Supporting Information

Solution Processed Low-Cost and Highly Electrocatalytic Composite NiS/PbS Nanostructures as a Novel Counter Electrode Material for High-Performance Quantum Dot-Sensitized Solar Cells with Improved Stability

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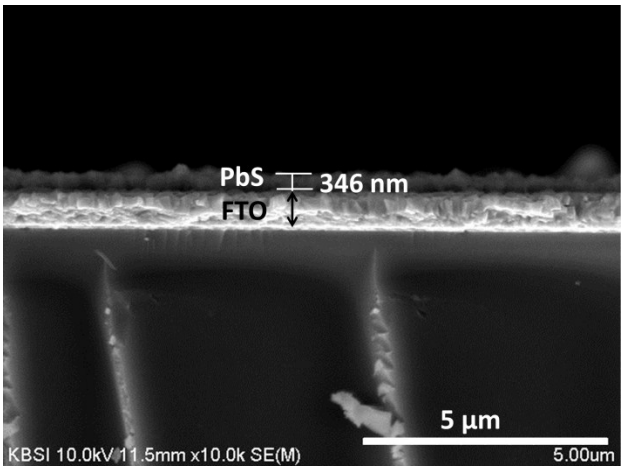

Fig. S1. Cross-sectional image of PbS thin film on the surface of FTO substrate.

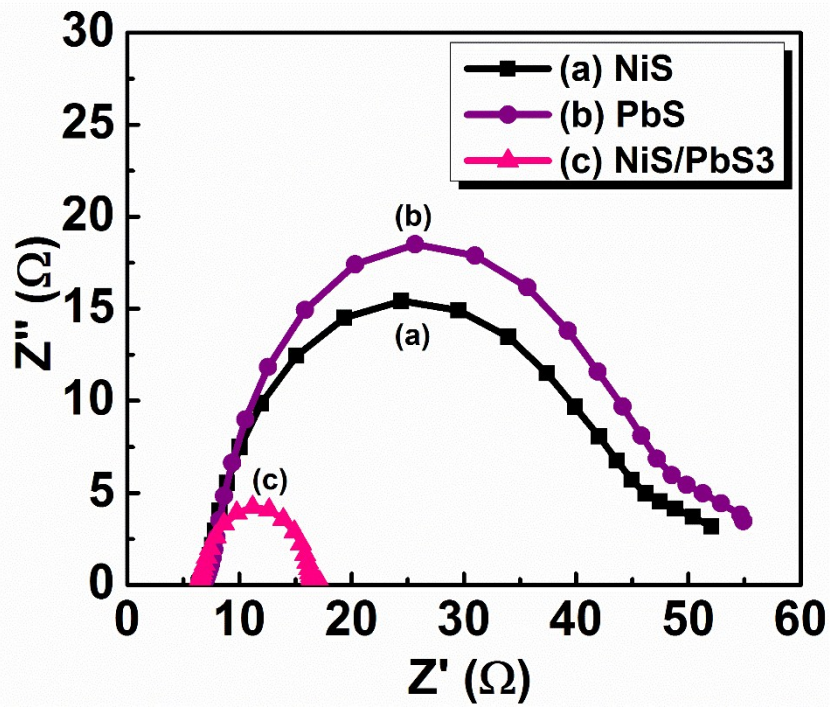

Fig. S2. Nyquist plots for the symmetric cell configuration consisting of two identical (a) NiS, (b) PbS, and (c) NiS/PbS3 CEs.

Table S1 EIS parameters extracted from fabricated symmetrical cells of NiS, PbS and NiS/PbS3 CEs, and the cells filled with a polysulfide electrolyte solution (1 M Na_2S, 2 M S, and 0.1 M KCl)

CEs	R_s (Ω)	R_{ct} (Ω)	CPE (μF)	Z_w (Ω)
NiS	6.63	39.65	137.2	6.19
PbS	6.75	42.12	124.8	6.31
NiS/PbS3	6.34	10.06	783.1	0.96

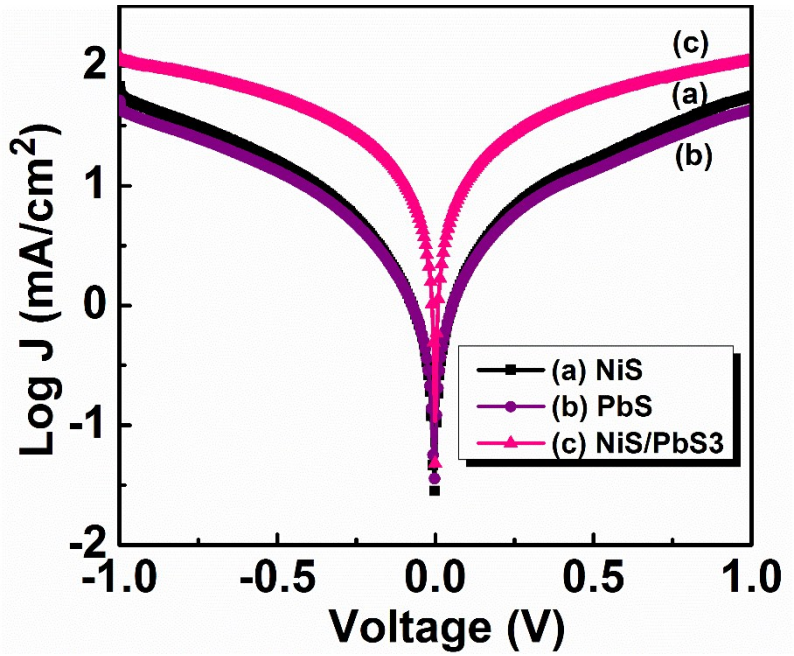

Fig. S3. Tafel curves of the symmetrical dummy cells fabricated with NiS, PbS and NiS/PbS3 CEs.

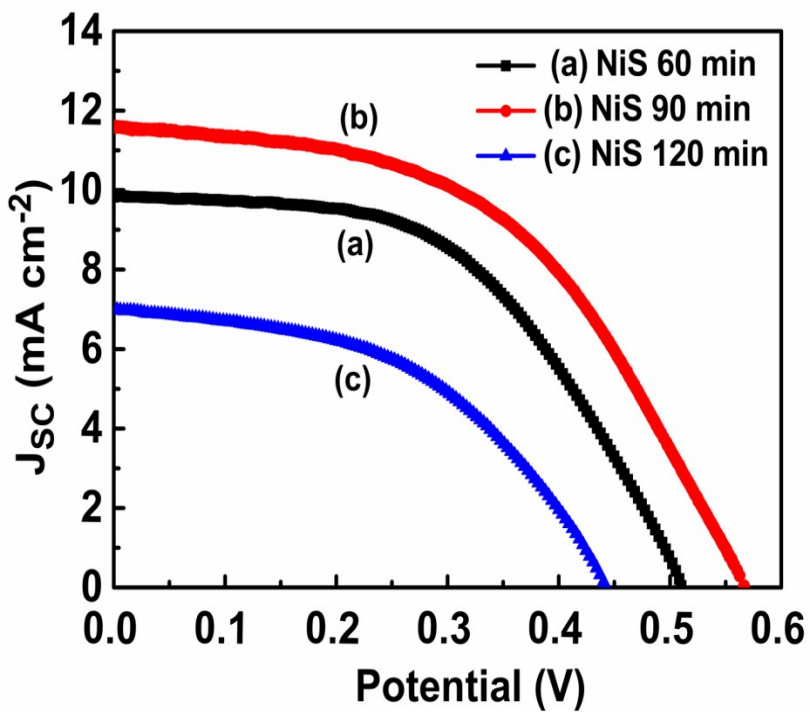

Fig. S4. Power conversion efficiency optimization using J-V curves of QDSSC based on NiS CE at different temperature with polysulfide electrolyte.

Table S2 photovoltaic parameters of QDSSCs made with different NiS CEs

Cell	V_{oc} (V)	Jsc(mA/cm^2)	FF	η%
NiS 60 min	0.5120	9.84	0.519	2.60
NiS 90 min	0.566	11.60	0.496	3.26
NiS 120 min	0.442	7.29	0.460	1.48

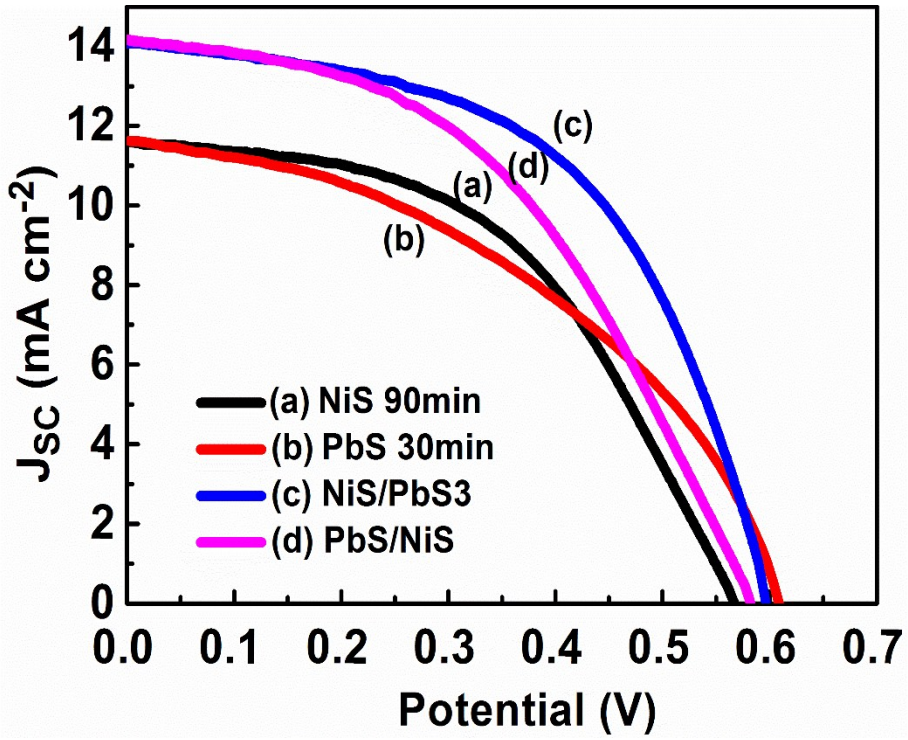

Fig. S5. Photocurrent-voltage characteristics of TiO_2/CdS/CdSe/ZnS QDSSCs with the NiS, PbS, NiS/PbS and PbS/NiS CEs under the illumination of AM 1.5G.

Table S3 photovoltaic parameters of NiS, PbS, NiS/PbS and PbS/NiS CEs based CdS/CdSe/ZnS QDSSCs.

Cell	V_{oc} (V)	J_{sc} (mA/cm^2)	FF	η%
NiS 90 min (NiS)	0.566	11.60	0.496	3.26
PbS 30 min (PbS)	0.608	11.61	0.432	3.06
NiS/PbS3	0.596	14.08	0.539	4.52
PbS/NiS	0.581	14.17	0.460	3.79