Electronic Supplementary Information

Efficient organic photovoltaic cells on a single layer graphene transparent conductive electrode using MoO_x as an interfacial layer

J. H. Du,[a†] H. Jin,[b†*] Z. K. Zhang,[a] D. D. Zhang,[a] S. Jia,[a] L. P. Ma,[a] W. C. Ren,[a] H. M. Cheng,[a] P. Burn[b]*

[a] Shenyang National Laboratory for Materials Science, Institute of Metal Research, Chinese Academy of Sciences, 72 Wenhua Road, Shenyang 110016, P. R. China

[b] Centre for Organic Photonics & Electronics, The University of Queensland, Brisbane, QLD 4072, Australia

[†] These authors contribute equally to this work.

[*] Corresponding author. Email address: jhdu@imr.ac.cn, h.jin1@uq.edu.au

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We used optical microscopy (OM), scanning electron microscopy (SEM), high-resolution transmission electron microscopy (HRTEM) and Raman spectroscopy to characterize the single layer graphene (SLG) grown on Cu foil and then transferred onto a SiO_2/Si substrate and TEM grid, respectively. As shown in Figure S1a-c, the graphene film is mostly single layer with some bilayer or multilayer islands on its surface. Raman spectrum in Figure S1d also shows typical features of single layer graphene dominant: a G band around 1590 cm^{-1}, a very strong symmetrical 2D band at 2683 cm^{-1}, and a strong 2D to G intensity ratio of ~2. The very small D band indicates the presence of defects and grain boundaries, which are frequently observed in CVD grown graphene.

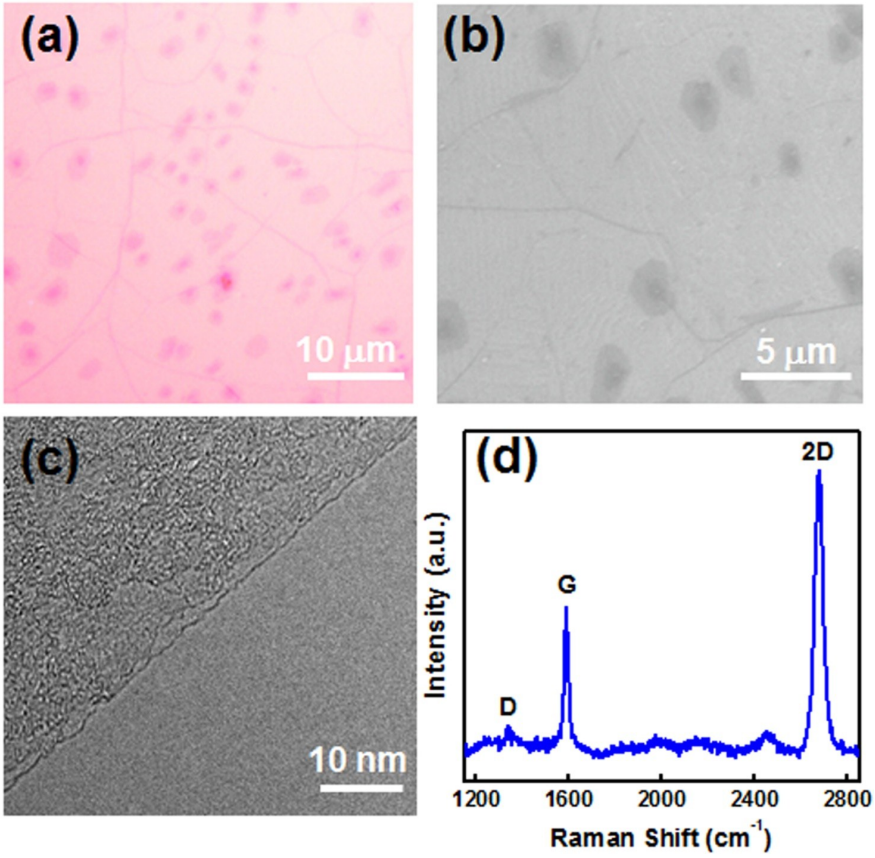

Figure S1. (**a**) OM, (**b**) SEM and (**c**) HRTEM images, and (d) Raman spectrum of a SLG.

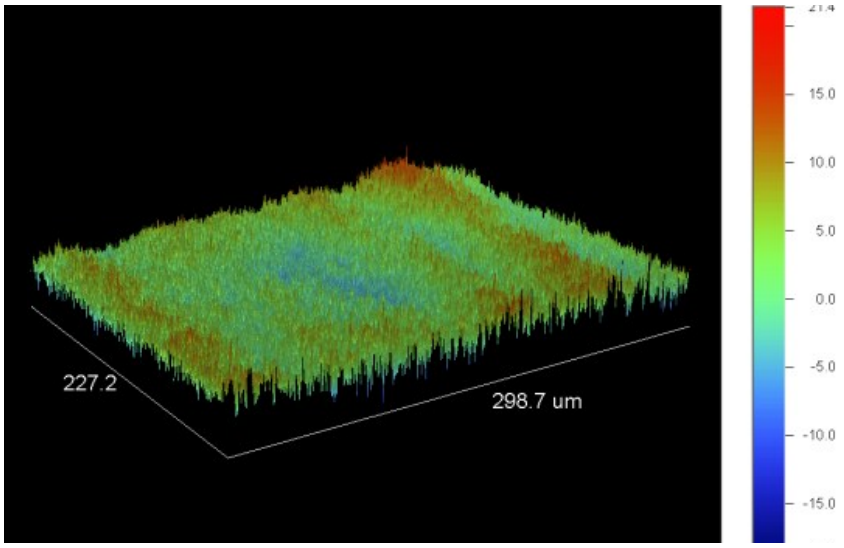

Figure S2. Optical profiler image of an ITO TCE on glass.

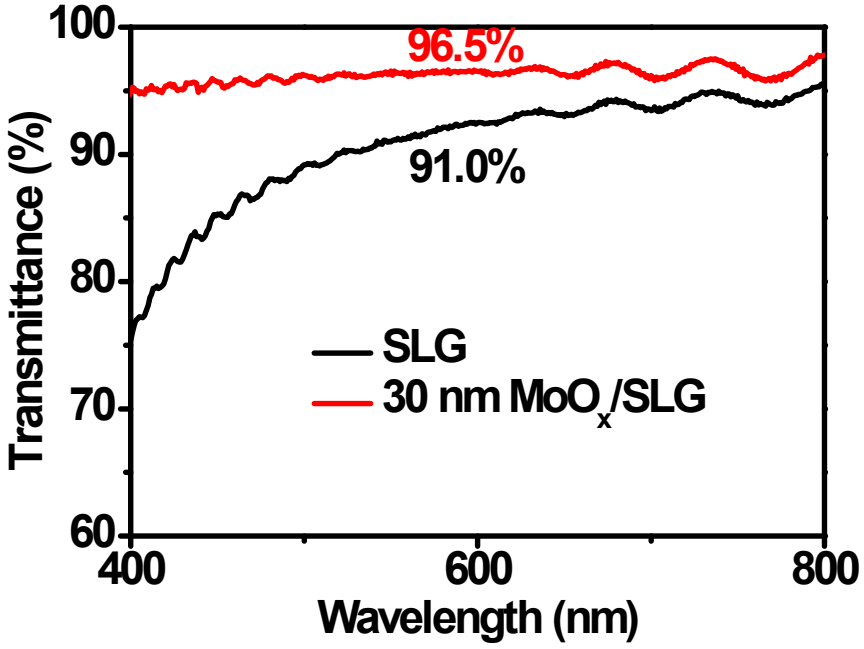

Figure S3. Transmittance of a SLG TCE before and after MoO_x deposition.

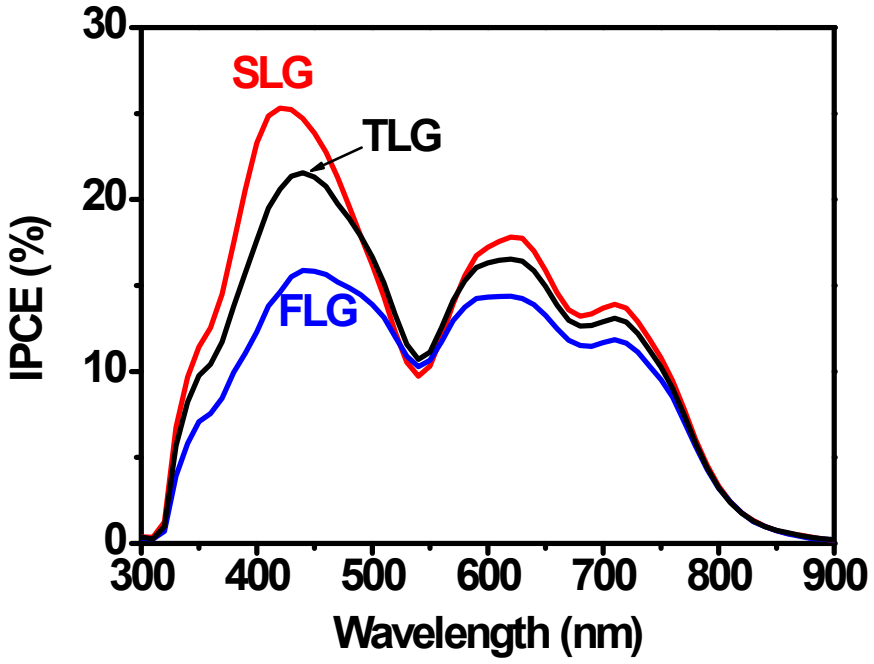

Figure S4. IPCE of OPV cells fabricated on SLG, TLG and FLG anodes.

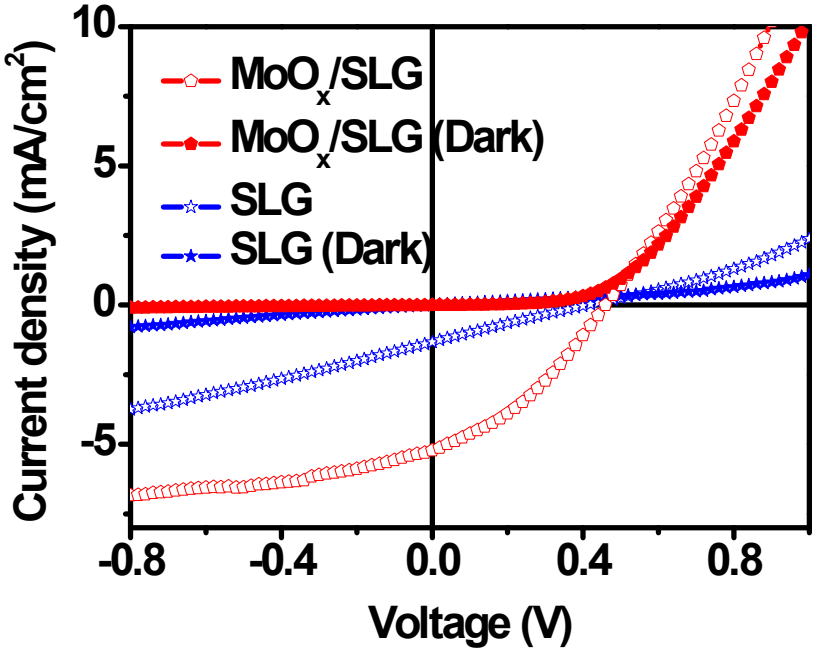

Figure S5. *J–V* characteristics of OPV cells fabricated on a SLG anode with and without a MoO_x interfacial layer under illumination and in the dark (solid symbols).

Table S1. Summary of performance of the devices fabricated on a SLG anode with and without a MoO_x interfacial layer, including V_{OC}, J_{SC}, FF, η, R_s and R_{sh} under illuminated condition (Parameters in Parentheses Are for the Best Cells).

TCE	V_{OC} (V)	J_{SC} (mA/cm^2)	FF	η (%)	R_s (Ω.cm^2)	R_{sh} (Ω.cm^2)
MoO_x/SLG	0.42±0.02	4.98±0.22	0.34±0.03	0.78±0.06	319±38	948±33
	(0.44)	(5.20)	(0.37)	(0.84)	(281)	(981)
SLG	0.38±0.02	1.06±0.27	0.24±0.01	0.09±0.04	1832±88	1361±38
	(0.40)	(1.33)	(0.25)	(0.13)	(1744)	(1399)