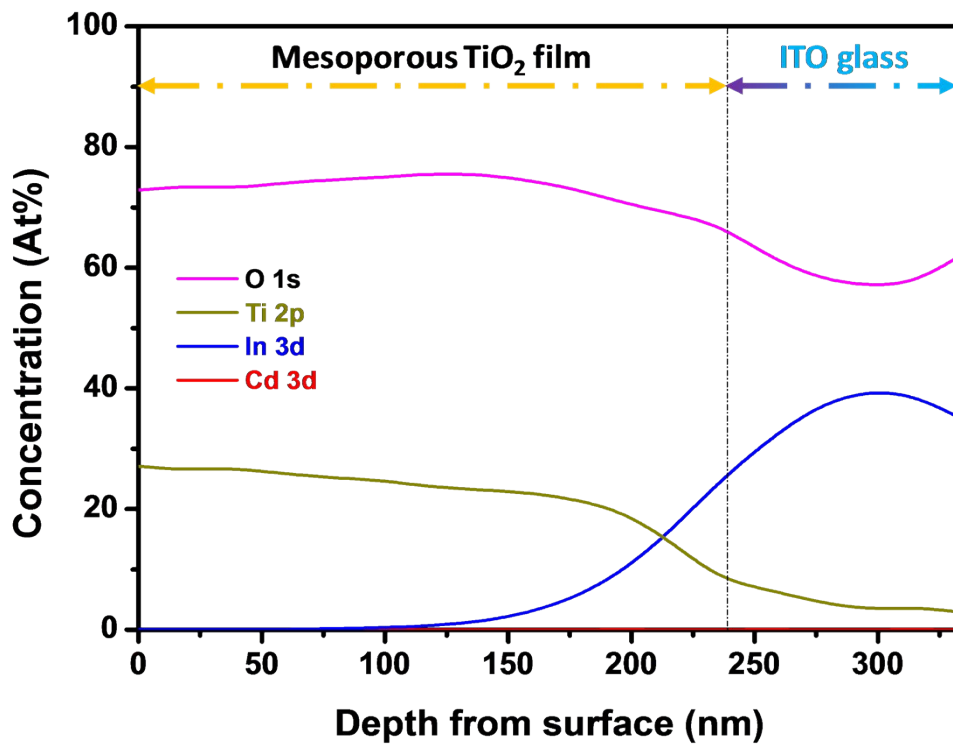


Figure S6. XPS depth profile of mesoporous TiO₂ film without CdZnS/ZnS QDs (dotted line distinguishes the mesoporous TiO₂ film from ITO glass).

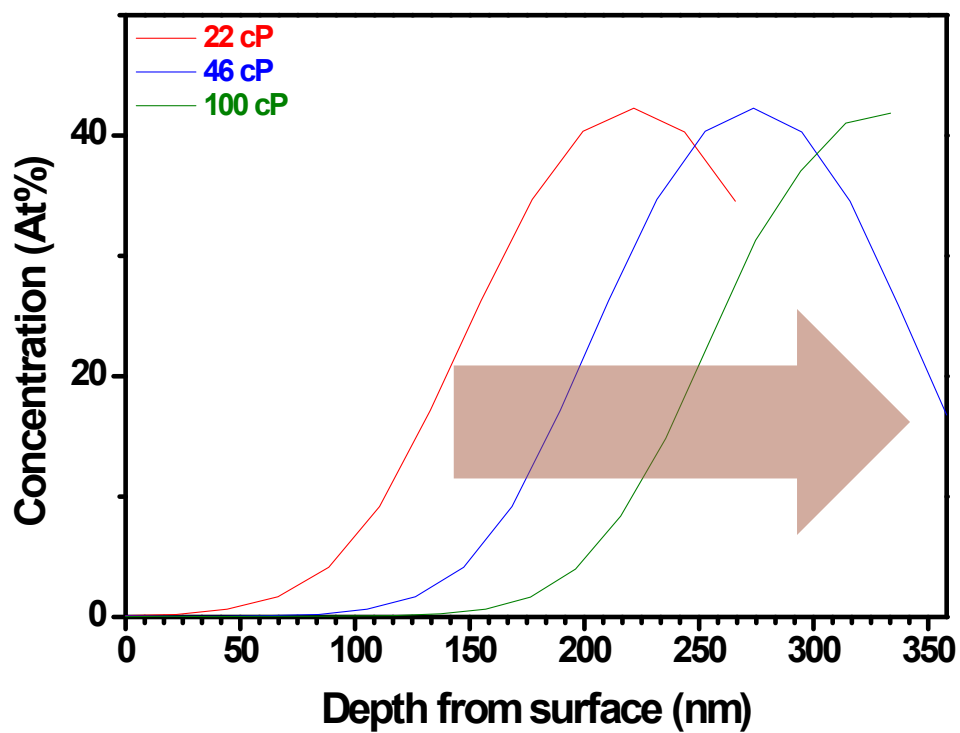


Figure S7. Shift of In 3d peaks from XPS depth profile depending on the viscosity of CdZnS/ZnS QD-TiO₂ film.

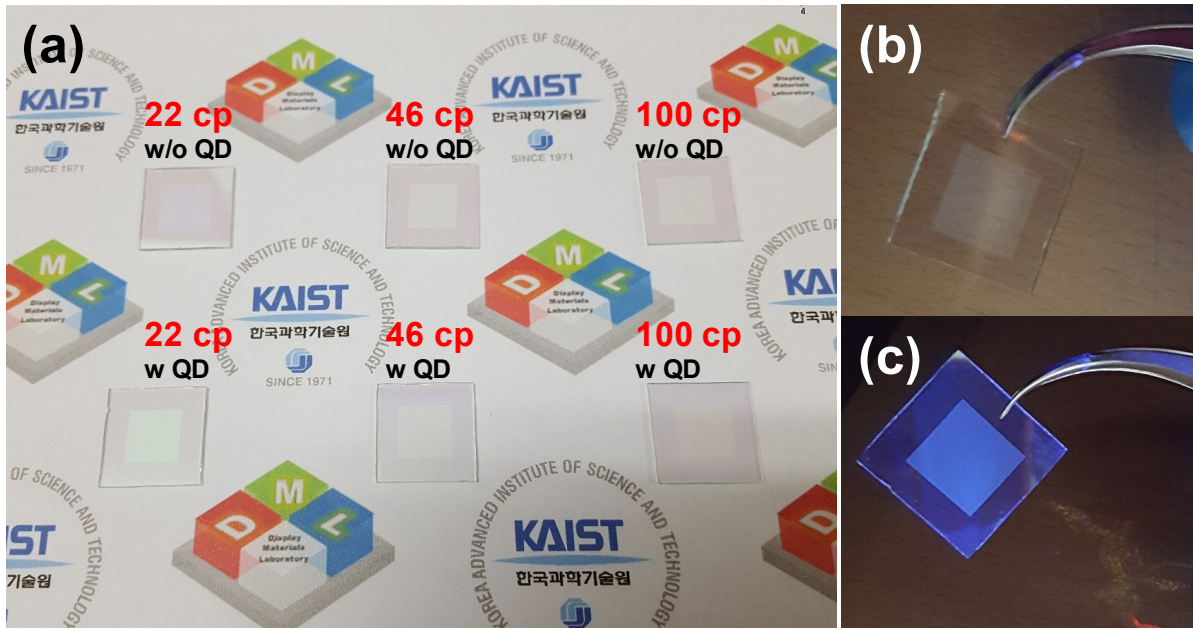


Figure S8. (a) Photographs of mesoporous TiO₂ films before and after dipping (b) CdZnS/ZnS QD-TiO₂ film without UV light excitation (c) QD-TiO₂ film emitting blue light by UV light excitation (excitation wavelength : 375 nm).

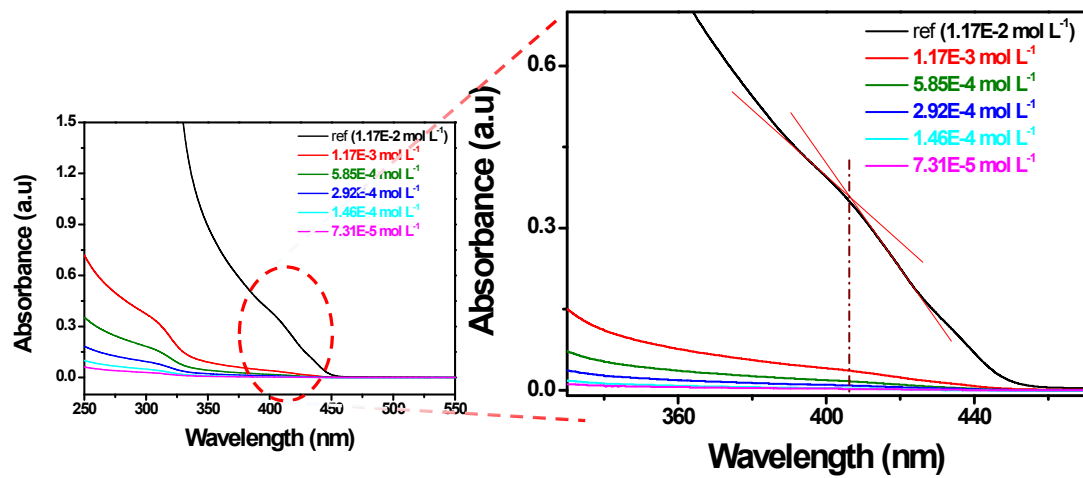


Figure S9. (left) Plot of absorbance versus wavelength using UV-visible spectroscopy from various concentration of CdZnS/ZnS QDs in solution. (right) Magnified plot from the left one to indicate the absorption peak of QDs.

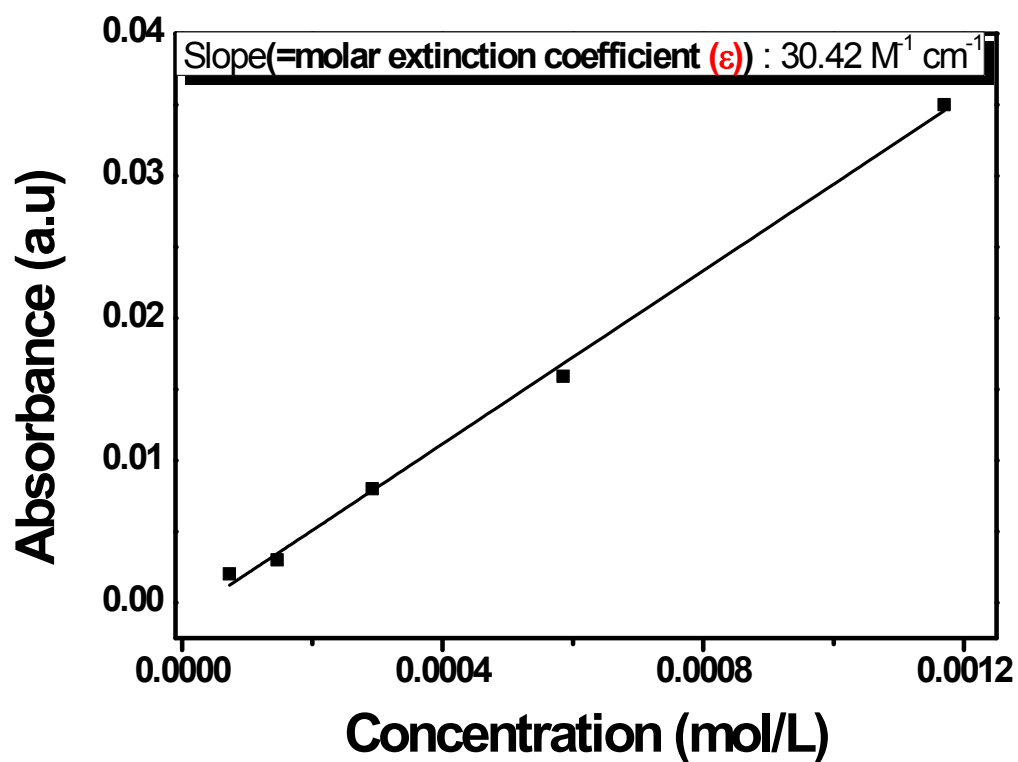


Figure S10. Plot of the absorbance versus concentration of CdZnS/ZnS QD solutions from Figure S10 to obtain molar extinction coefficient. The slope of this plot is molar extinction coefficient of QDs.