Electronic Supplementary Material (ESI) for New Journal of Chemistry.

Supporting Information

Improved Power Conversion Efficiency of Perovskite Solar Cells using Highly Conductive WO_x doped PEDOT:PSS

Anil Kanwat, V., Sandhya Rani, Jin Jang*

Advanced Display Research Center, Department of Information Display, Kyung Hee University, Hoegi-dong, Dongdaemun-gu, Seoul 130-701, South Korea

Email: jjang@khu.ac.kr

Table S1. Summary of PEDOT:PSS treated thin films in the literature.

Ref. #	Solvent	Sheet Resistance (/sq)	Transmittance (%) @ 550 nm	Conductivity (S/cm)	Treatment type
1	DMSO		80	389	Doping
1	EG	450	90	634	Doping
1	DMSO		85	700	Post treatment
1	EG	65	75	1418	Post treatment
2	H_2SO_4	67	87	3065	Post treatment
3	H_3PO_4	120	80	1460	Post treatment
4	H_2SO_4	45	90	4300	Post treatment
This work	EG	25	90	3000	Post treatment
	EG	35	95	1920	Post treatment

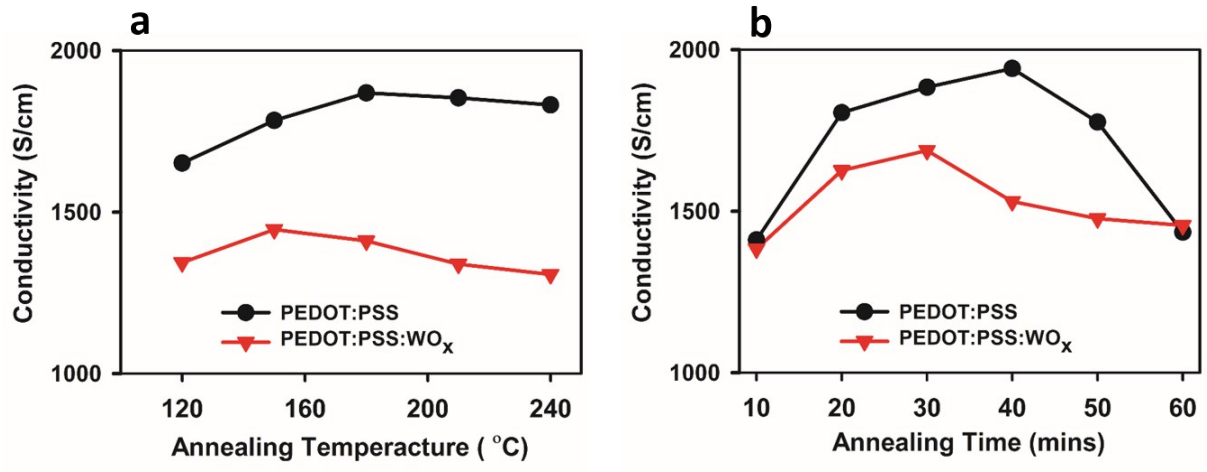

Figure S1. Effect of EG treatment on conductivity of single layered PEDOT:PSS (50nm thick) and PEDOT:PSS:WO_x (40 nm thick) with (a) annealing temperature (a) and annealing time.

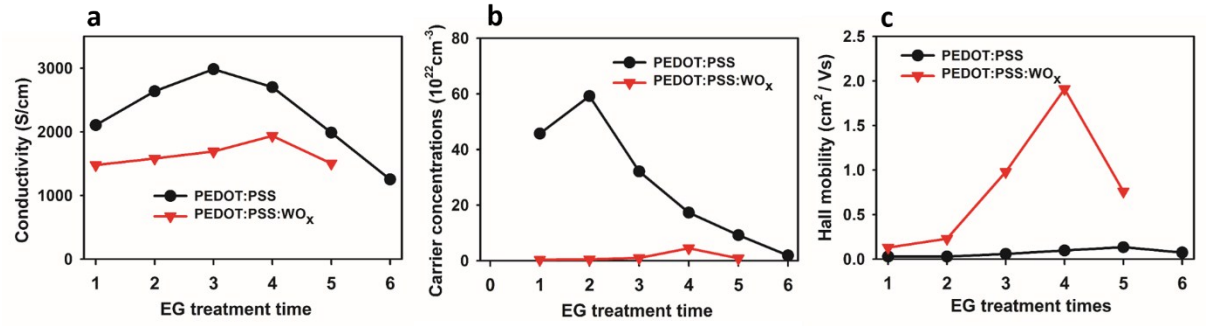

Figure S2. (a) Conductivity, (b) carrier concentrations, and (c) mobility of multiple EG treated on multiple layered of PEDOT:PSS/PEDOT:PSS:WO_x thin films measured by Hall effect.

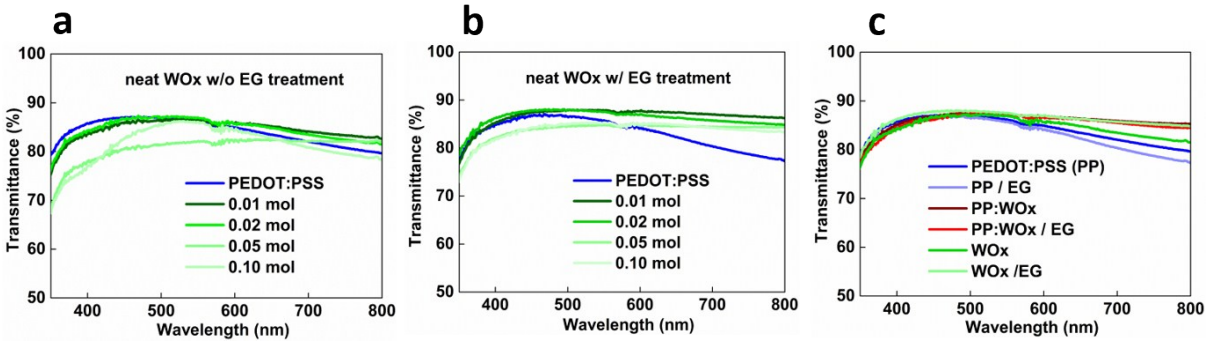

Figure S3. Transmittance plots of (a) neat sol-gel processed WO_x thin films, (b) neat sol-gel processed WOx thin films after EG treatment, and (c) comparison of w/ and w/o EG treated thin films of PEDOT:PSS, WOx doped PEDOT:PSS and neat WO_x thin films.

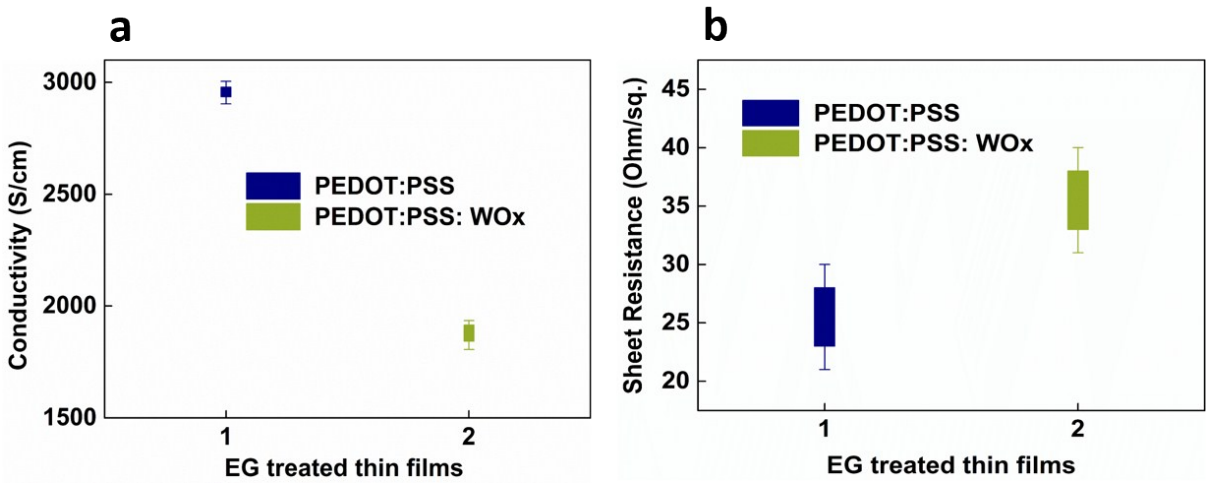

Figure S4. (a) Conductivity and (b) sheet resistance mean deviations of PEDOT:PSS/PEDOT:PSS:WO_x of 10 samples. EG treatment carried out on each layers of multiple layered (180 nm thick 4 layers of PEDOT:PSS, and 160 nm thick 3 layers of PEDOT:PSS:WO_x.

1. Xia, K. Sun, J. Ouyang, Adv. Mater. 2012, 24, 2436.
2. N. Kim , H. Kang , J. H. Lee , S. Kee , S. H. Lee , and K. Lee, Adv. Mater. 2015, 27, 2317−2323.
3. W. Meng, R. Ge, Z. Li, J. Tong, T. Liu, Q. Zhao, S. Xiong, F. Jiang, L. Mao, Y. Zhou, ACS Appl. Mater. Interfaces 2015, 7, 14089−14094.
4. Y. H. Kim, C. Sachse, M. L. Machala, C. May, L. M. Meskamp, K. Leo, Adv. Funct. Mater. 2011, 21, 1076–1081.