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Supporting materials for

Ni Nanobelts Induced Enhancement of Hole Transport and Collection for High Efficiency and Ambient Stable Mesoscopic Perovskite Solar Cells

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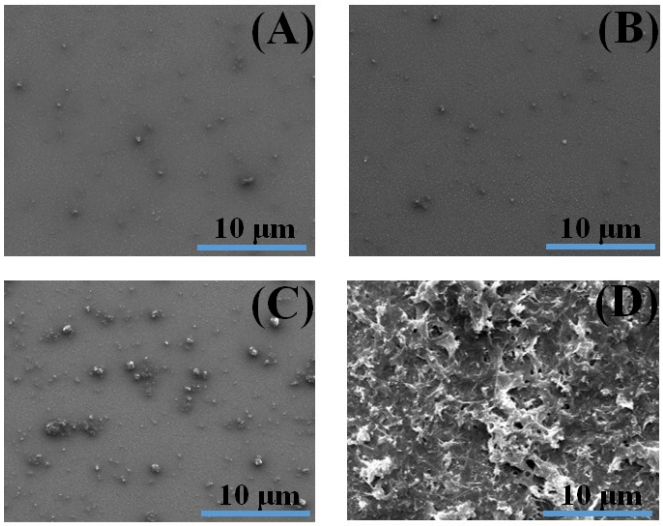

Fig. S1 FESEM images from the top view of HTM with different Ni nanobelt concentration. (A) 1.2, (B) 1.8, (C) 7.4, and (D) 29.4 mg/mL.

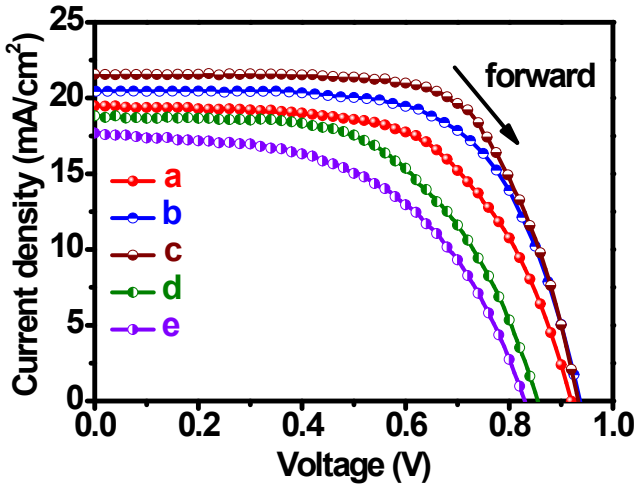

Fig. S2 *J-V* characteristics of the best performing devices based on different concentration of Ni nanobelts under irradiation of 100 mWcm^{-2}, simulated AM1.5 sunlight. All the devices were measured with forward scan with a scan rate of 0.1 V/s. (a) 0 mg/ml, (b) 1.2 mg/ml, (c) 1.8 mg/ml, (d) 7.4 mg/ml, (e) 29.4 mg/ml.

Table S1 Photovoltaic parameters measured with forward scan for PSCs based on different HTMs at an irradiation of 100 mW cm^{-2} AM1.5 sunlight.

HTM	J_{sc} (mA/cm^2)	V_{oc} (V)	FF (%)	PCE (%)	PCE$_{average}$ (%)[#]
a	19.48	0.91	61.8	10.95	10.43
b	20.46	0.93	65.7	12.50	12.02
c	21.57	0.93	69.0	13.84	13.43
d	18.82	0.86	57.2	9.26	8.69
e	17.68	0.83	53.6	7.86	7.23

[#]The average values were obtained from five cells.

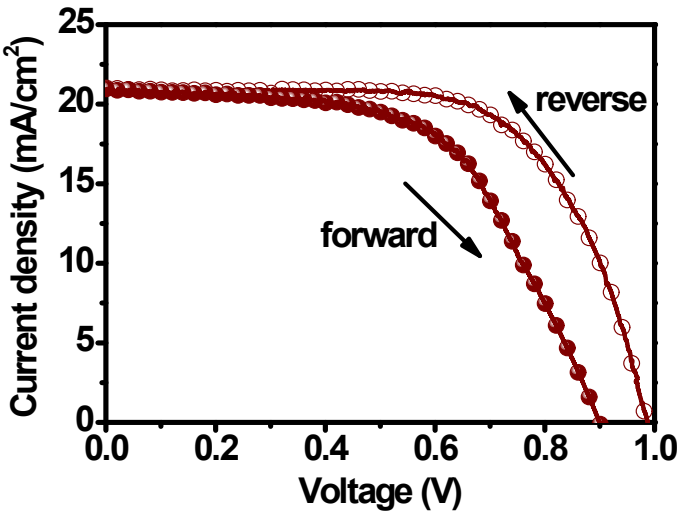

Fig. S3 *J-V* characteristic curves of 1.8 mg/ml Ni nanobelts based devices without spiro-OMeTAD interlayer under simulated AM 1.5 sunlight of 100 mW/cm^2 irradiance. The device was measured from forward scan and reverse scan with scan rate of 0.1V/s, respectviely.

Table S2 Performance parameters of 1.8 mg/ml Ni nanobelts based device without spiro-OMeTAD interlayer.

Scanning direction	J_{sc} (mA/cm^2)	V_{oc} (V)	FF (%)	PCE (%)	$PCE_{average}$ (%)[#]
forward scan	20.95	0.90	58.2	10.97	10.53
reverse scan	21.02	0.99	65.7	13.68	13.22

[#]The average values were obtained from five cells.

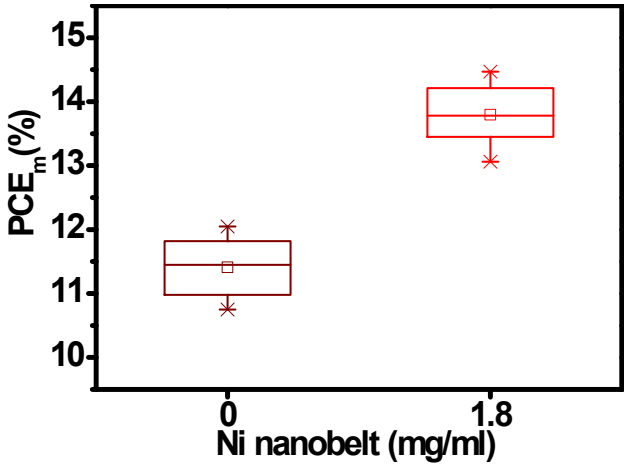

Fig. S4 The stabilized power output efficiency (PCE_m) values shown as box plots for efficiency distributions of the devices based on 0 and 1.8 mg/mL Ni nanobelts.