ARTICLE

Supplementary information

Core-shell ZnO@TiO_2 hexagonal prism heterogeneous structures as photoanodes for boosting the efficiency of quantum dot sensitized solar cells

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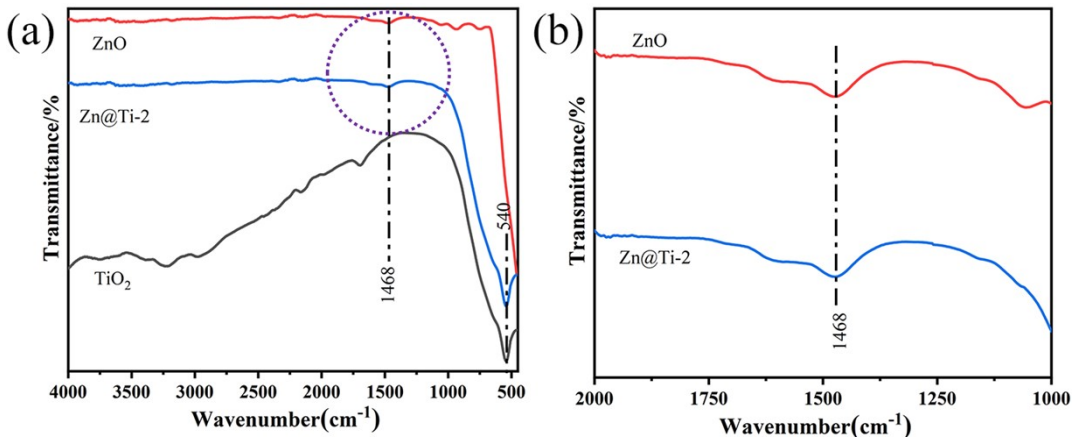

Fig. S1 FTIR spectra of (a)TiO_2,ZnO and Zn@Ti-2 ; (b) local magnification of FTIR spectra of ZnO and Zn@Ti-2.

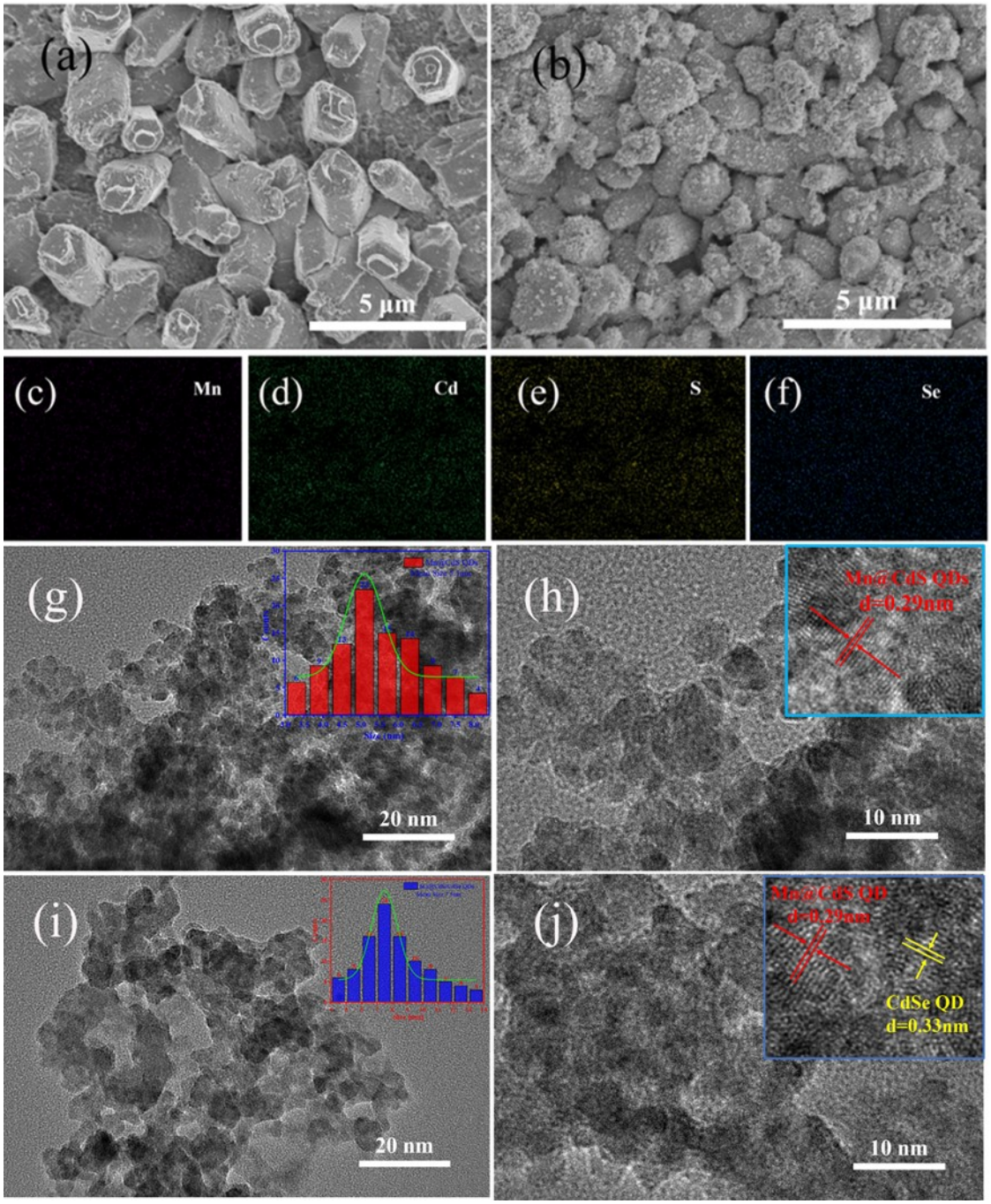

Fig. S2 SEM images of(a)Zn@Ti-2; (b) Zn@Ti-2 loaded with Mn@CdS/CdSe QDs; (c-f) EDS element mapping of Zn@Ti-2 loaded with Mn@CdS/CdSe QDs; TEM and HRTEM images of (g) Mn@CdS QDs; (h) Mn@CdS/CdSe QDs.

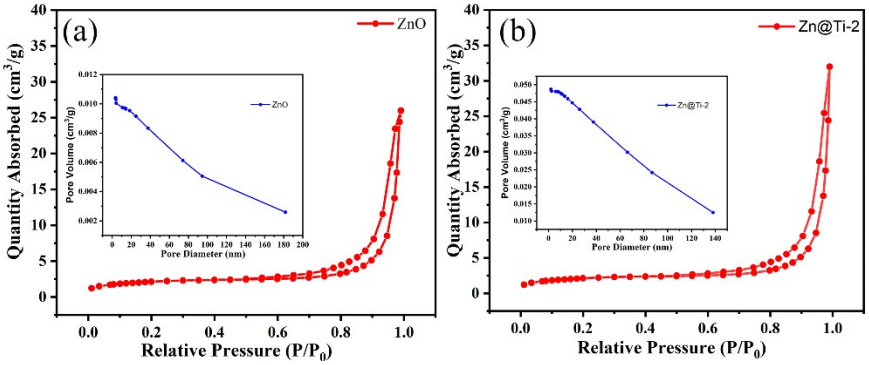

Fig. S3 Nitrogen adsorption-desorption isotherms of (a) ZnO; (b) Zn@Ti-2 (illustration shows pore size distributions of ZnO and Zn@Ti-2).

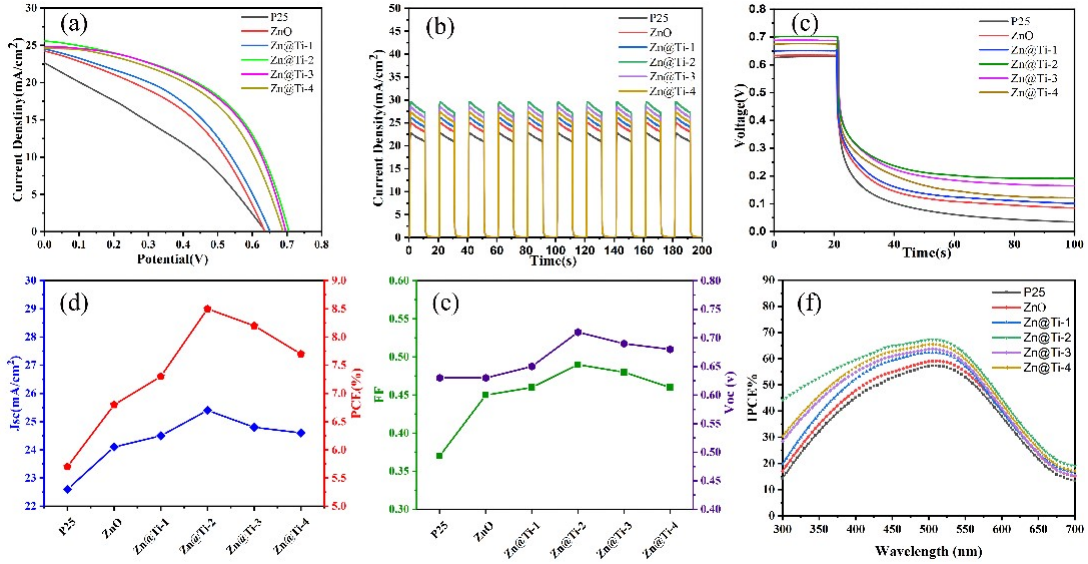

Fig.S4 (a) J-V curves of QDSSCs with different photoanodes; (b) transient photocurrent responses; (c) OCVD curves; (d) comparison of average *Jsc* and *PCE*; (e) comparison of average *FF* and *Voc*; (f) IPCE comparison chart.

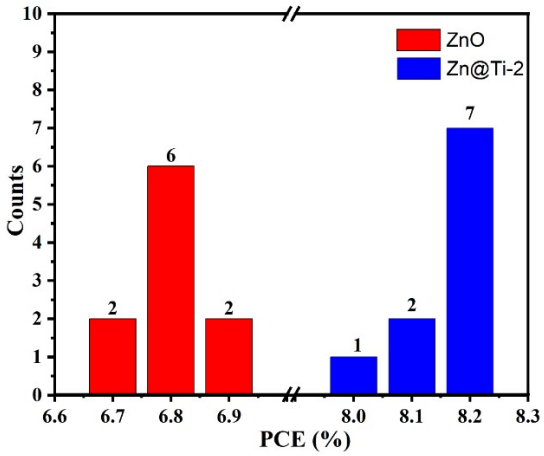

Fig. S5 *PCE* distribution histogram of 10 cells measured for ZnO and Zn@Ti-2.

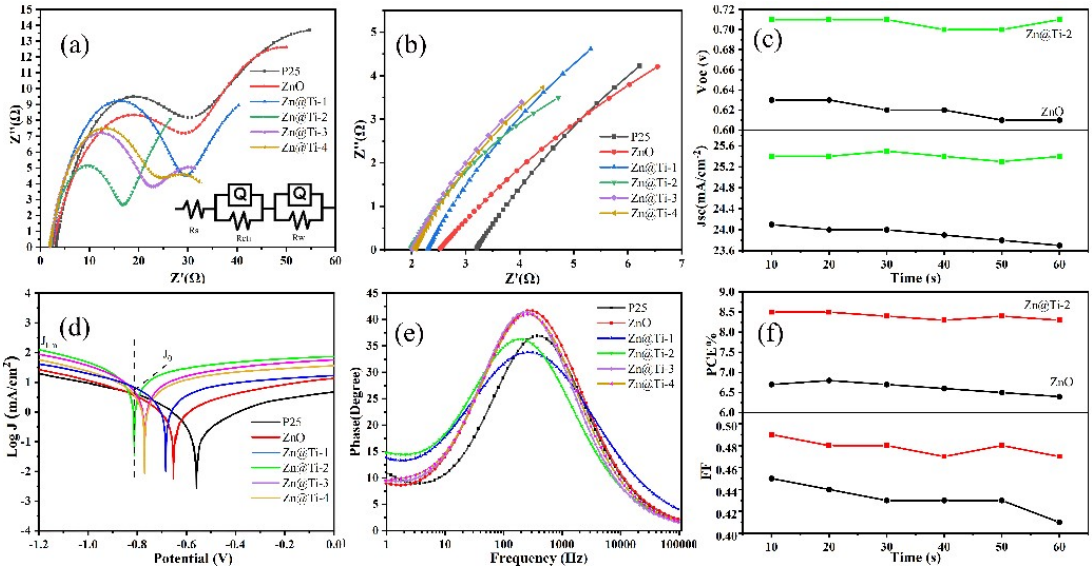

Fig. S6 (a) Nyquist curve of QDSSCs with different photoanodes; (b) Partial magnification of Nyquist curve; (c) Time function curves of *Voc* and *Jsc* corresponding to ZnO and Zn@Ti-2; (d) Tafel curve of QDSSCs with different photoanodes; (e)Bode phase curve; (f) Time function curves of *PCE* and *FF* corresponding to ZnO and Zn@Ti-2.

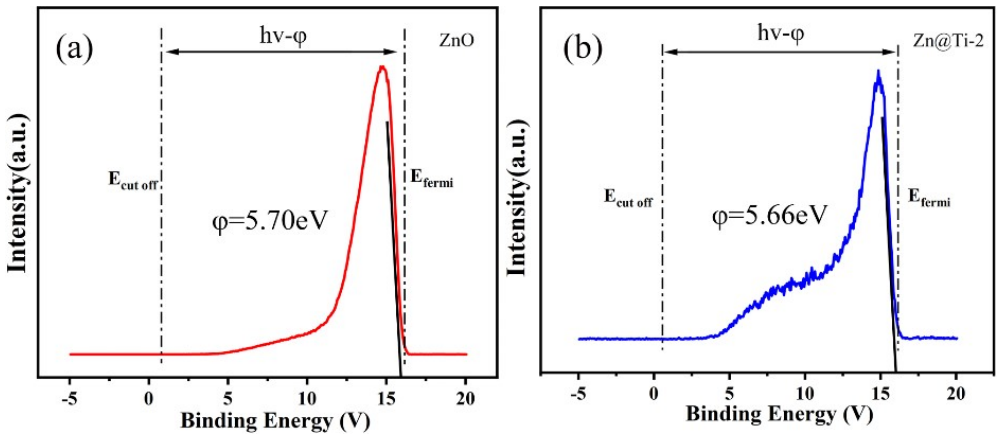

Fig. S7 Ultraviolet photoelectron spectra of (a) ZnO; (b)Zn@Ti-2.

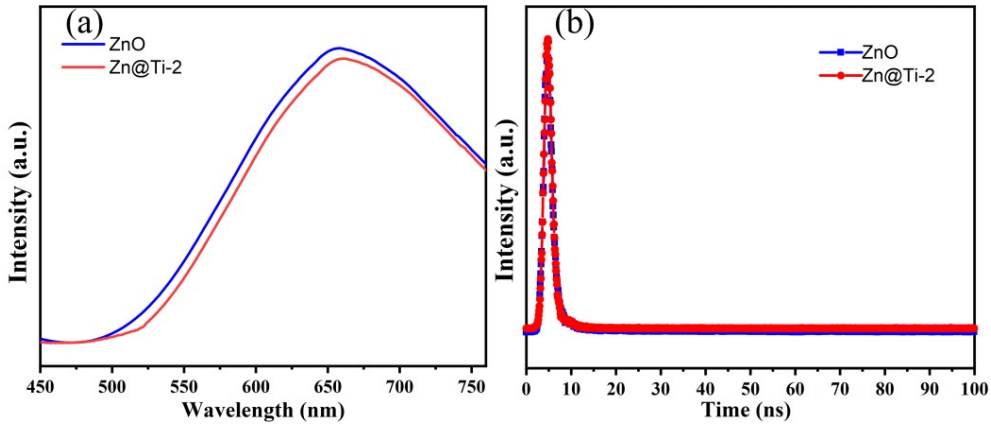

Fig. S8 (a) PL spectra of ZnO and Zn@Ti-2; and (b) time-resolved PL attenuation spectra of ZnO and Zn@Ti-2.

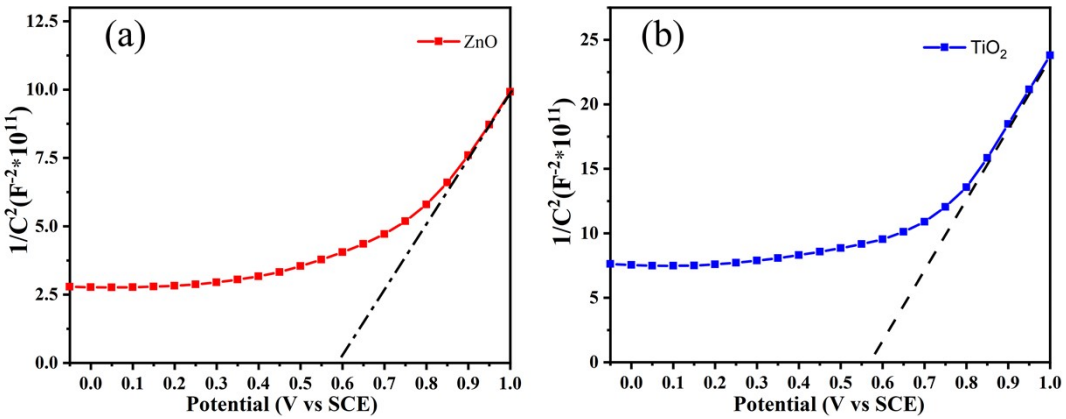

Fig. S9 Mott-Schottky diagram of (a) ZnO and (b) TiO_2.

Table. S1 Comparisons of present photovoltaic values in this study with other reports of similar Photoanode and QDs.

Photoanode	QDs	*PCE*	*Jsc* (mA/cm^2)	*Voc* (V)	*FF*	Year	Ref
RGO@TiO_2NRs	CdS	2.20%	11.7	0.45	0.42	2019	1
ZnO	CdSe	3.05%	9.28	0.63	0.74	2021	2
TiO_2	CdS@CdSe	5.70%	18.3	0.51	0.54	2023	3
RGO@TiO_2NRs	CdS	2.20%	11.7	0.45	0.42	2019	4
TiO_2/ZnO inverse opal	CdS@CdSe	8.18%	31.2	0.57	0.46	2022	5
TiO_2	Zn@CdS@CdSe	5.59%	21.5	0.52	0.50	2022	6
TiO_2	CdS@CdSe	4.05%	14.0	0.48	0.60	2023	7

Table S2 Photovoltaic parameters of QDSSCs corresponding to different photoanodes.

	Jsc (mA/cm^2)	*Voc* (V)	*PCE*	*FF*
P25	**22.6**	**0.63**	**5.7%**	**0.37**
ZnO	**24.1**	**0.63**	**6.8%**	**0.45**
Zn@Ti-1	**24.5**	**0.65**	**7.3%**	**0.46**
Zn@Ti-2	**25.4**	**0.71**	**8.5%**	**0.49**
Zn@Ti-3	**24.8**	**0.69**	**8.2%**	**0.48**
Zn@Ti-4	**24.6**	**0.68**	**7.7%**	**0.46**

Table S3 Performance parameters of EIS corresponding to different anodes.

	Rs (Ω)	*Rct* (Ω)	J_0 (mA/cm^2)	τ_e (ms)
P25	**3.2**	**55.86**	**0.49**	**7.35**
ZnO	**2.5**	**38.13**	**0.90**	**7.22**
Zn@Ti-1	**2.3**	**26.32**	**1.82**	**7.05**
Zn@Ti-2	**1.98**	**14.40**	**2.45**	**6.40**
Zn@Ti-3	**2.02**	**16.45**	**2.22**	**6.65**
Zn@Ti-4	**2.1**	**20.12**	**2.01**	**6.80**

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