

Supplement information

Enhanced Performance o Perovskite Solar Cells by luminescent Small Molecule DBP: Perovskite Absorption Spectrum Modification and Interface Engineering

Saisai Ding^a, Shiqi Li^a, Qinjun Sun^a, Yukun Wu^a, Yifan Liu^a, Yanxia Cui^a, Hua Wang^b, Yuying Hao^{a,b}, Yucheng Wu^{b*}*

a College of Physics and Optoelectronics, Key Lab of Advanced Transducers and Intelligent Control System, Taiyuan University of Technology, Taiyuan 030024, China.

b Key Laboratory of Interface Science and Engineering in Advanced Materials, Taiyuan University of Technology, Taiyuan, 030024, China.

**Corresponding author: haoyuying@tyut.edu.cn, wyc@tyut.edu.cn*

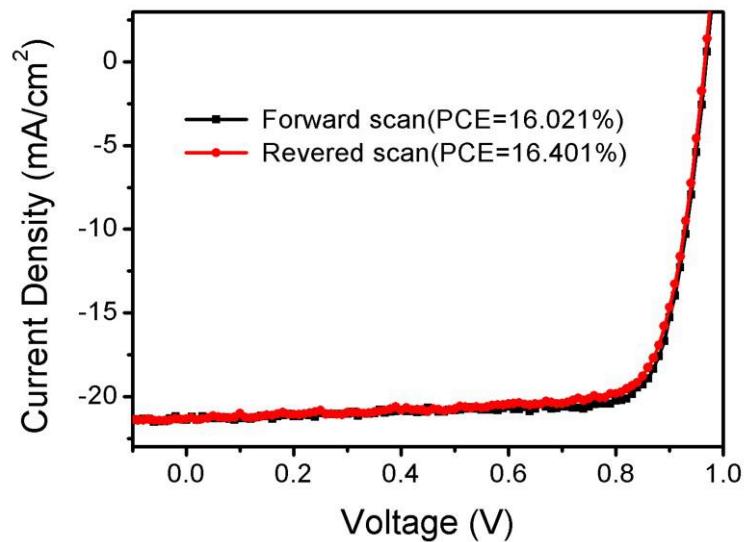


Figure S1 Forward and reverse scan J - V curves of the PSCs made with optimized concentration DBP in DB

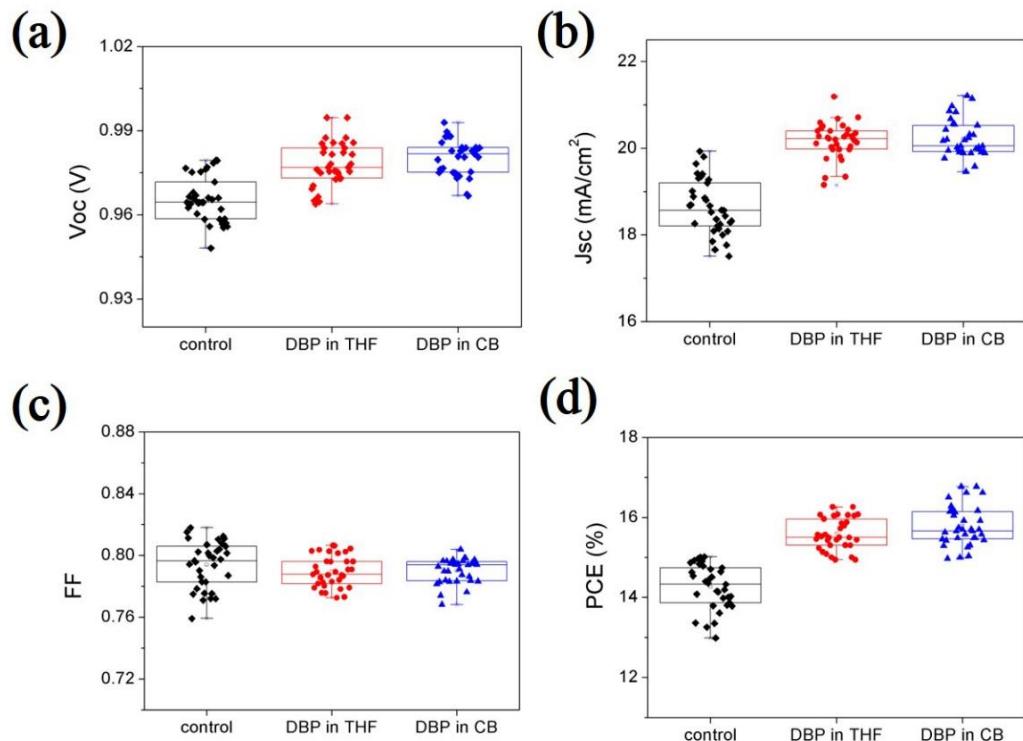


Figure S2 (a) Voc, (b) J_{sc} , (c) FF and (d) PCE statistical distribution of PSCs without and with DBP based on thirty-six devices for each kind, respectively.

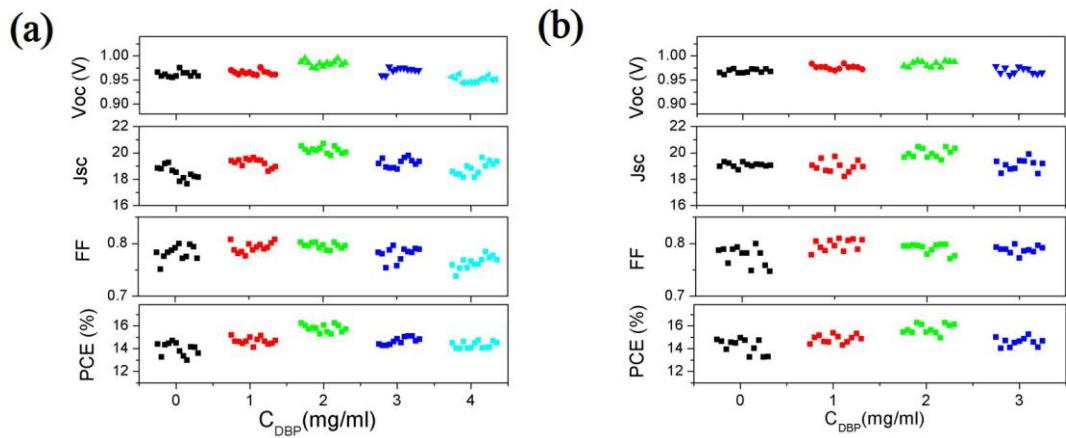


Figure S3 Photovoltaic parameter statistical distributions of PSCs plotted as a function of DBP concentrations (C_{DBP}) in (a) THF and (b) CB solvents, the data points with the same colour correspond to the same DBP concentration

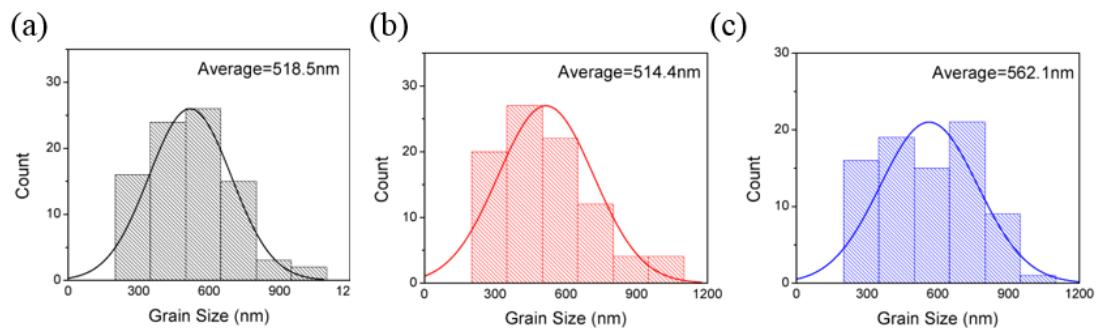


Figure S4 Histograms of crystal grain size distribution corresponding to the top-view SEM images of three films including perovskite, perovskite/DBP (in THF) and perovskite/DBP (in CB), as shown in Figure 2.

Table S1. Photovoltaic performance of reference and only solvent treatment PSCs under AM 1.5 G illumination (100 mW. cm⁻²). The data were obtained based on eighteen devices for each condition.

	Voc (V)	Jsc (mA/cm ²)	FF	PCE (%)
Reference	0.97±0.008	18.64±0.63	0.793±0.022	14.26±0.56
THF	0.97±0.006	18.92±0.41	0.783±0.033	14.33±0.65
CB	0.97±0.008	18.69±0.61	0.794±0.015	14.41±0.43

Table S2 PL delay lifetime with weight fractions fitted by a bi-exponential decay function

Samples	τ_1 /ns	A ₁ (%)	τ_2 /ns	A ₂ (%)
perovskite	28.73	53.25	94.54	46.75
perovskite/DBP (in THF)	20.85	17.73	116.21	80.04
perovskite/DBP (in CB)	17.82	9.36	121.54	88.16

Table S3 Fitting parameters of EIS data for the PSCs with and without DBP

	Rs (ohm·cm ²)	Rct (ohm·cm ²)	Rrec (ohm·cm ²)
None DBP	1.94×10 ⁻⁸	130.5	227.5
DBP in THF	1.45×10 ⁻⁸	61.5	333.8
DBP in CB	1.74×10 ⁻⁸	61.3	348.2

Table S4. the roughness and surface potential of three kinds of films including perovskite, perovskite/DBP (in THF), perovskite/DBP (in CB)

Samples	Roughness (nm)	Surface potential (mV)
perovskite	12.35	131.4
perovskite/DBP (in THF)	12.51	232.3
perovskite/DBP (in CB)	12.37	297.5