Electronic Supplementary Information

Quantum Dots-Induced Improved Performance of Cadmium Telluride (CdTe) Solar Cells without Cu Buffer Layer

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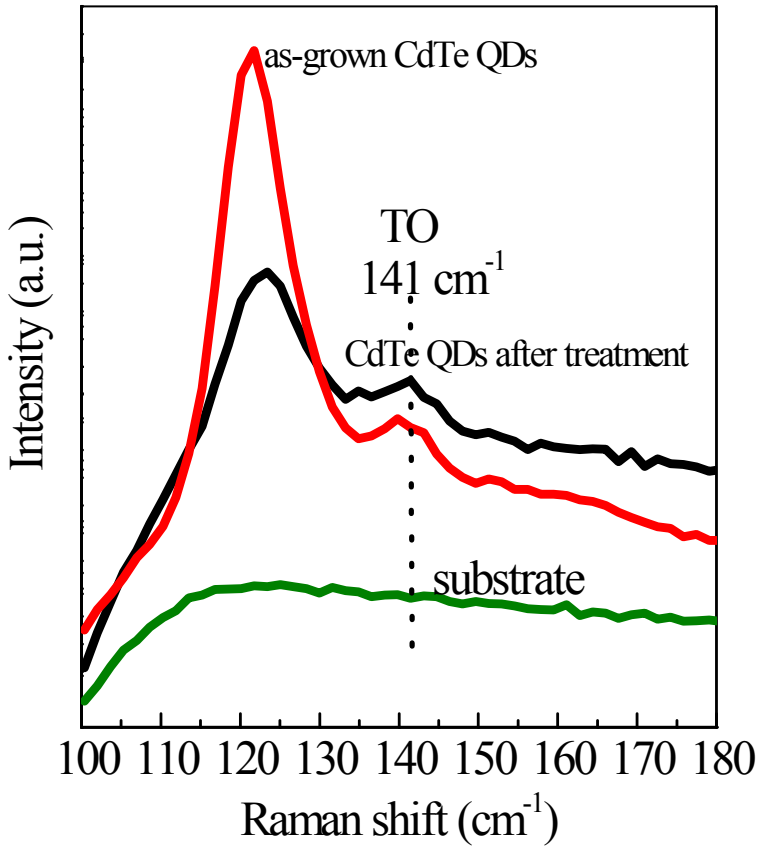

Fig. S1 Raman spectra of CdTe QDs before and after thermal treatment

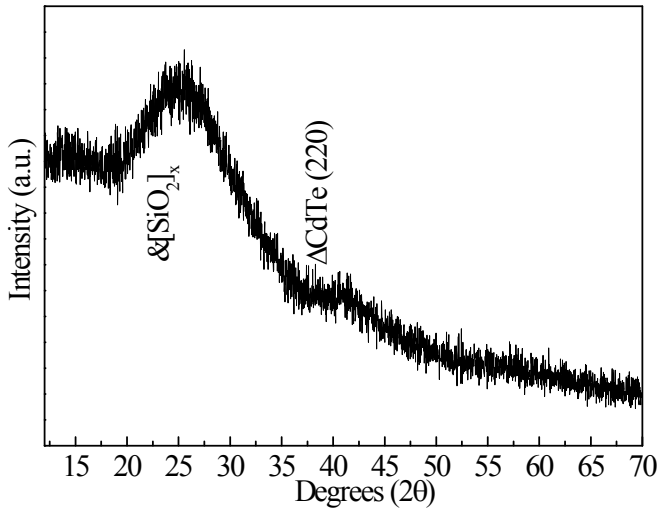

Fig. S2 XRD pattern of the as-synthesized CdTe QDs

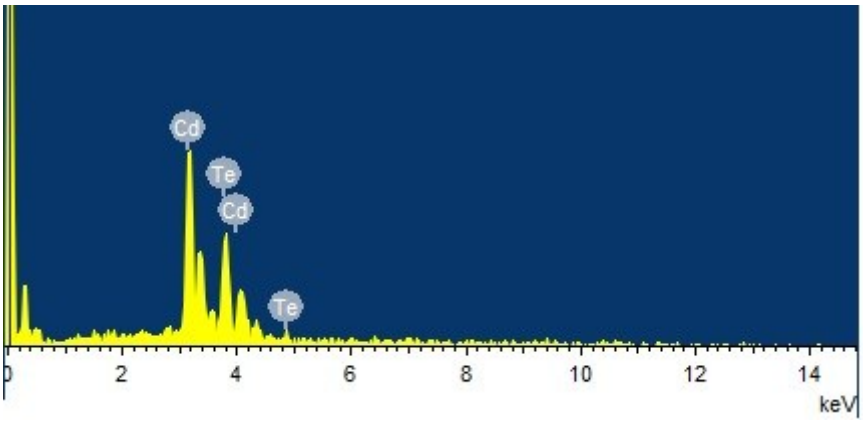

Fig. S3 EDX spectrum of CdTe QDs

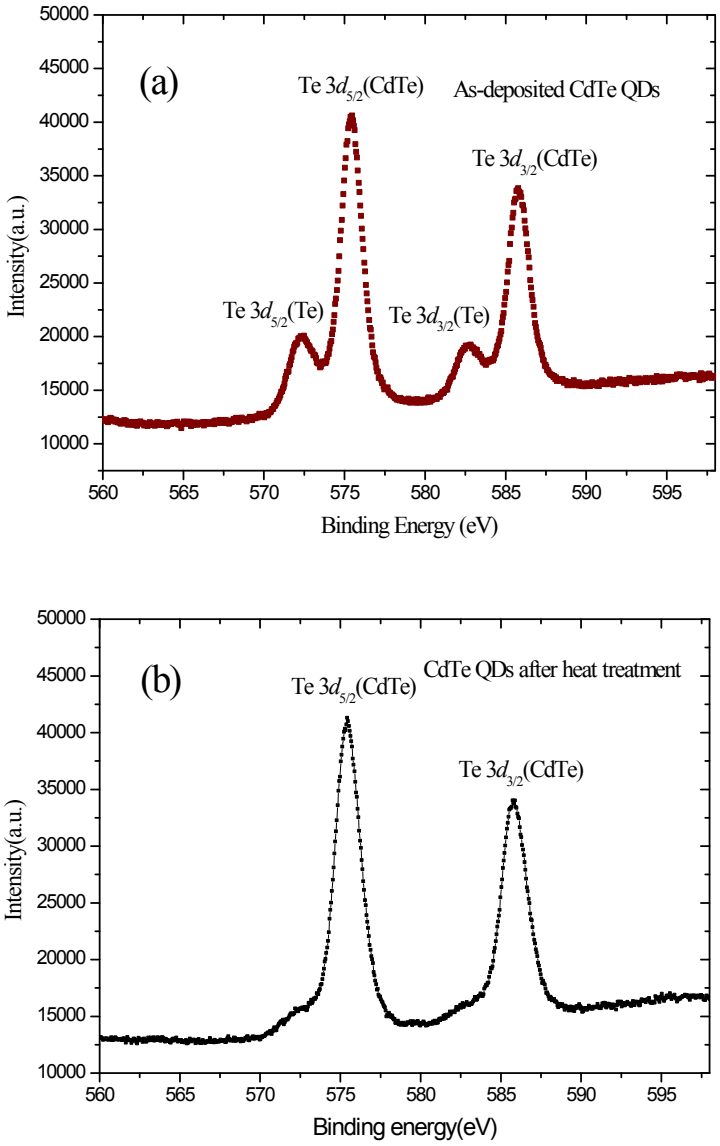

Fig. S4 XPS spectra of Te for CdTe QDs before (a) and after (b) thermal treatment

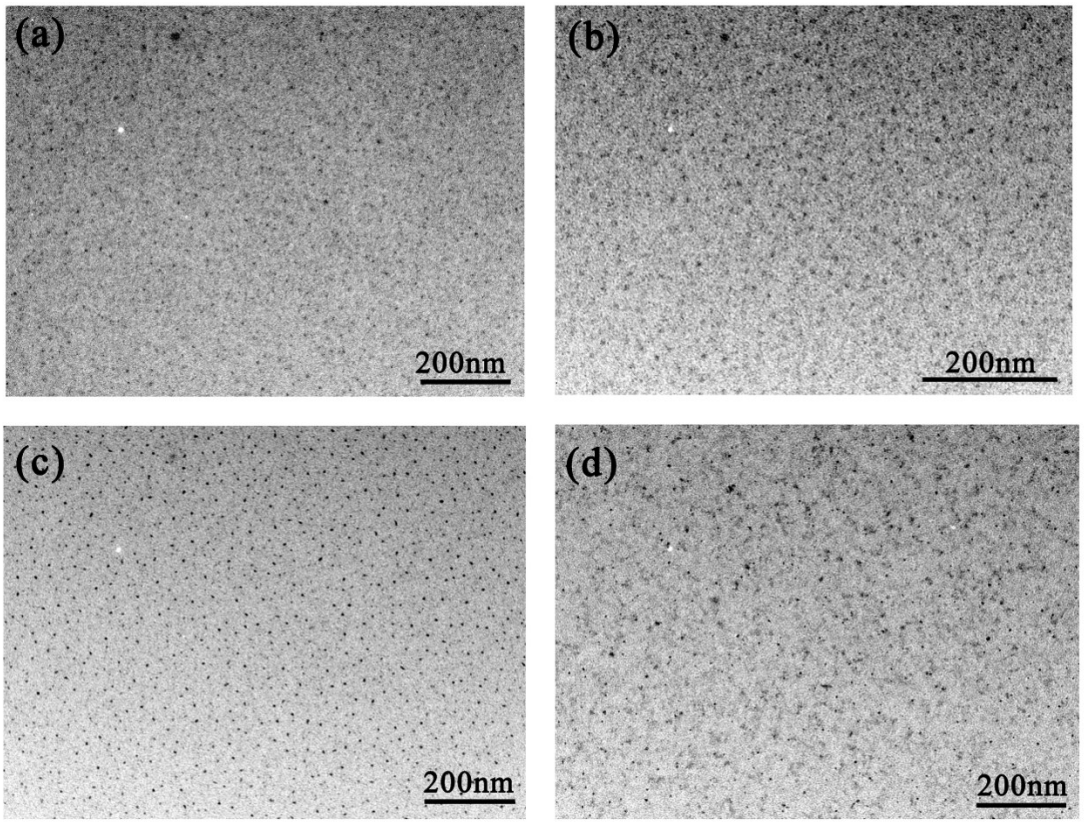

Fig. S5 TEM images of CdTe QDs deposited for 10 s (a), 20 s (b), 30 s (c), and 40 s (d) after thermal treatment at 170 ^{o}C for 40 min.

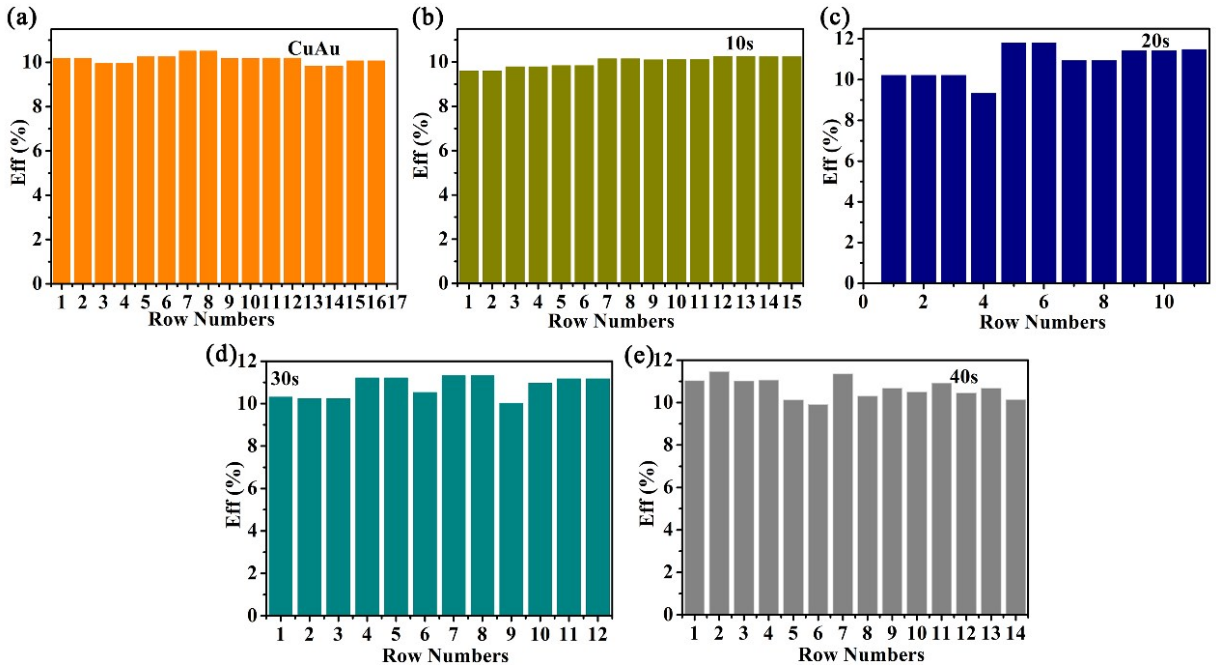

Fig. S6 Average Eff for a batch of CdTe devices with Cu and CdTe QDs deposited with different time as buffer layers after thermal treatment

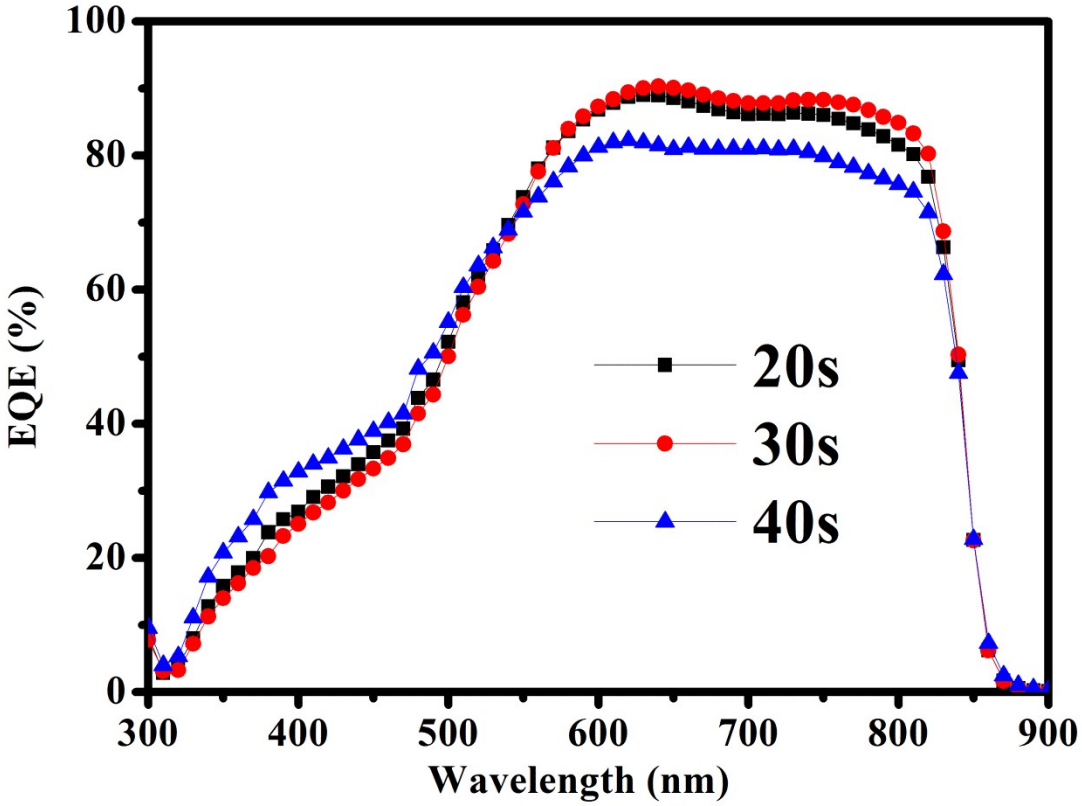

Fig. S7 (a)EQE curves for CdTe cells with CdTe QDs deposited for 20, 30, and 40s as buffer layers.

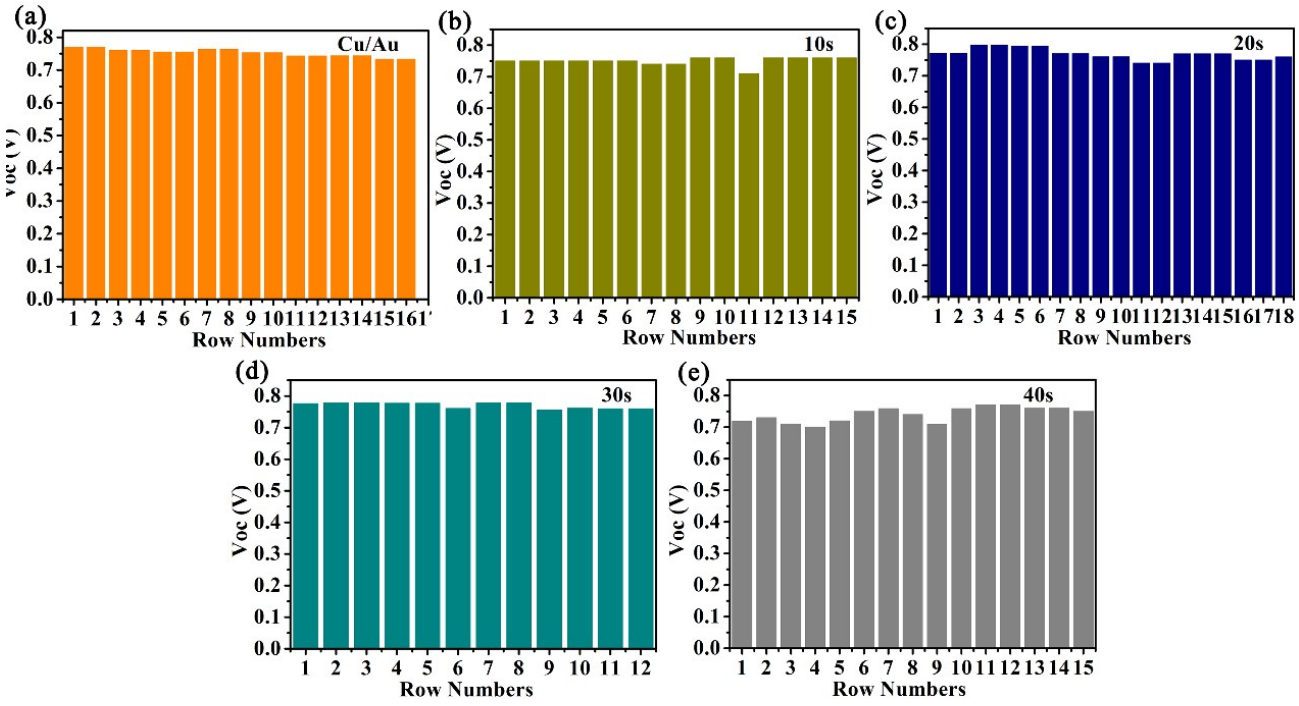

Fig. S8 Average V_{OC} for more than 14 CdTe devices with Cu and CdTe QDs deposited with different time as buffer layers after thermal treatment

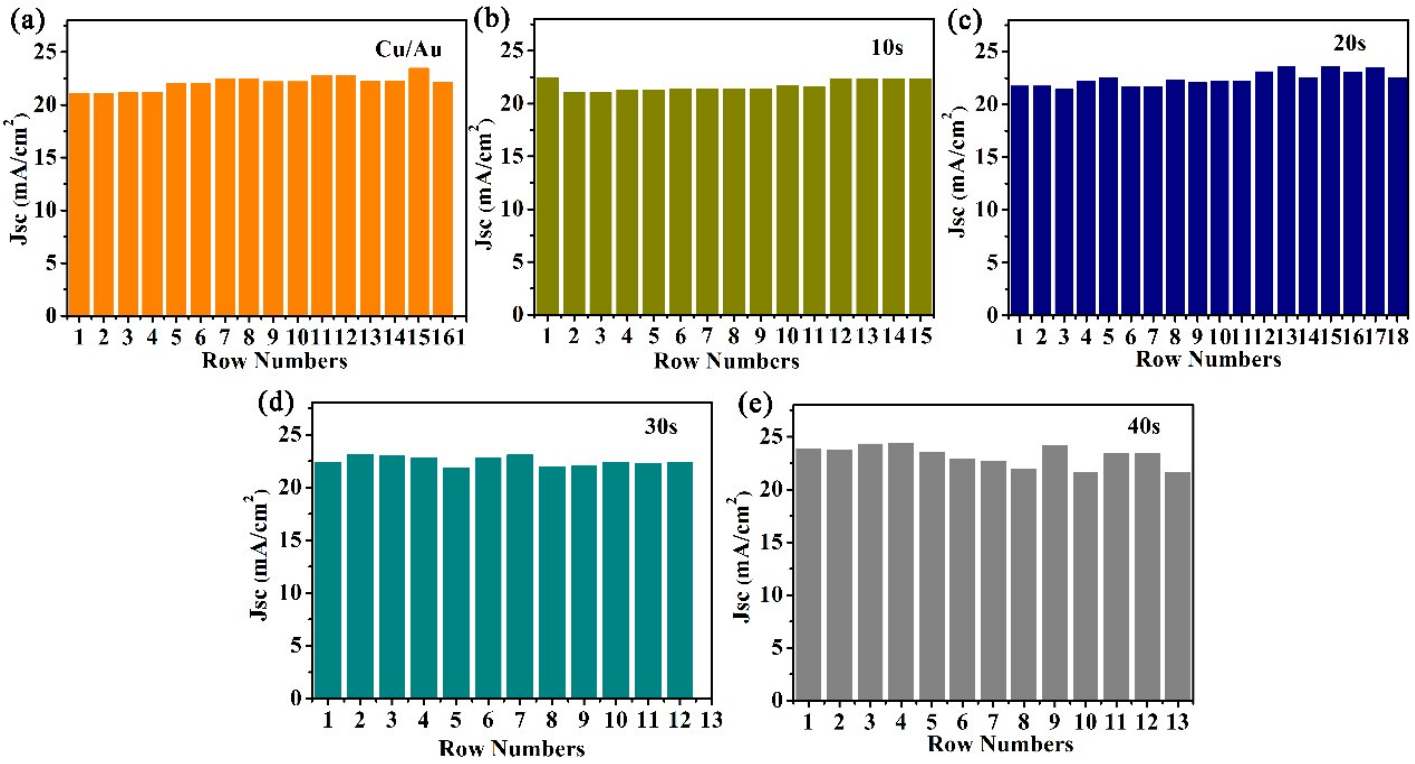

Fig. S9 Average J_{SC} for more than 14 CdTe devices with Cu and CdTe QDs deposited with different time as buffer layers after thermal treatment

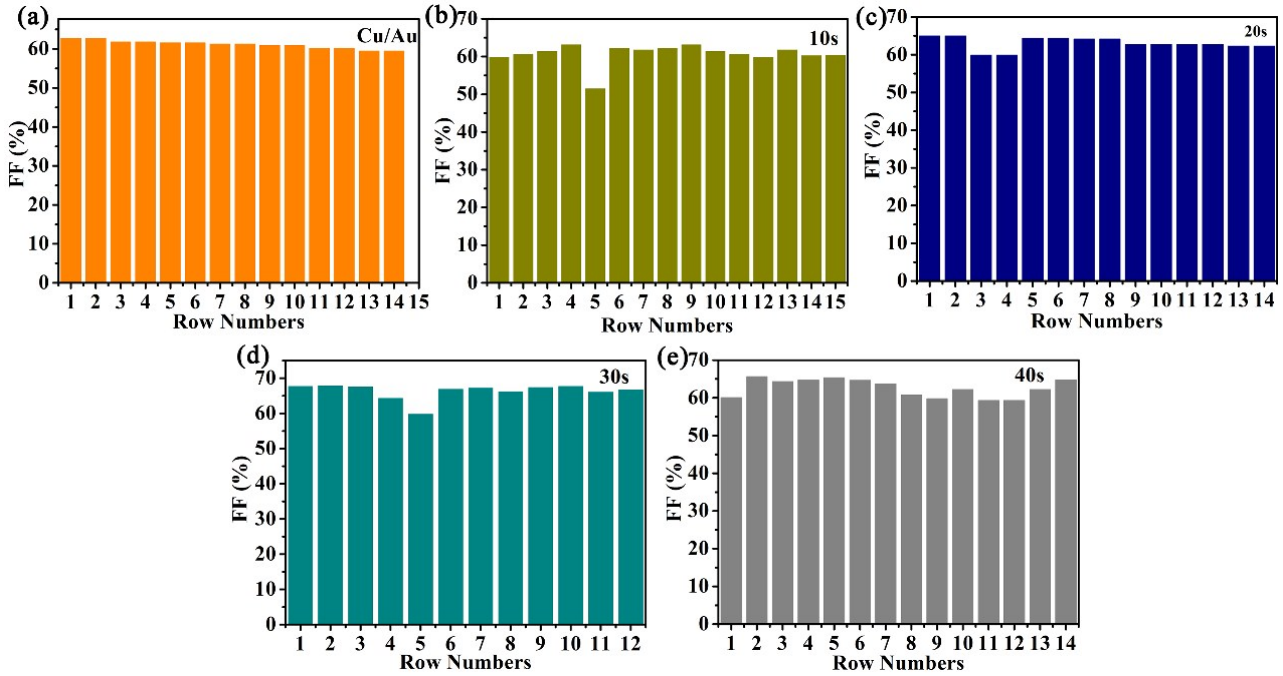

Fig. S10 Average FF for more than 14 CdTe devices with Cu and CdTe QDs deposited with different time as buffer layers after thermal treatment

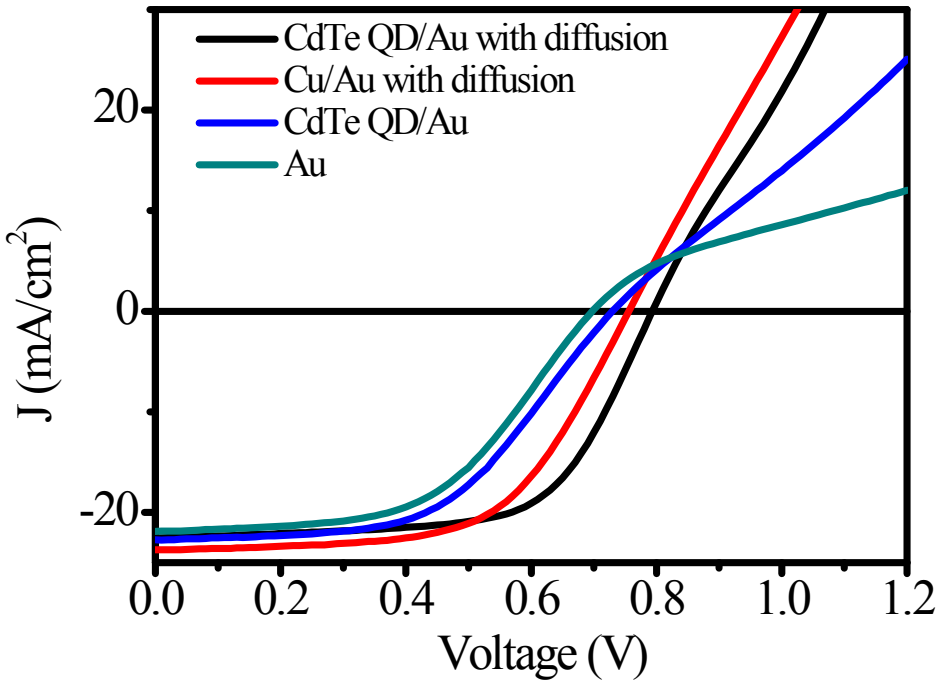

Fig. S11 I-V curves of CdTe cells with CdTe QDs/Au and copper/Au without and with diffusion

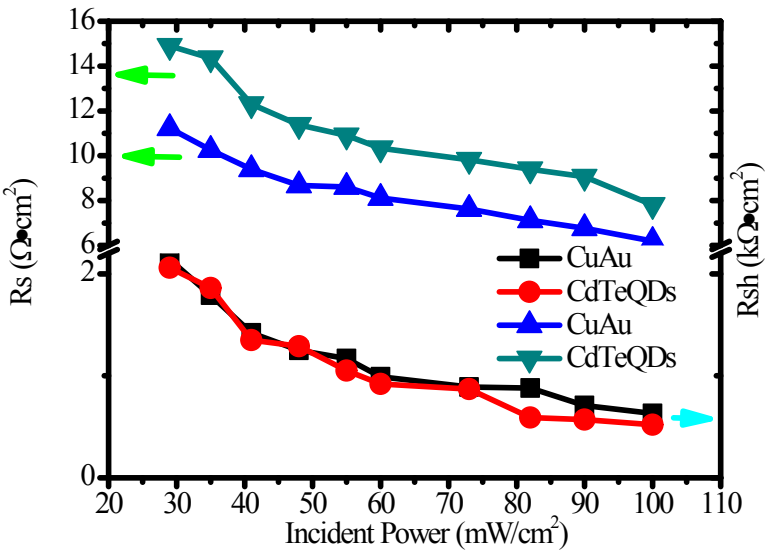

Fig. S12 The dependence of R_S for CdTe cell with CdTe QDs and Cu as buffer layers

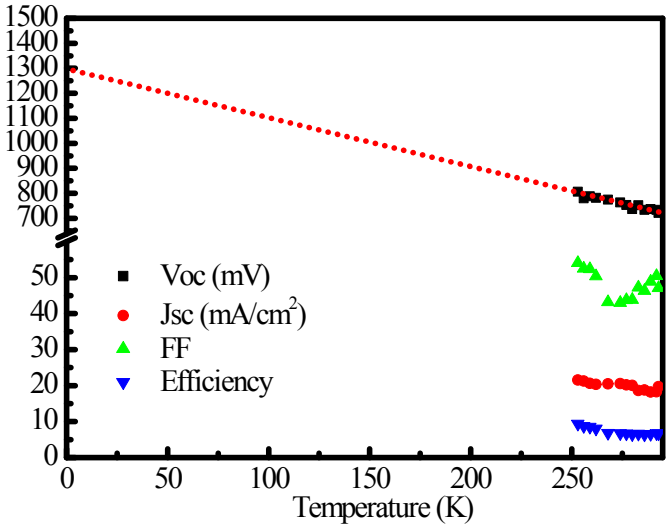

Fig. S13 Voc, Jsc, FF, and Eff as a function of temperature for CdTe cell with CdTe QDs as buffer layer

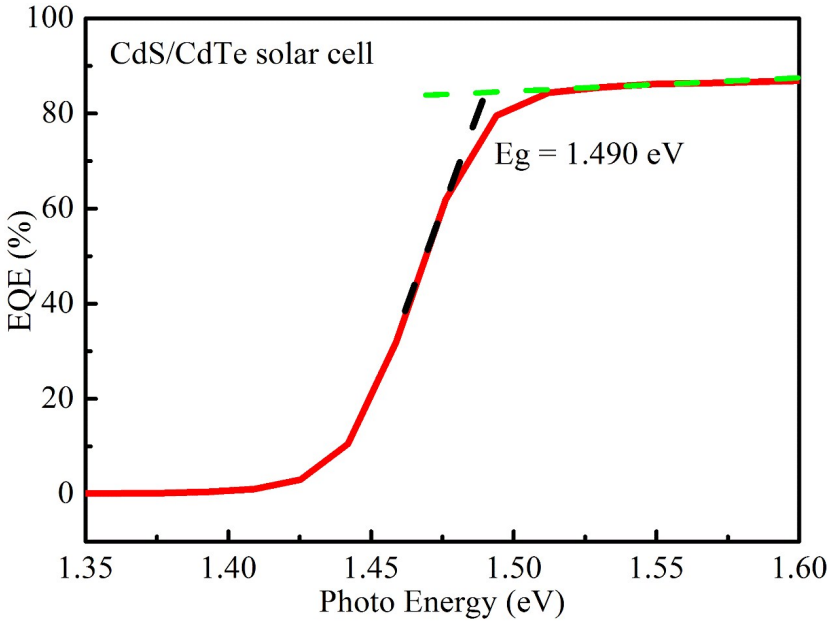

Fig. S14 The band gap of CdTe determined from the EQE curve, the band gap of CdTe is ~ 1.49 eV

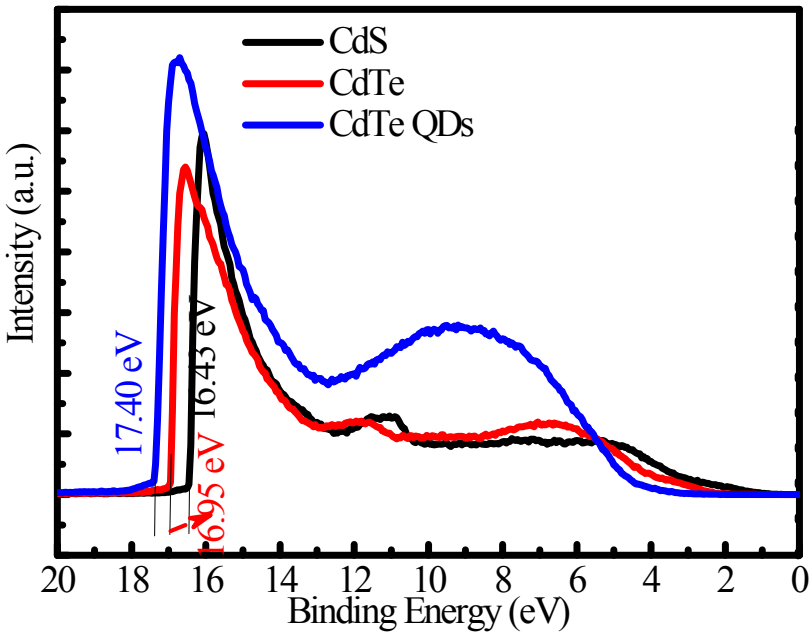

Fig. S15 Ultraviolet photoelectron spectrometer (UPS) of CdS, CdTe, and CdTe QDs

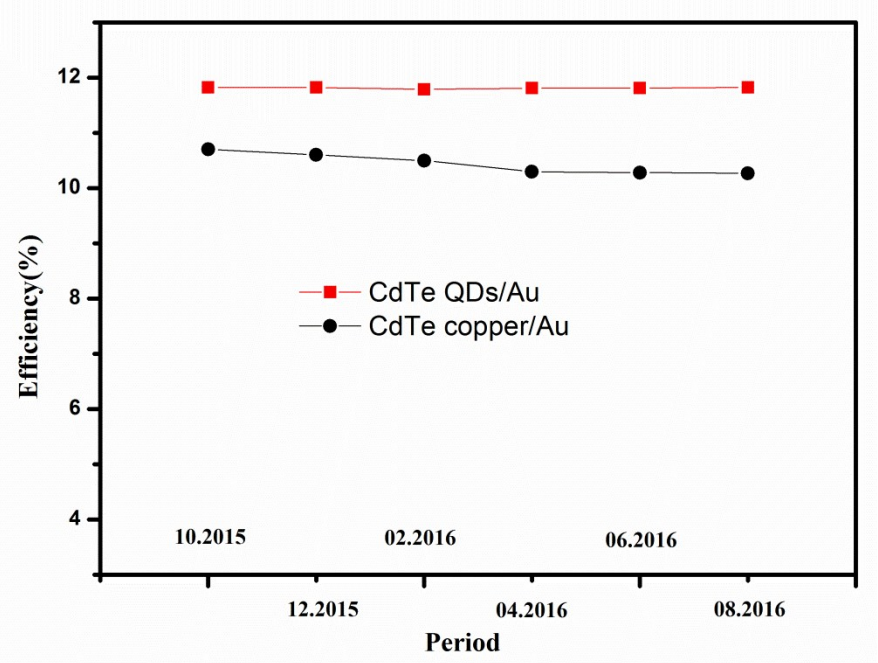

Fig. S16 Efficiency degradation for both CdTe QDs and copper contacted devices as a function of the time from October, 2015 to August, 2016.

Table S1 Summary of the growth condition for both CdS and CdTe

Content	CdS:O	CdTe
Temperature (℃)	Room temperature	272 ºC
Target-Substrate distance (cm)	12	12
RF power density (W/cm^2)	0.88	1.32
Ar (SCCM)	28.3	28.3
Deposition pressure (Pa)	3	2
Oxygen (SCCM)	0.25	0
Thickness (μm)	0.1	2.0~2.3