Thiourea Resin Polymer as a Multifunctional Modifier of Buried Interface for Efficient Perovskite Solar Cells with reduced lead leakage

Wenjing Hou,*[a] Rujia Hu,[a] Sheng Zhu,[a] Jin kang,*[b] Yaoming Xiao[c] Gaoyi Han*[a]

[a] *Institute of Molecular Science, Key Laboratory of Chemical Biology and Molecular Engineering of Education Ministry, Key Laboratory of Materials for Energy Conversion and Storage of Shanxi Province, State Key Laboratory of Quantum Optics and Quantum Optics Devices, Shanxi University, Taiyuan 030006, P. R. China.*

[b] *Department of Chemistry and Chemical Engineering, Collaborative Innovation Center for Functional Chemicals, High Value Fine Chemicals Research Center, Jinzhong University, Jinzhong, 030619, Shanxi China;*

[c] *College of Chemical Engineering and Materials Science, Quanzhou Normal University, Quanzhou 362000, P. R. China.*

[*] Corresponding authors.

E-mail: houwenjing@sxu.edu.cn (Wenjing Hou); kangjin@jzxy@edu.cn (Jin Kang); han_gaoyis@sxu.edu.cn (Gaoyi Han)

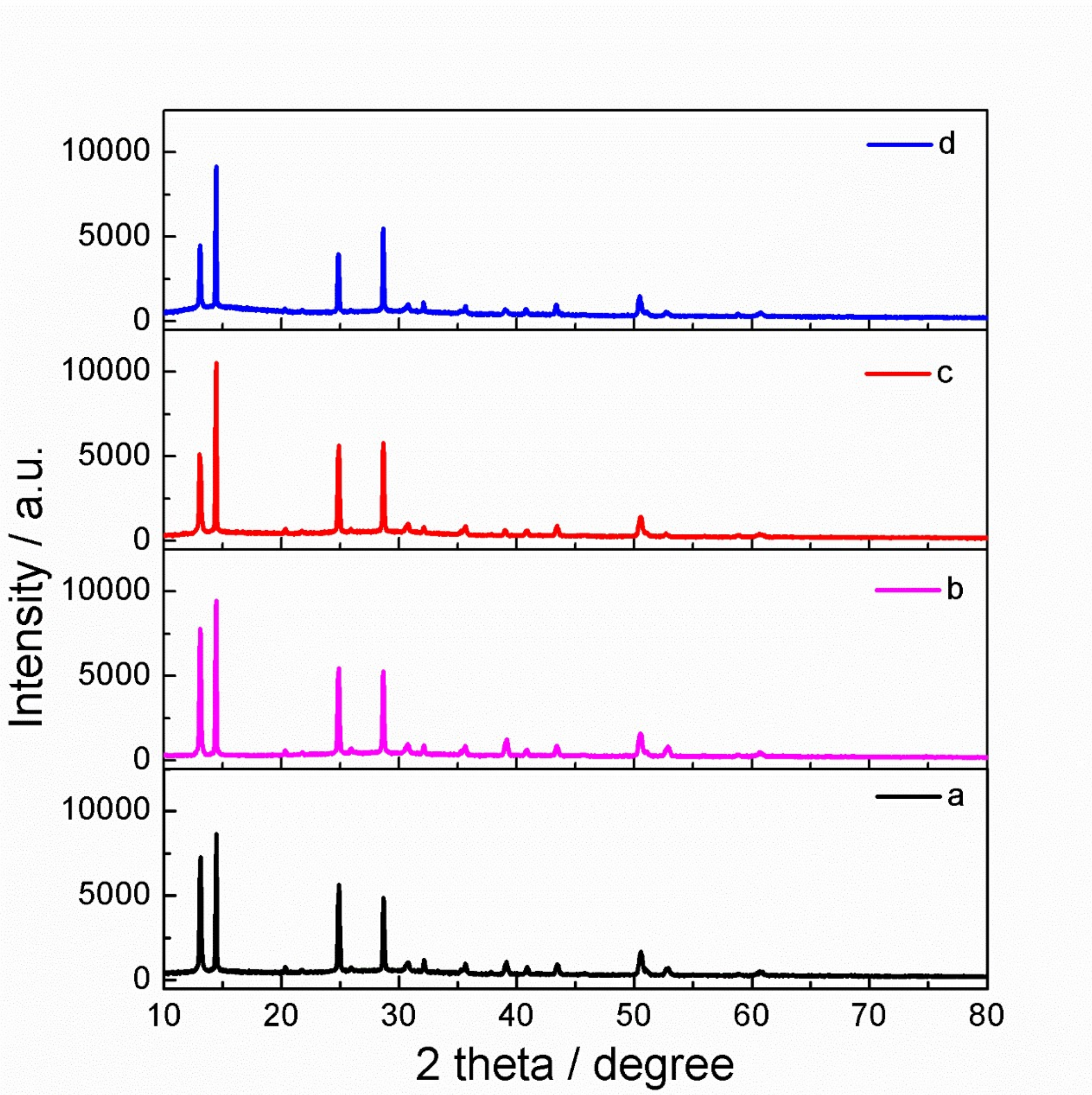

Fig. S1 XRD patterns of perovskite films deposited on the SnO_2 ETLs modified with different concentration of TSU: a (0.00 mg mL^{-1}), b (0.5 mg mL^{-1}), c (0.10 mg mL^{-1}) and d (0.15 mg mL^{-1}), respectively.

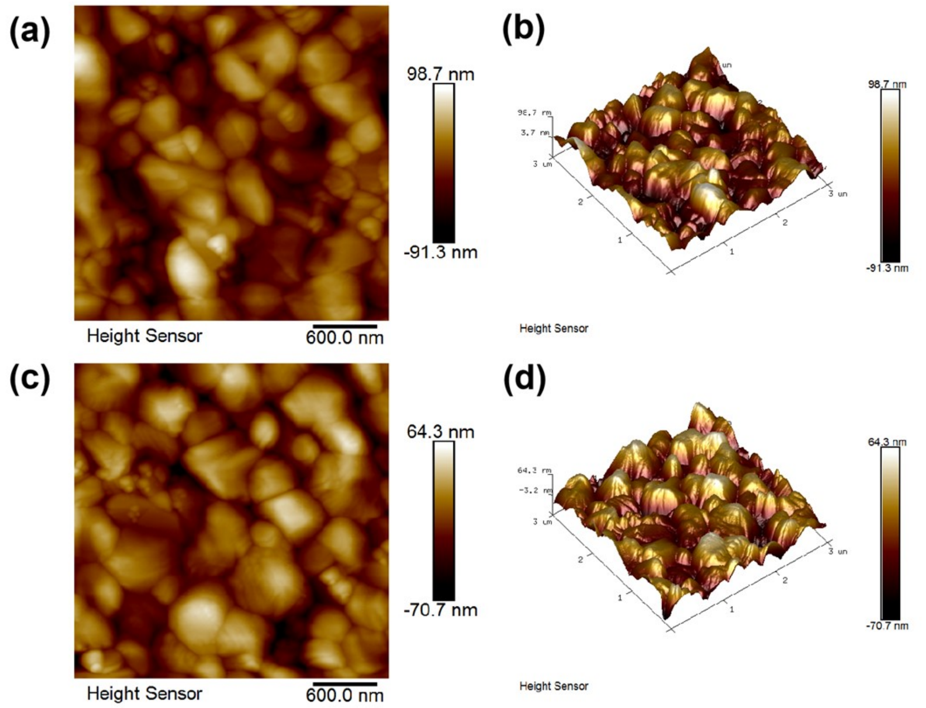

Fig. S2 2D and 3D AFM images of perovskite films based on different substrates (a, b) SnO_2 and (c, d) TSU-modified SnO_2.

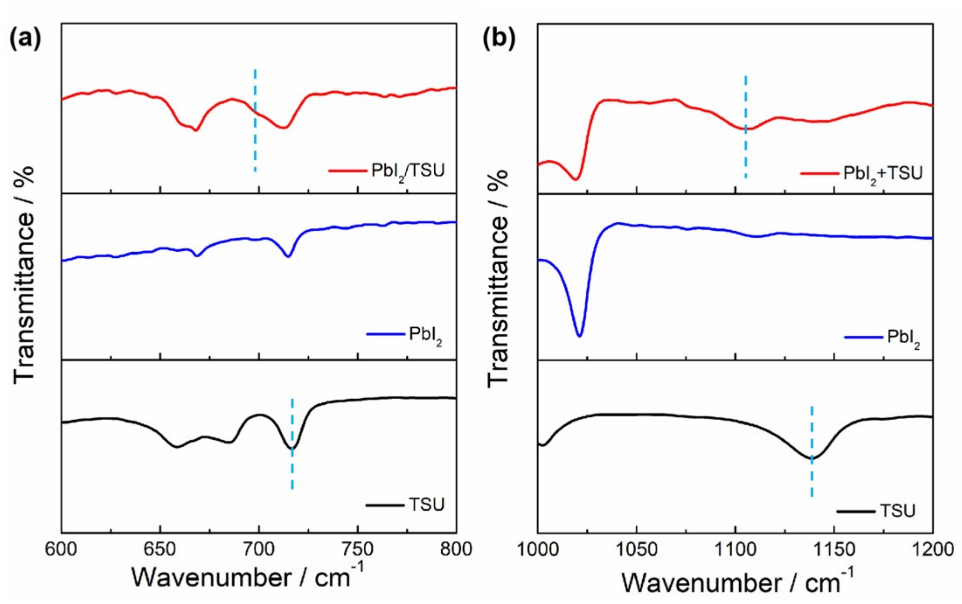

Fig. S3 FTIR spectrum of TSU, PbI_2, and PbI_2/TSU within different range: (a) 600~800 nm, and (b) 1000-1200 nm.

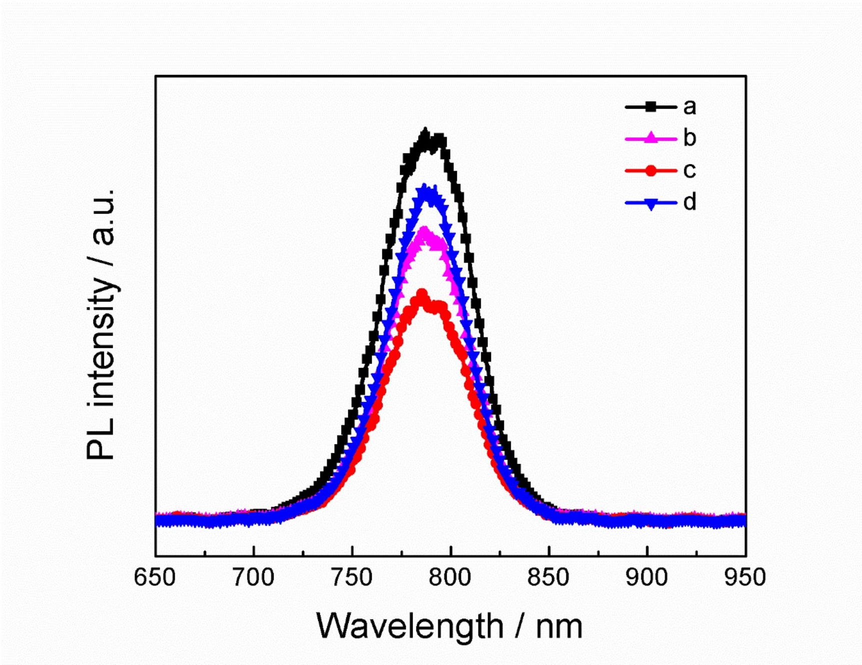

Fig. S4 The steady PL spectra of the perovskite films deposited on the SnO_2 ETLs modified with different concentration of TSU.

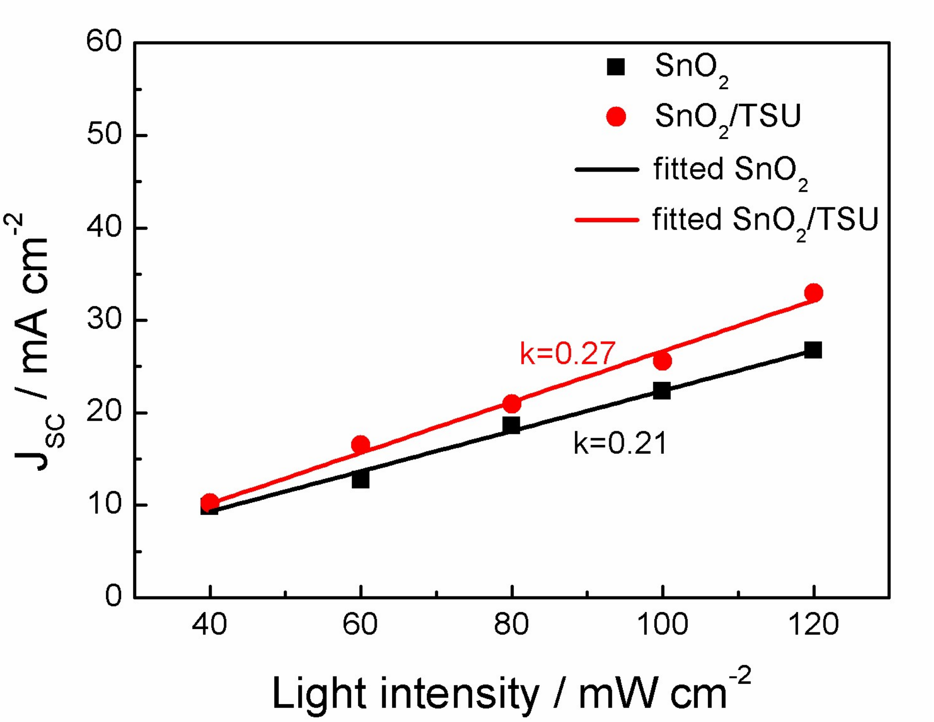

Fig. S5 J_{SC} dependence on light intensity for the devices based on the SnO_2 and TSU-modified SnO_2 substrates.

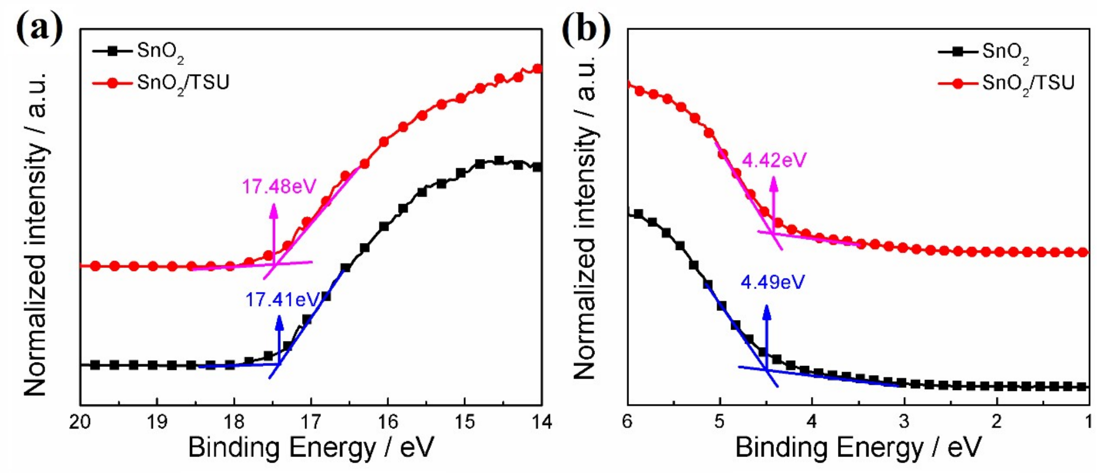

Fig. S6 UPS spectra of SnO_2 and TSU-modified SnO_2 ETLs on ITO substrates: (a) binding energy cutoff (E_{cutoff}), (b) the binding energy onset (E_{onset})

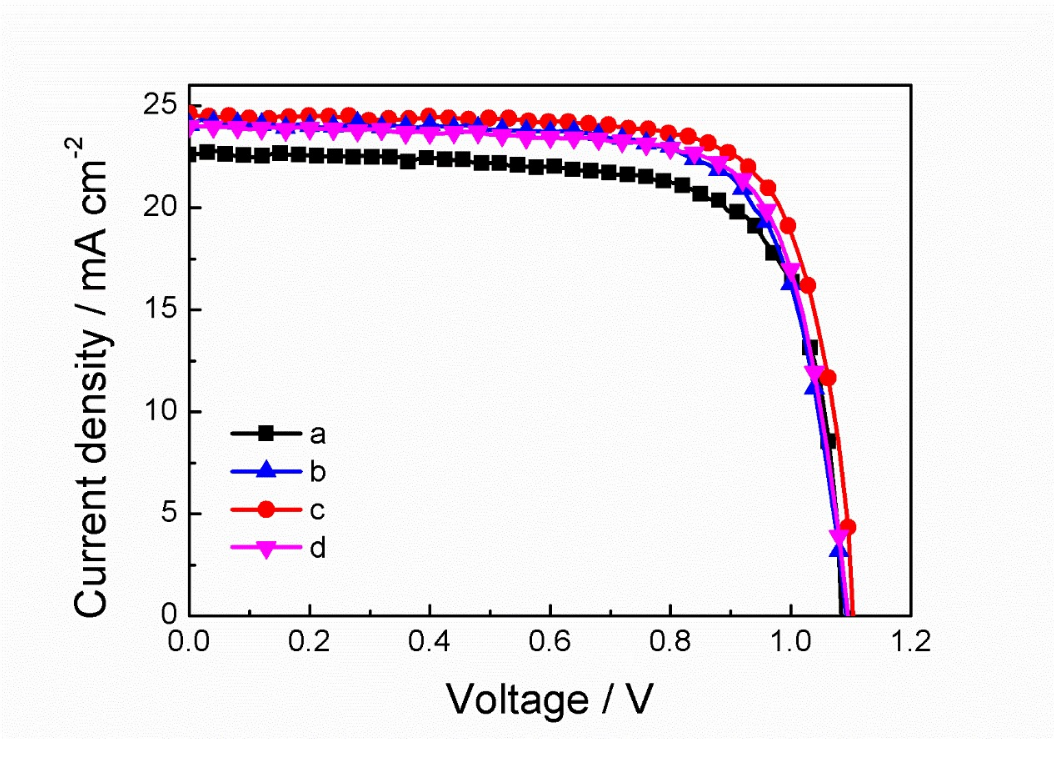

Fig. S7 J-V curves of the different devices based on different content of TSU modification with reverse scan rate of 100 mV s^{-1}.

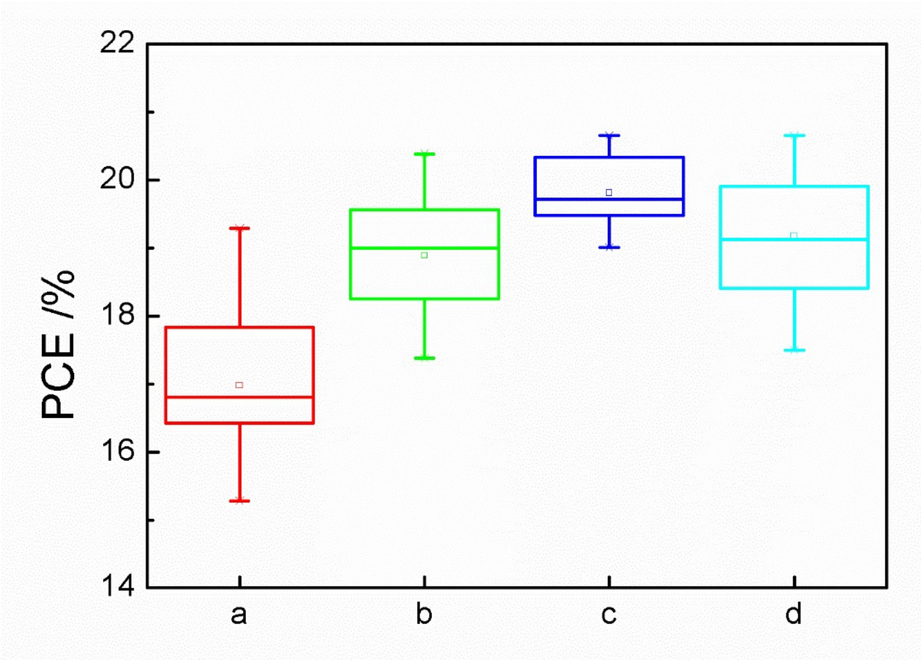

Fig. S8 The statistical PCE of devices based on different content of TSU modification.

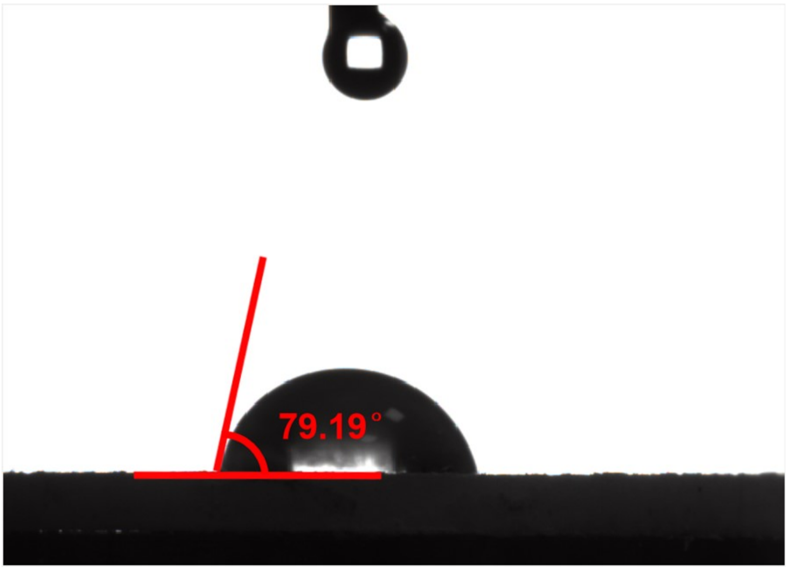

Fig. S9 The contact angle of TSU.

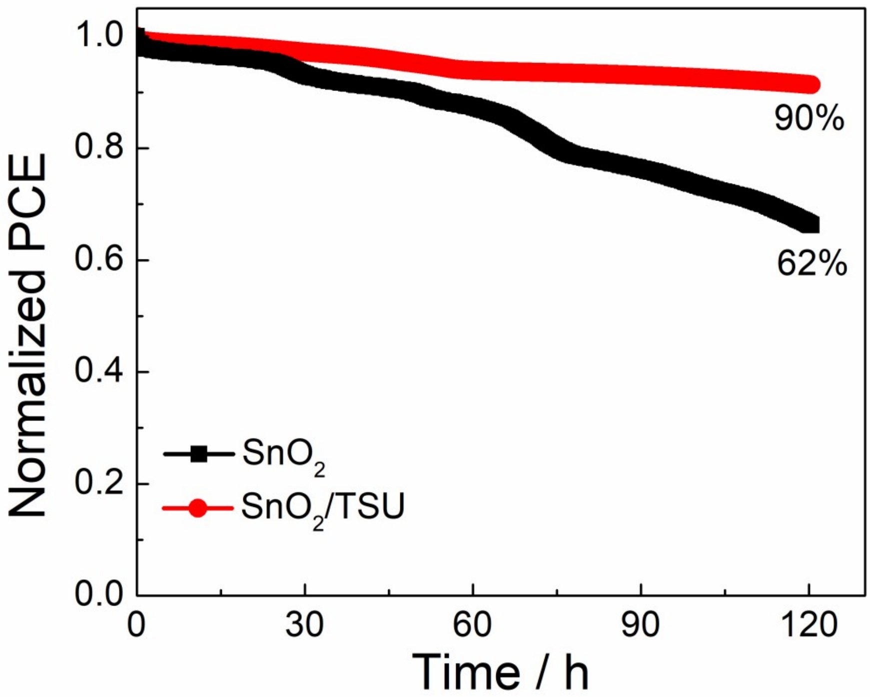

Fig. S10 The steady-state PCE versus time for the best-performing devices deposited on SnO_2 and TSU-modified SnO_2 substrates at the maximum power point.