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

Supporting information

InP and Sn:InP based quantum dot sensitized solar cells

Calculation procedure for ligand exchange efficiency:

The ratio of the concentration before (C_1) and after (C_2) ligand exchange is defined as the exchange efficiency ($Y_{exchange}$).

$$Y_{exchange} = \frac{C_2}{C_1} \times 100\% = \frac{A_2/\varepsilon_2 l_2}{A_1/\varepsilon_1 l_1} \times 100\% \quad (1)$$

Here, A represents the absorbance at the first excitonic absorption peak. l represents the constants. ε is the correlation molar extinction coefficient that is calculated using the empirical functions (2).

$$\varepsilon = 3046.1D^3 - 76532D^2 + (5.5137 \times 10^5)D - 8.9839 \times 10^5 \quad (2)$$

Here, the correlation diameter (D) is calculated using equation (3).

$$D = -3.3307 \times 10^{-12}\lambda^5 + 1.0262 \times 10^{-8}\lambda^4 - 1.0781 \times 10^{-5}\lambda^3 + 5.4550 \times 10^{-3}\lambda^2 - 1.3122\lambda + 119.9 \quad (3)$$

Where, λ represents the first excitonic absorption peak wavelength.

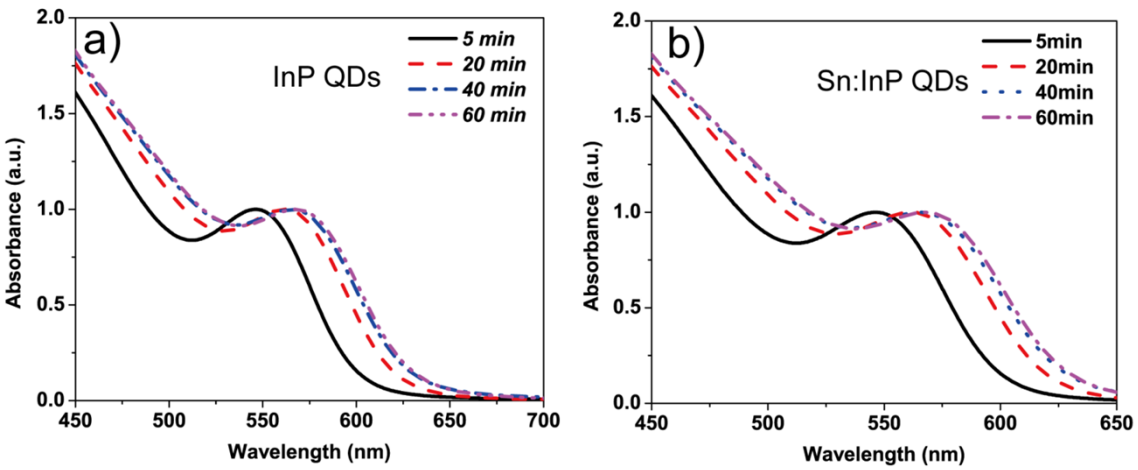

Figure S1. The temporal evolution of UV-vis absorption spectra of a) InP QDs and b) Sn:InP QDs with Sn/In=0.1

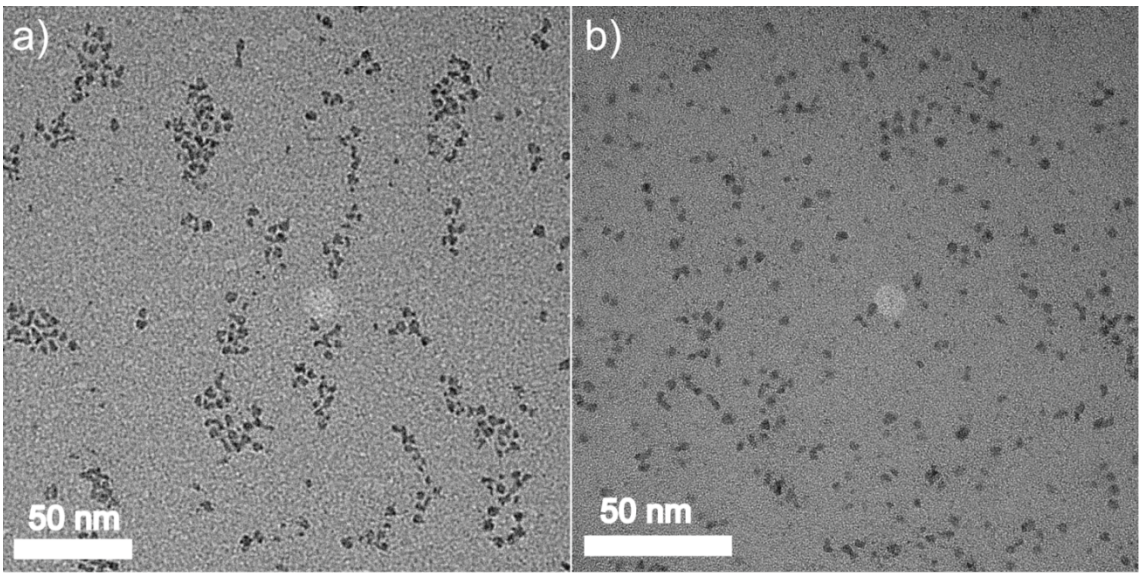

Figure S2. HR-TEM images of a) undoped InP and b) Sn:InP QDs

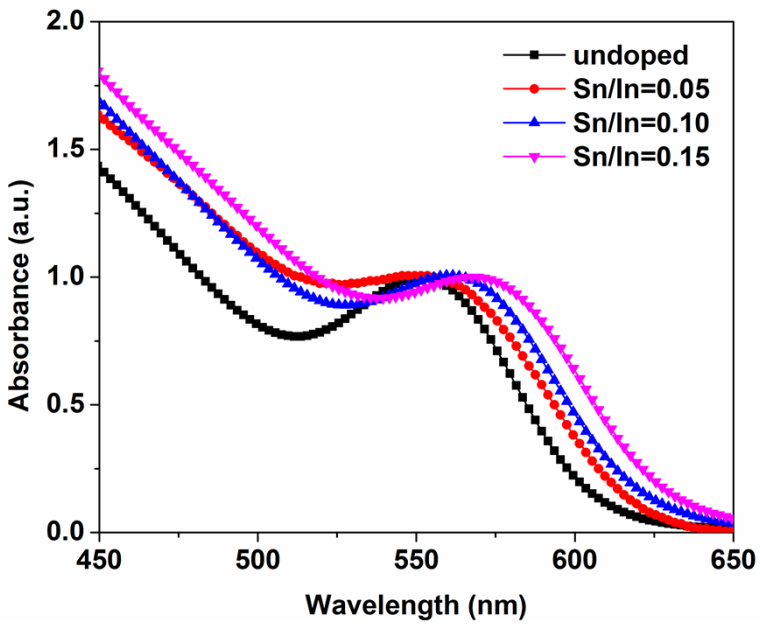

Figure S3 The absorption spectra of undoped InP QDs and Sn doped InP QDs with different Sn/In ratios of 0.05, 0.1 and 0.15

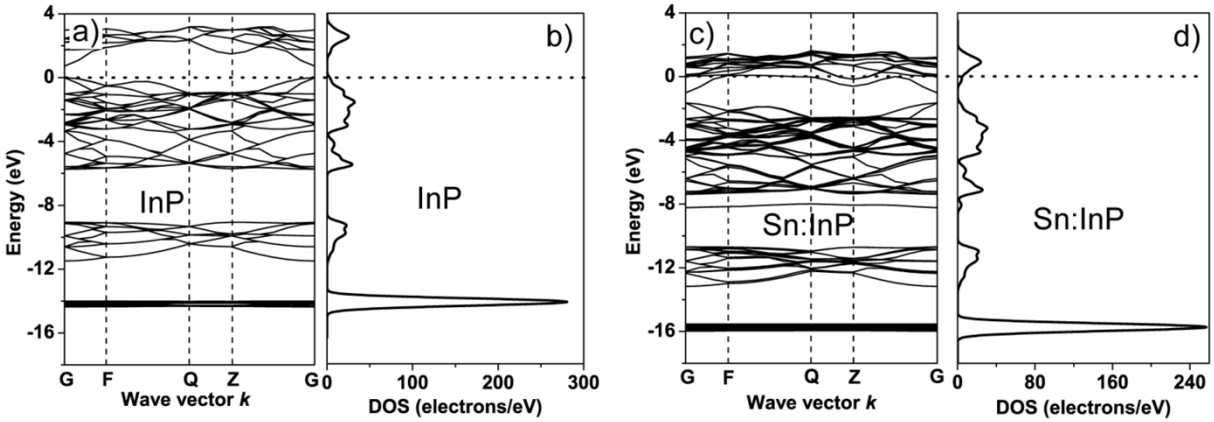

Figure S4. Band and DOS curves of undoped InP and Sn:InP semiconductor materials

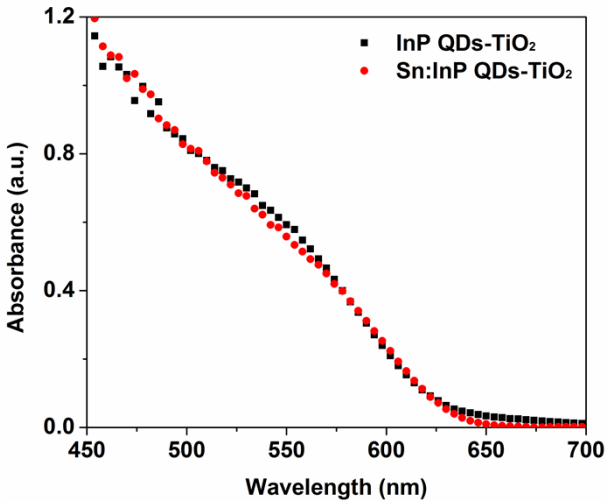

Figure S5. UV-vis spectra of QDs sensitized TiO_2 films

Table S1 ICP-AES analysis results of Sn:InP QDs with different Sn/In ratios

Samples	Sn/In ratios –ICP-AES	Initial configuration ratios
Sn:InP	0.081	0.15
Sn:InP	0.055	0.10
Sn:InP	0.010	0.05

Table S2 EDS analysis results of Sn:InP QDs (Sn/In=0.1) sensitized TiO_2 films

Element	Weight %	Atomic %
P *Kα*	3.04	5.01
In *Lα*	12.29	5.46
Sn *Lα*	0.87	0.38
Ti *Kα*	83.79	89.16

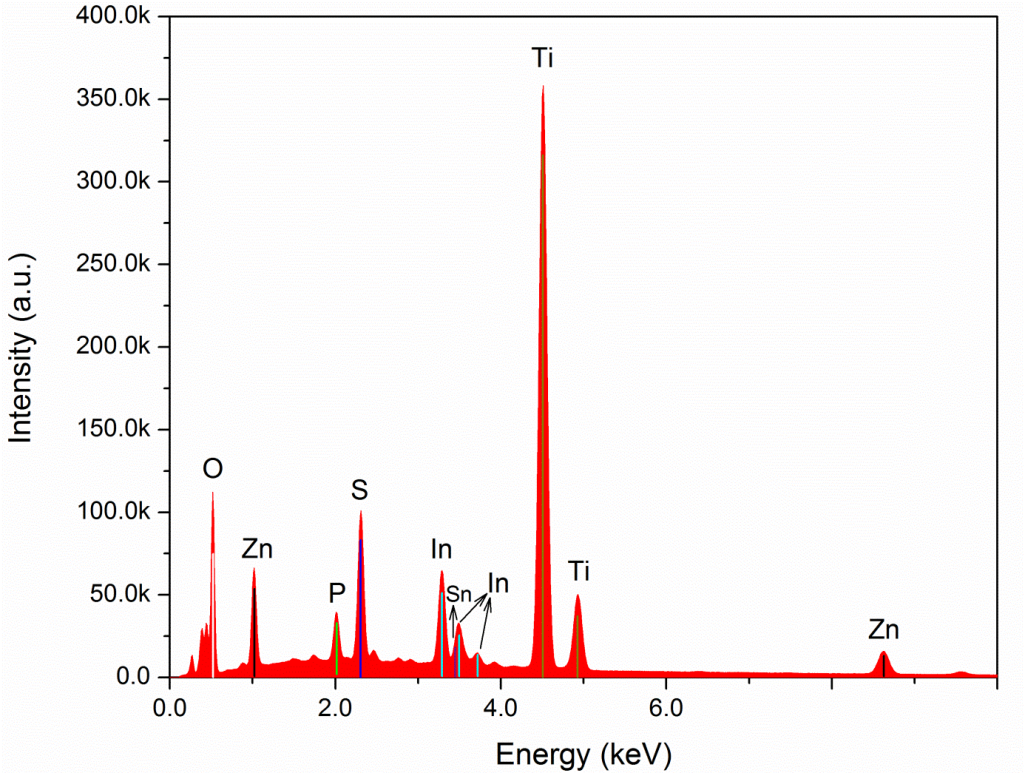

Figure S6. EDS spectrum of the Sn:InP QDs sensitized photoanode

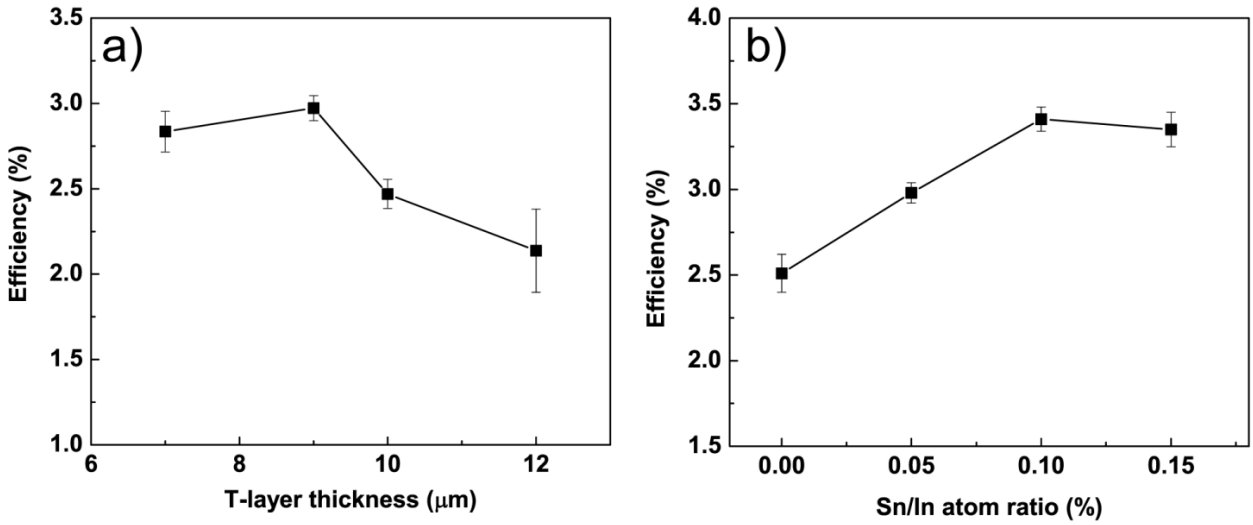

Figure S7. Efficiency of a) different transparent layer thickness of TiO_2 films and b) Sn/In atom ratios

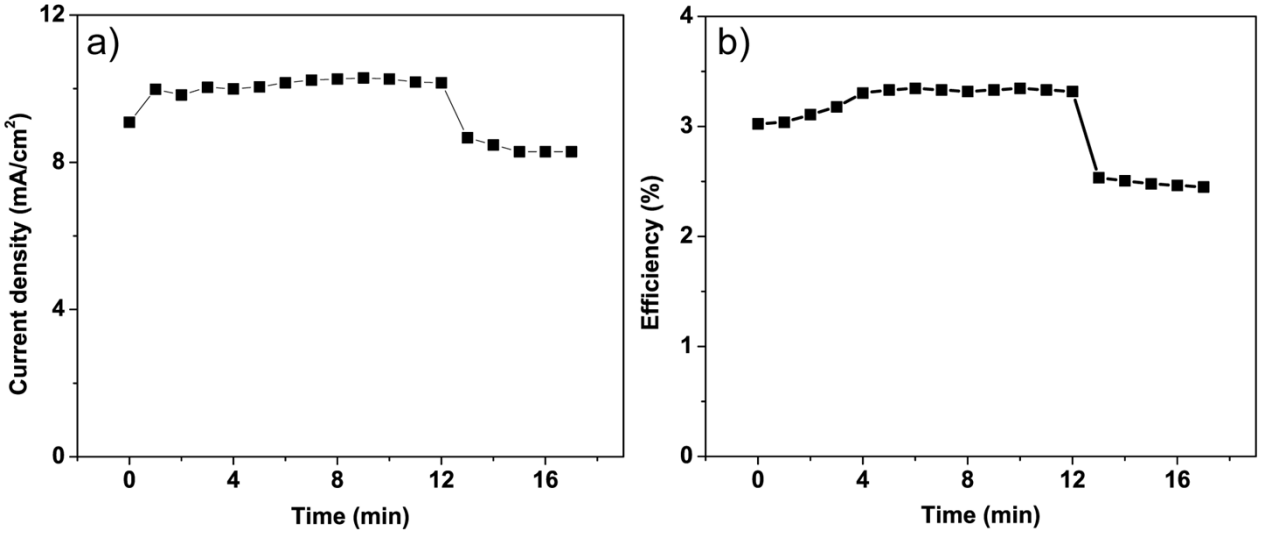

Figure S8. The stability of Sn:InP QDSSCs: a) current density and b) efficiency versus illumination time under continuous illumination.

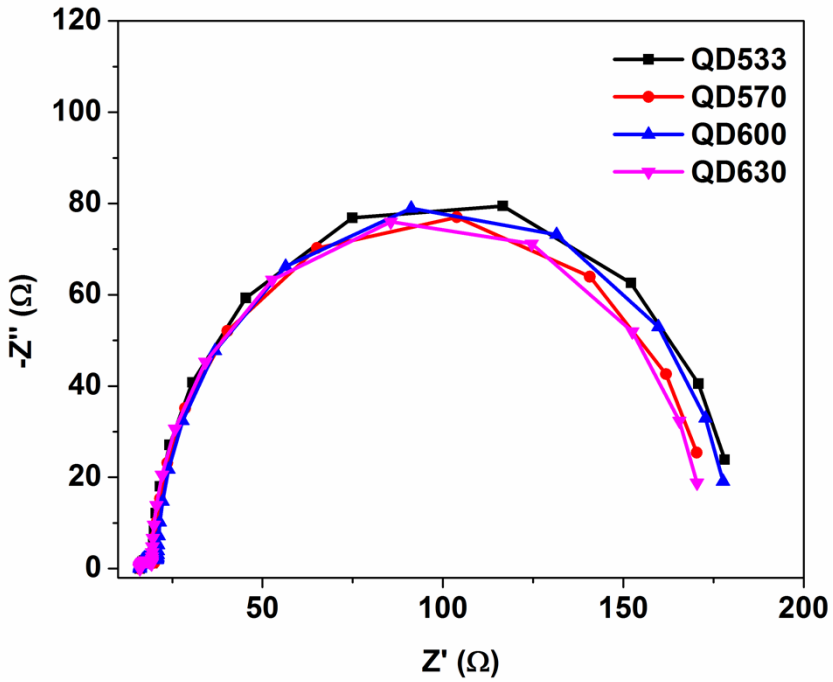

Figure S9. Nyquist curves of Sn:InP QDSSCs with different absorption wavelength.