Electronic Supplementary Material (ESI) for Journal of Materials Chemistry C.

Supporting Information

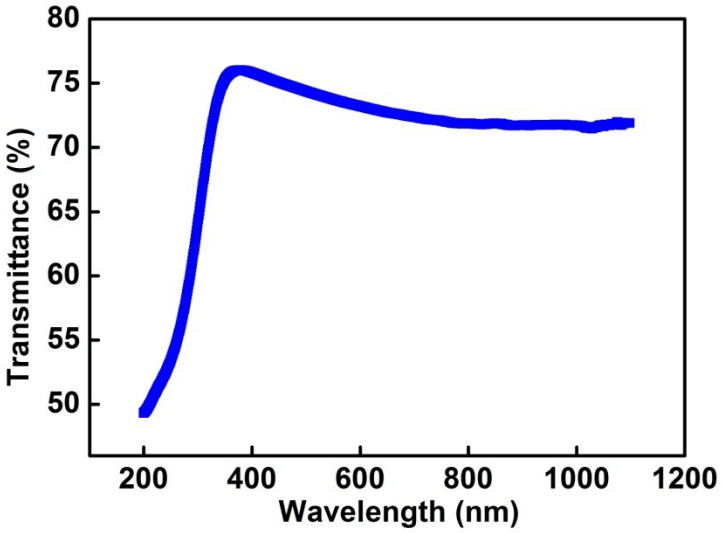

Figure. S1 Transmittance of 15 nm Ti layer.

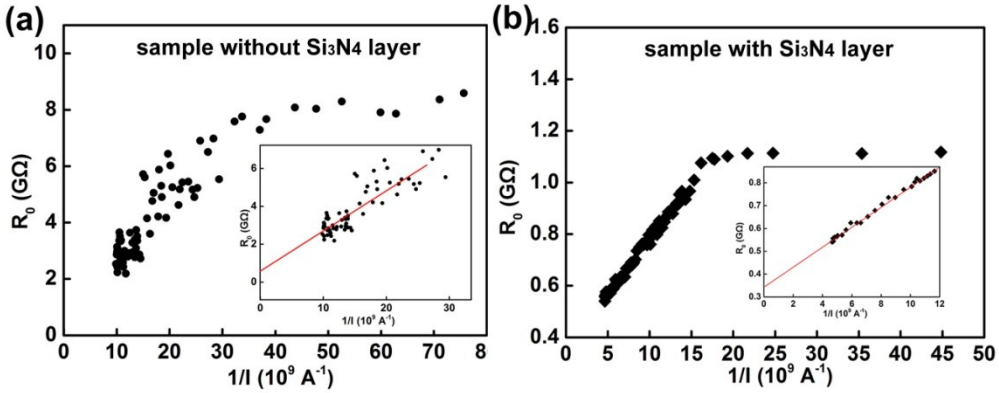

Figure. S2 The differential resisitance R_0 as a function of forward current 1/I.

The I-V curves of the heterojunction in the dark are considered to be fitted well by the modified Shockley equation:

$$I = I_0\{exp[\beta(V - IR_s)] - 1\} + \frac{V - IR_s}{R_{sh}} \qquad \text{(S1)}$$

Where: I_0 is the reverse saturation current, R_s is the series resistance and R_{sh} is the shunt resistance. $\beta = q/nkT$, where q is the electronic charge, n is the diode quality factor, k is the Boltzmann constant, and T is the absolute temperature.

From equation (S1), the junction differential resistance, R_0, can be given by:

$$R_0 = \frac{dV}{dI} = R_s + \frac{1}{\beta I_0 exp[\beta(V - IR_s)] + 1/R_{sh}} \qquad \text{(S2)}$$

For higher forward bias, where R_s affects the curves, equation (S1) can be approximated as $I = I_0 exp[\beta(V - IR_s)]$, and since $1/R_{sh} < \beta I$, equation (S2) can be written as follows:

$$R_0 \cong R_s + 1/\beta I \qquad \text{(S3)}$$

Thus, by plotting R_0 vs $1/I$ for high forward bias, shown in Figure. (S1), the value for R_s and n parameters can be extracted.

At low voltages, where the current flowing through R_{sh} becomes important, and equation (S2) becomes:

$$R_0 \cong R_s + R_{sh} \qquad \text{(S4)}$$

Usually, $R_s \ll R_{sh}$, and R_0 thus approaches R_{sh} at low bias.

The graph of R_0 vs $1/I$ is shown in Figure. S2. As a result, the values of n, R_s and R_{sh} are 8.1, 550 MΩ and 8 GΩ for the heterojunction without Si_3N_4 layer while these values are 1.65, 350 MΩ and 1.1 GΩ for the heterojunction with Si_3N_4 layer**.**

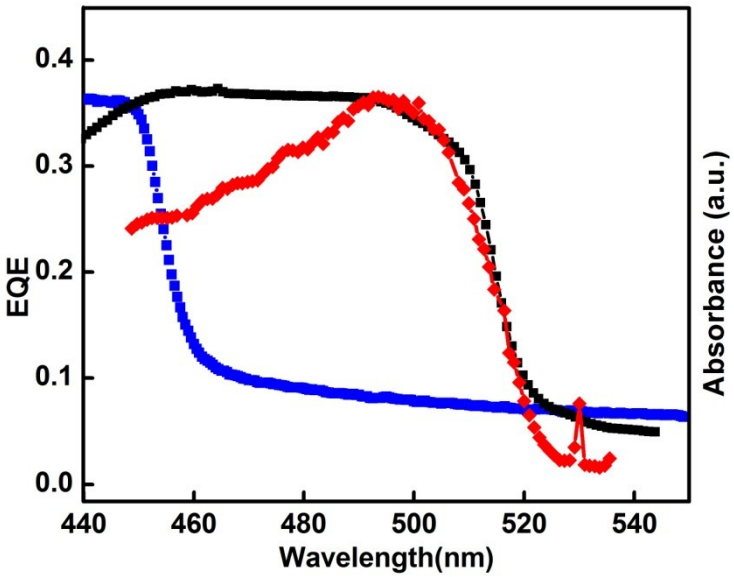

Figure. S3 EQE spectrum of the p-ZnSe/n-CdS core-shell heterojunction solar cells and the absorption spectrum of CdS and ZnSe. It is noted that the EQE spectrum shows the maximum EQE value of ~ 37% located at ~ 495 nm and indicates that CdS film has major contribution in the heterojunction solar cells.

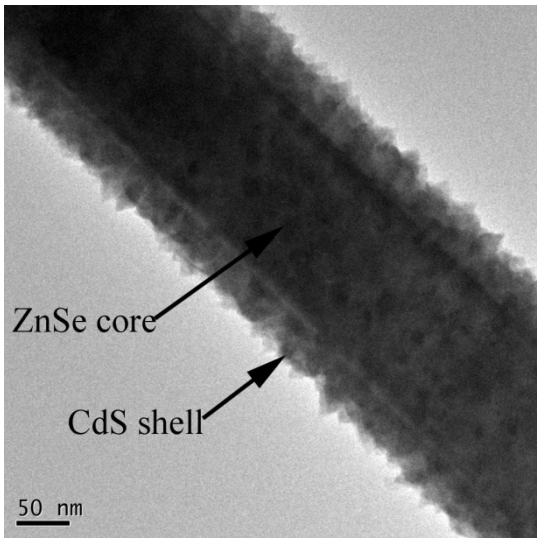

Figure S4. TEM image of a ZnSe/CdS core-shell heterojunction. The TEM image showed that there was a sharp distinction in the contrast along the radial direction of the nanowire, which revealed that its core-shell structure.