

Application of a Multifunctional Liquid Crystal Material in Colorful PEDOT:PSS/Si Heterojunction Solar Cells

Zheng Zhou^{a,b,c}, Shibo Chen^d, Yingming Shen^c, Juan Wang^{a,b}, Guijun Zhang^{a,b}, Yang Shi^{a,b}, Haixia Wu^{a,b},
Jingjing Luo^{a,b}, Xiaohong Cheng^{d,*}, Yu Yang^{a,b,*}

^a International Joint Research Center for Yunnan Optoelectronic Materials, School of Materials and Energy, Yunnan University, Kunming 650500, P. R. China.

^b International Joint Research Center for Optoelectronic and Energy Materials, School of Materials and Energy, Yunnan University, Kunming 650500, P. R. China.

^c Yunnan Provincial Academy of Science and Technology, Kunming 650100, P. R. China

^d Key Laboratory of Medicinal Chemistry for Natural Resource, Ministry of Education, School of Chemical Science and Technology, Yunnan University, Kunming 650500, P. R. China.

*:E-mail: xhcheng@ynu.edu.cn, yuyang@ynu.edu.cn

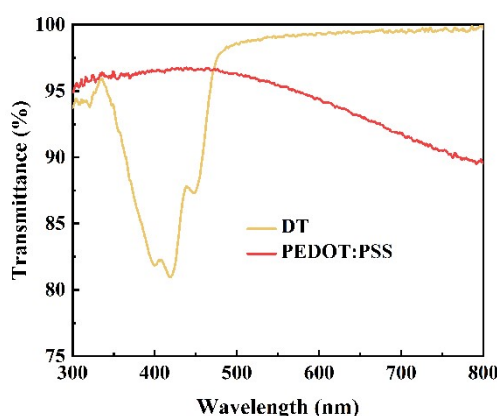


Figure S1. The transmittance spectra of DT film, and PEDOT:PSS film on glass.

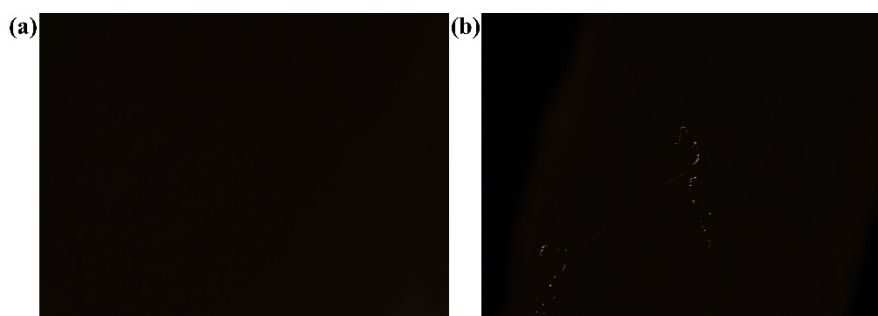


Figure S2. The images of PEDOT:PSS film (a) PEDOT:PSS+DT film (b) by polarizing optical microscopy.

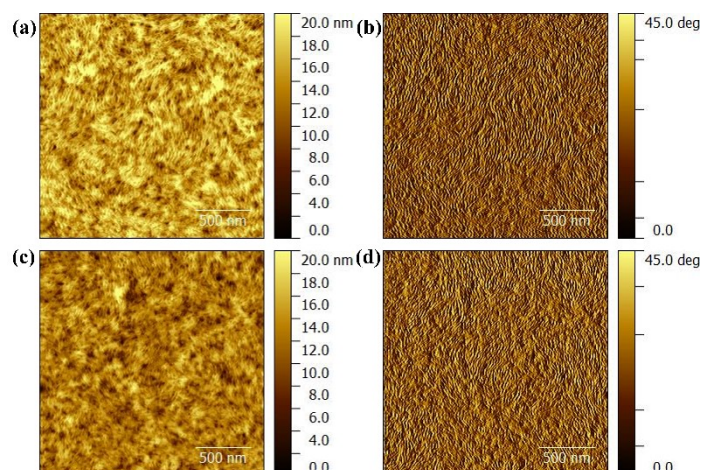


Figure S3. (a) AFM morphology and (b) phase images of PEDOT:PSS film. (c) AFM morphology and (d) phase images of PEDOT:PSS+DT film.

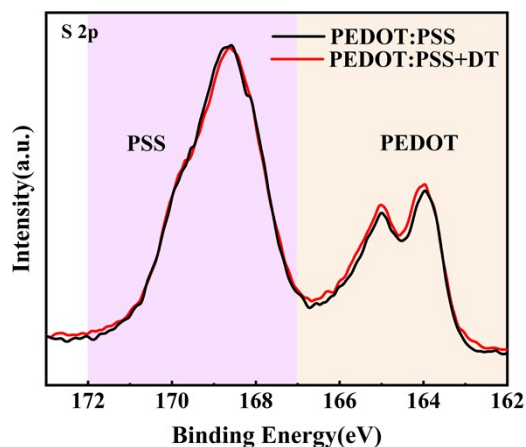


Figure S4. XPS spectra in the S 2p regions of PEDOT:PSS film and PEDOT:PSS+DT films.

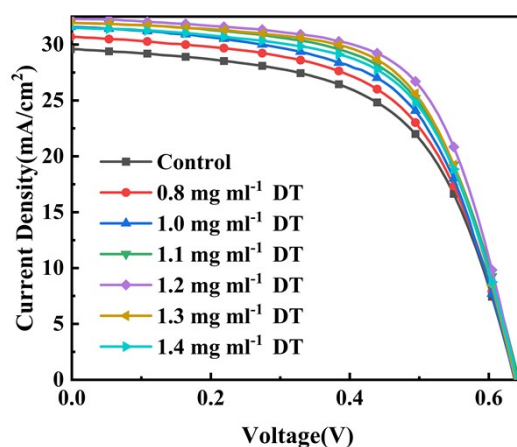


Figure S5. The light current J–V curves of devices with different concentrations of DT.

Table S1

Photovoltaic parameters of the champion devices with and with adding DT.

Devices	J_{SC} (mA cm ⁻²)	V_{OC} (mV)	FF (%)	PCE (%)
Control	29.59	0.638	58.45%	11.03%
0.8 mg ml ⁻¹	30.70	0.639	58.84%	11.56%
1.0 mg ml ⁻¹	31.57	0.637	59.88%	12.05%
1.1 mg ml ⁻¹	31.94	0.643	61.38%	12.61%
1.2 mg ml ⁻¹	32.28	0.640	64.11%	13.24%
1.3 mg ml ⁻¹	31.93	0.638	62.85%	12.81%
1.4 mg ml ⁻¹	31.50	0.641	61.55%	12.42%

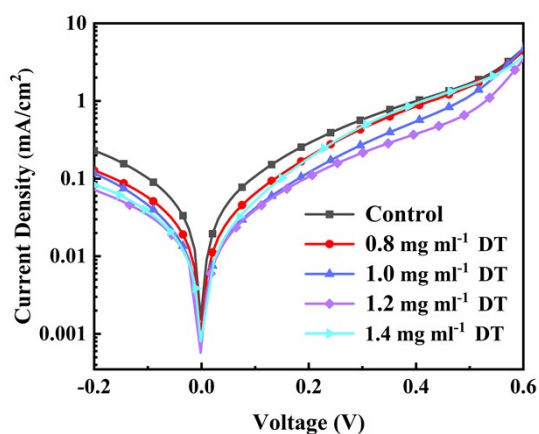


Figure S6. The dark J–V curves of devices with different concentrations of DT.

Table S2

The n and J_0 properties of optimized control and DT-based device.

Samples	n	J_0 (A cm ⁻²)
Control device	2.59	5.73×10^{-4}
DT-added device	1.87	8.04×10^{-6}

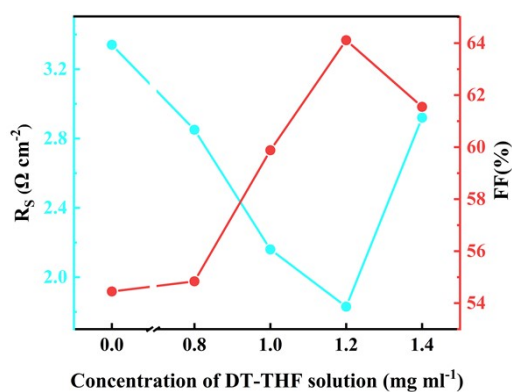


Figure S7. The R_s and FF of devices with different DT concentrations.

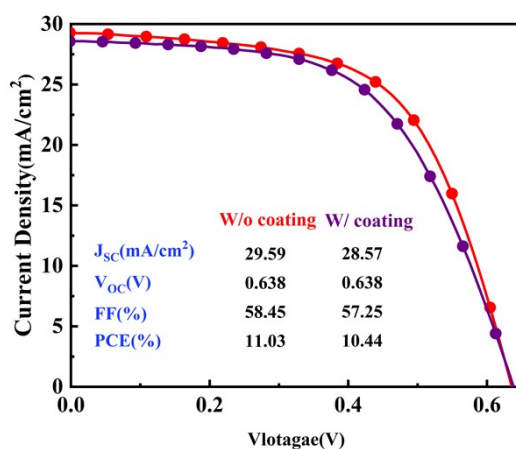


Figure S8. J–V curves of the devices with a configuration of Al/Si/PEDOT:PSS/Ag/DT (W/ coating) and Al/Si/PEDOT:PSS/Ag (W/o coating) .

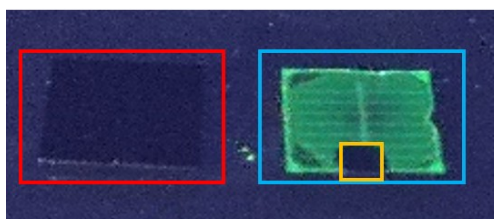


Figure S9. The image of devices without (red line) and with (cyan line) DT coating irradiated under UV lamp. The DT film covered on the square electrode of Ag-grids (yellow line) was erased with THF for testing performance of devices.