Supporting Information

Surface Ions Transfer Growth of Ternary $CdS_{1-x}Se_x$ Quantum Dots and Their Electron Transport Modulations

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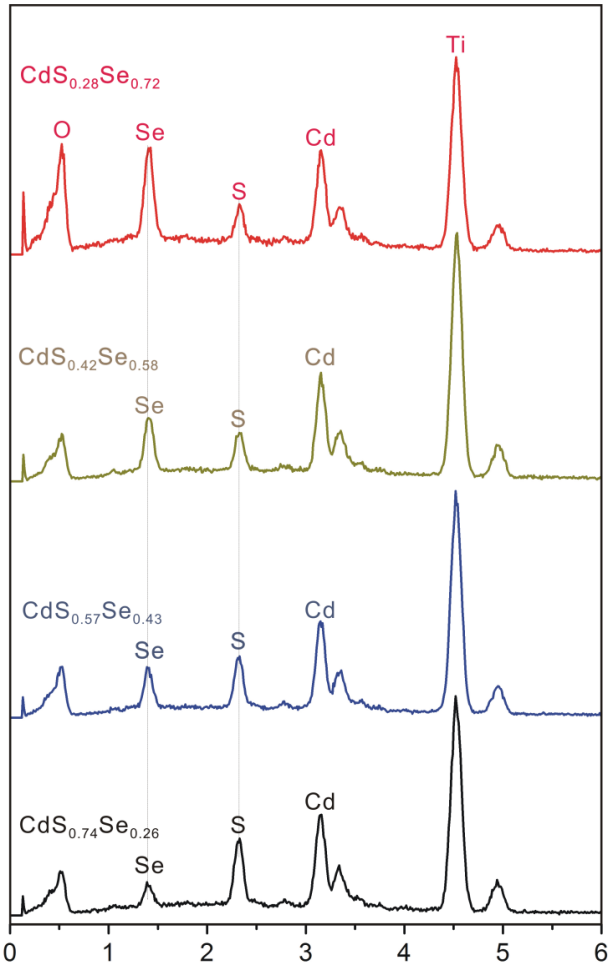

Figure S1. EDX spectrum of ternary $CdS_{1-x}Se_x$ QDs, with specific elemental peaks. These peaks are as follows: Titanium K_α=4.51 keV and K_β=4.93 keV, Oxygen K_α=0.52 keV, Cadmium L_α=3.13 keV and L_β=3.31 keV, Surful K_α=2.37 keV and Selenium L_α=1.37 keV. The value of Se/(S+Se) is 0.26, 0.43, 0.58 and 0.72 for $CdS_{0.74}Se_{0.26}$ QDs, $CdS_{0.57}Se_{0.43}$ QDs, $CdS_{0.42}Se_{0.58}$ QDs and $CdS_{0.28}Se_{0.72}$ QDs.

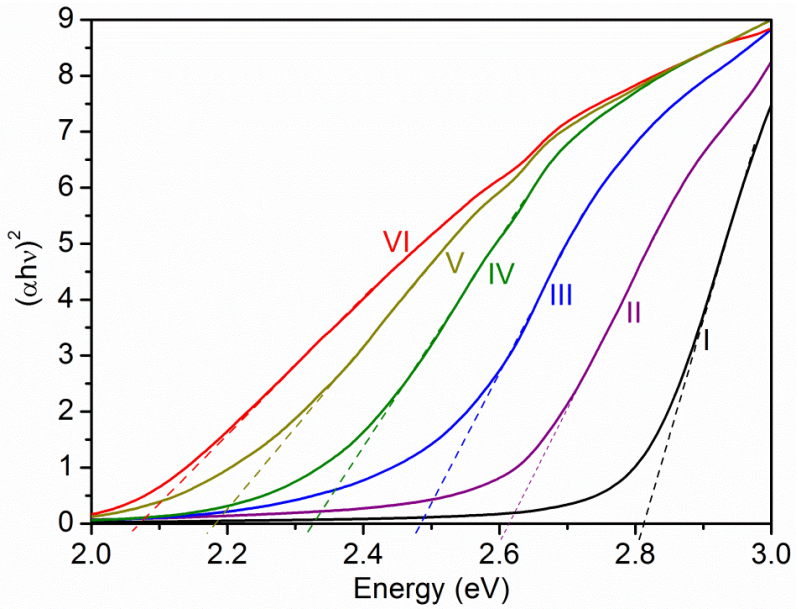

Figure S2. Tauc's law was employed to evaluate the optical bandgaps of the $CdS_{1-x}Se_x$ QDs. The plots of $(\alpha h\nu)^2$ Vs. $h\nu$ are presented in for pristine CdS QDs (curve I) and $CdS_{1-x}Se_x$ QDs with Se content of 0.26, 0.43, 0.58, 0.72 and 1 (curve II to VI), where α is the absorption coefficient, $h\upsilon$ is photon energy, E_g is the energy band gap, and A is a constant.[1,2] The illustrate estimation of the bandgaps have values of 2.82, 2.48, 2.62, 2.32, 2.18 and 2.06 eV, respectively.

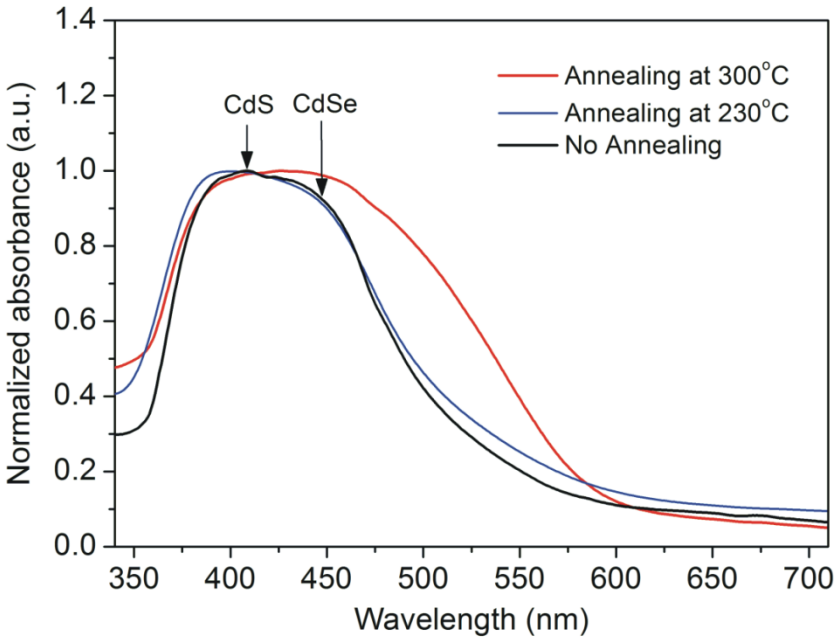

Figure S3. Normalized absorbance spectrum of as-prepared and annealed $CdS_{1-x}Se_x$ QDs. The red shift of the spectrum can be observed when the QDs were annealed at 300°C, due to the dissolve and enlarger of QDs, while it is no obvious shift when they were annealed at 230°C. The as-prepared QDs in RT have two individual peaks which attribute to both CdS and CdSe. The peak was merged after annealing at 230°C due to lattice charge and formation of ternary alloy structure.

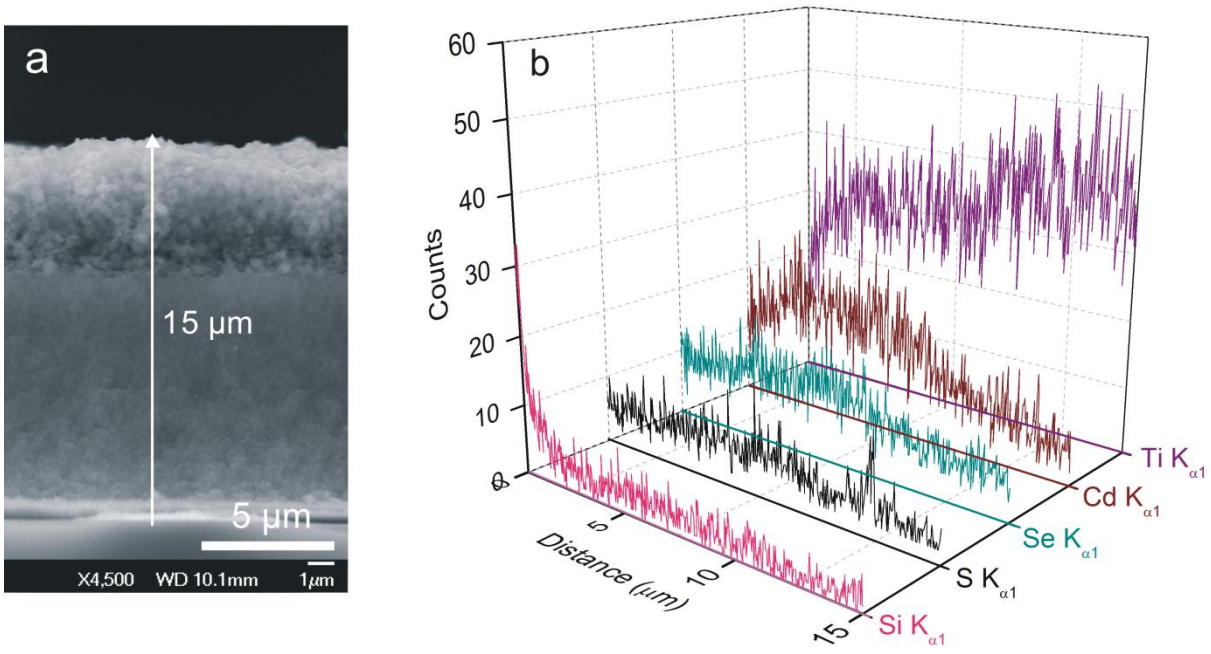

Figure S4. (a) Cross-section image and (b) corresponding elemental linescan mapping of 15 μm $CdS_{1-x}Se_x$ QDs sensitized TiO_2 photoelectrode. The line scan of Si, S, Se, Cd and Ti were conducted from bottom-to-up, as the arrow indicated in figure S4(a). The obvious higher concentration of the Cd elements within the 10 μm dense TiO_2 film is attributed to the more efficient loading of QDs in dense TiO_2 films. The dramatically increasing of Si is attributed to the bottom glass substrate.

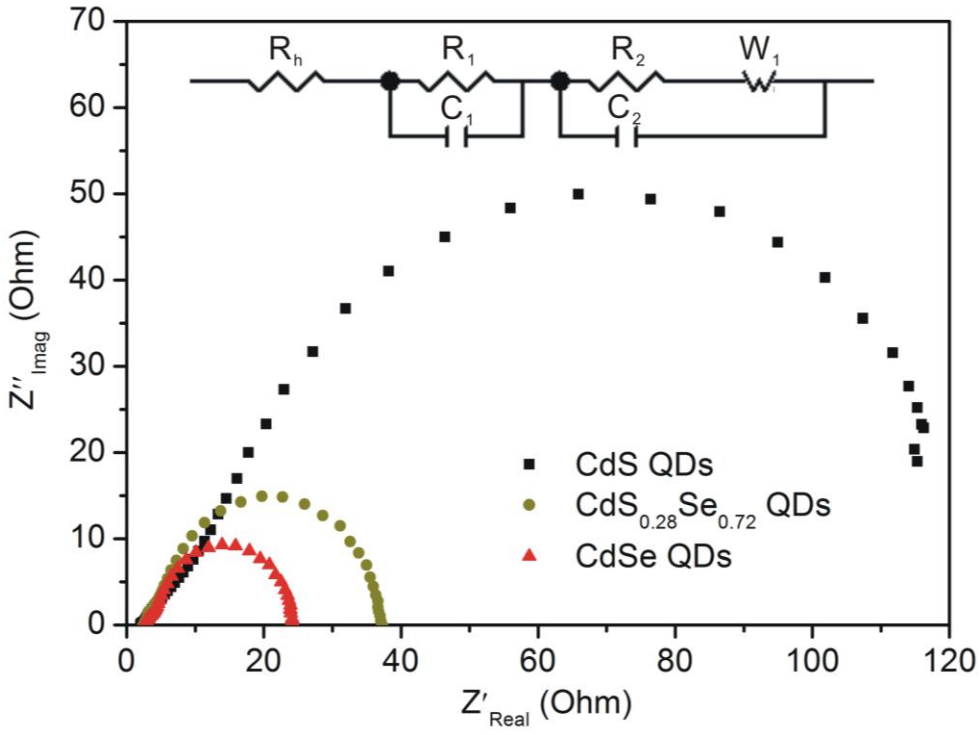

Figure S5. EIS spectra of CdS, $CdS_{1-x}Se_x$, and CdSe QDSSCs measured under 100 mW/cm^2 illumination. The inset is a scheme of equivalent circuit used to model the experimental data.

References

1. J. Tauc, R. Grigorovici, A. Vancu, *Phys. Status Solidi* 1966, **15**, 627.

2. R. W. Collins, C. Y. Huang, *Phys. Rev. B* 1986, **34**, 2910.