Supporting Information

Bifunctional π-conjugated ligand assisted stable and efficient perovskite solar cells via interfacial stitching

Feijie Wei, [a] Bo Jiao, [a,b] Hua Dong, [a,b]* Jie Xu, [a] Ting Lei,[a] Yue Yu,[c,d] Lin Ma, [d] Junjie Zhang, [c] Dongdong Wang, [c] Jinbo Chen,[a] Xun Hou[a] and Zhaoxin Wu[a,b]*

[a]Key Laboratory for Physical Electronics and Devices of the Ministry of Education & Shaanxi Key Lab of Information Photonic Technique, School of Electronic and Information Engineering, Xi'an Jiaotong University, No.28, Xianning West Road, Xi'an, 710049, China.

[b]Collaborative Innovation Center of Extreme Optics, ShanxiUniversity, Taiyuan 030006, China

[c]Department of Chemistry, School of Science, Xi'an Jiaotong University, Xi'an 710049, China

[d]School of Physics and Optoelectronic Engineering, Xidian University, Xi'an 710071, China.

***Corresponding author.**
E-mail: donghuaxjtu@mail.xjtu.edu.cn
E-mail: zhaoxinwu@mail.xjtu.edu.cn

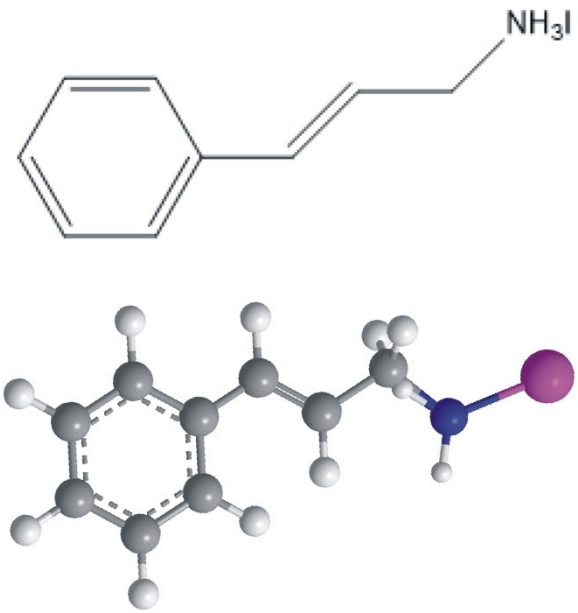

Figure S1. Molecule structure of the PPEAI

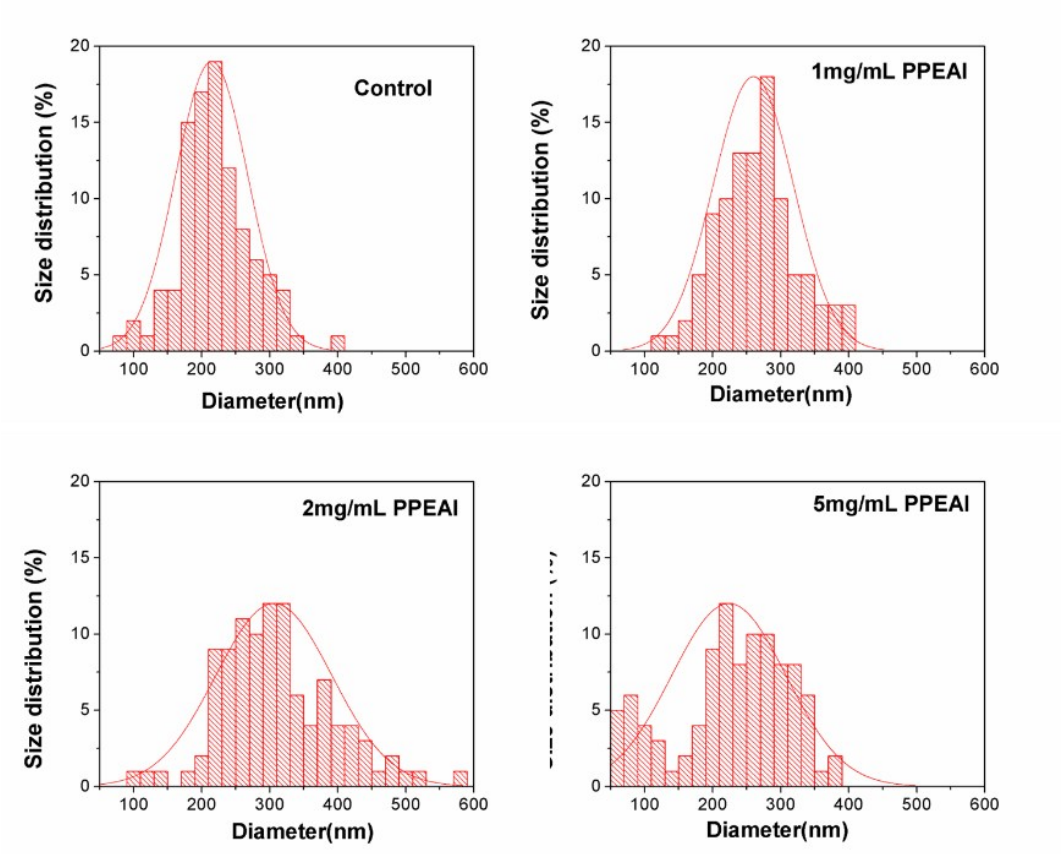

Figure S2 Size distribution of the morphology for different perovskite films

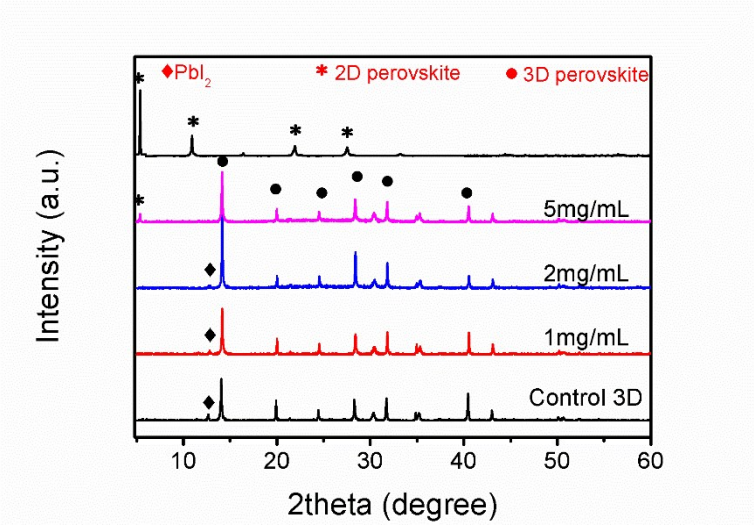

Figure S3 XRD date of different perovskite films

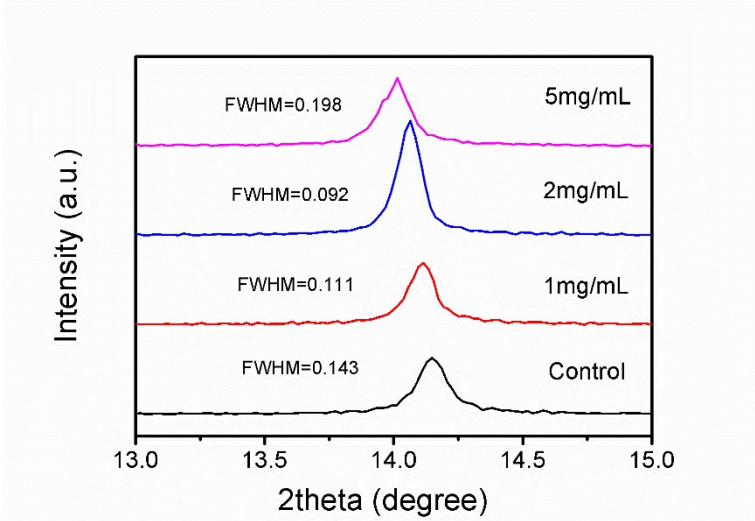

Figure S4. Enlarged XRD of the control and PPEAI modified perovskite films

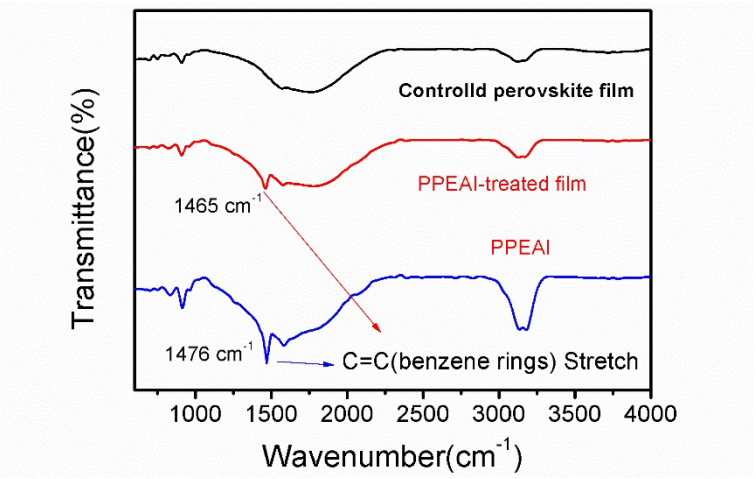

Figure S5. FTIR spectrum of PPEAI powder, controlled and PPEAI-modified perovskite films(2mg/ml).

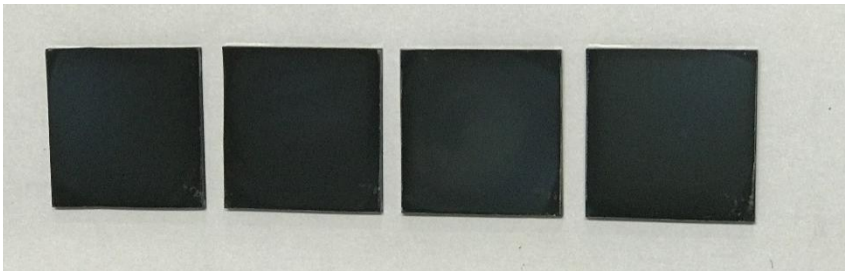

Figure S6. From left to right: 0mg/ml, 1mg/ml, 2mg/ml, 5mg/ml PPEAI modified perovskite films.

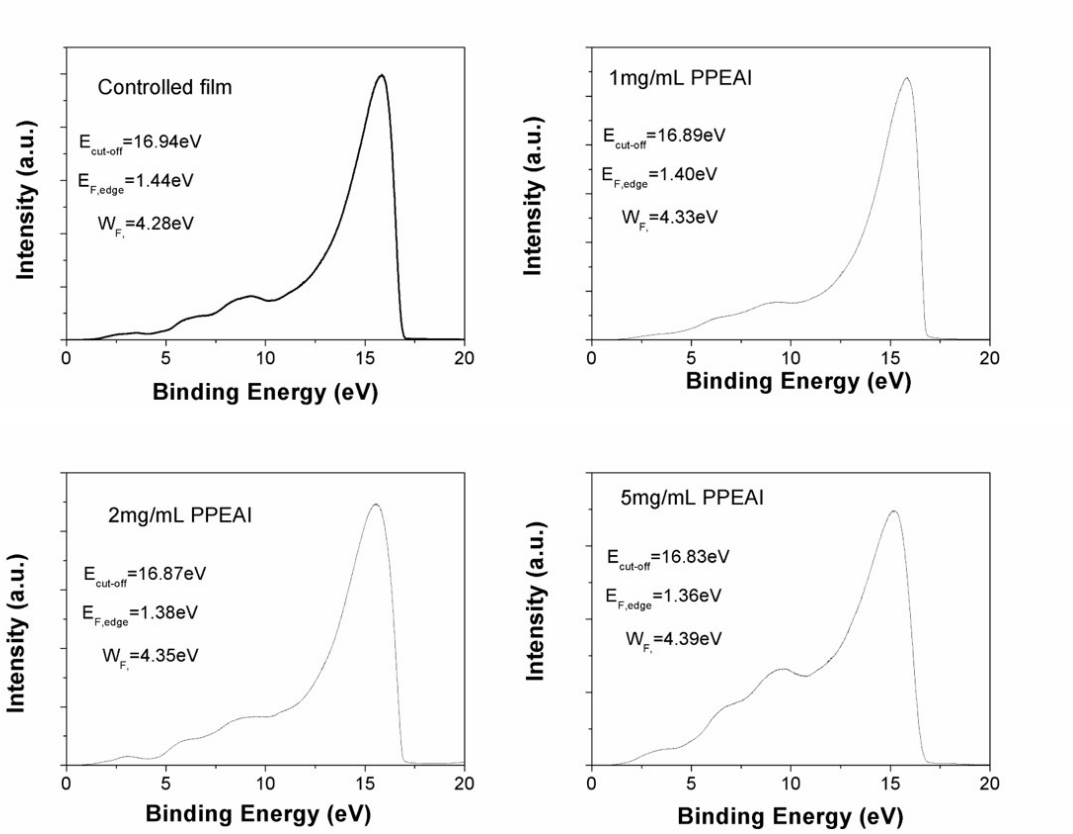

Figure S7 UPS spectra of different perovskite films

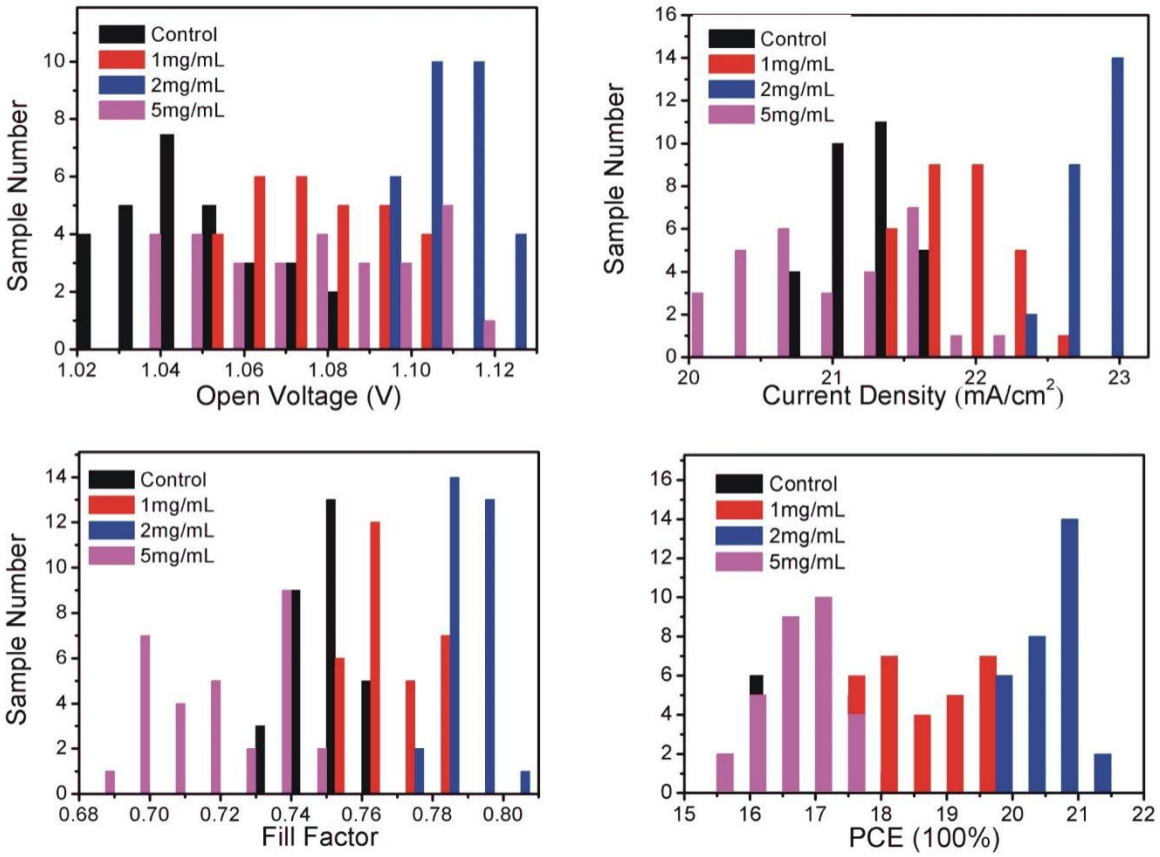

Figure S8. Parameter Statistics of the PSCs employing different perovskite films

Table S1 Performance parameters of PSCs with different perovskite films (30 devices for each type)

Concentrations of the PPEAI	V_{oc}(V)	J_{sc}(mA cm^{-2})	FF	PCE(%)
Control	1.0679±0.021	21.53±0.54	0.743±0.015	17.04±0.69
1mg/ml	1.097±0.017	21.98±0.62	0.779±0.013	18.89±0.71
2mg/ml	1.119±0.012	22.87±0.81	0.784±0.012	20.12±0.54
5mg/ml	1.102±0.015	20.84±0.61	0.711±0.011	16.48±0.57

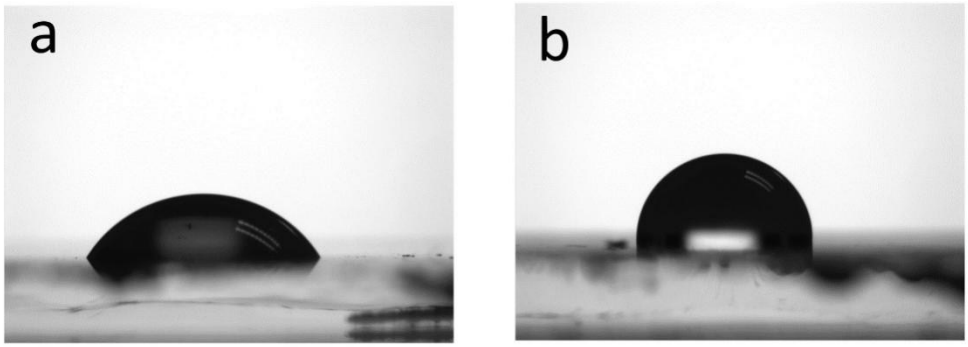

Figure S9. Contact angle measurement of (a) controlled and (b) PPEAI modified films.

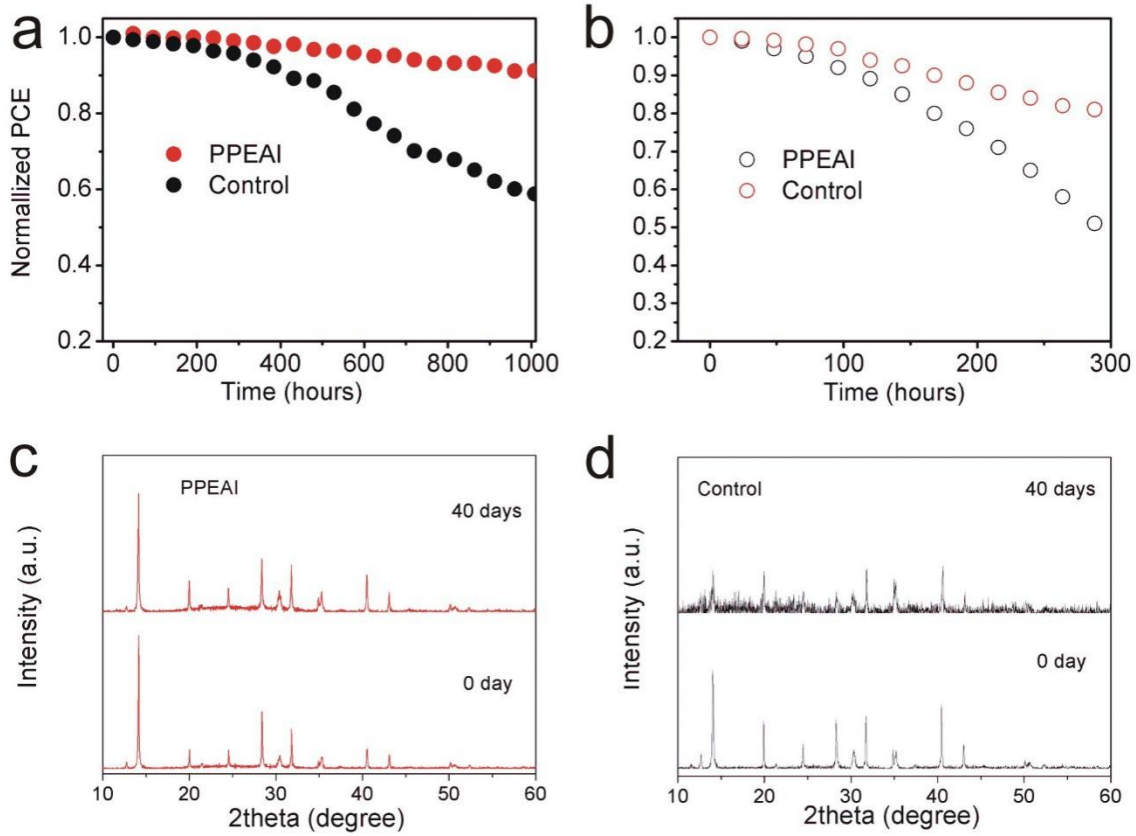

Figure S10. Efficiency evolution of the devices with/without PPEAI under dark and operation condition. (room temperature and humidity ~50% in ambient air)