Solution-Processed Graphene Oxide for High Performance Polymer Solar Cells

Chain-Shu Hsu
Hong-Yi Hsu
Jiun-Tai Chen

National Chiao Tung University, 1001 University Road, Hsinchu, Taiwan

cshsu@mail.nctu.edu.tw

Abstract

Graphene oxide was prepared by using Hummer method. Due to the excellent electron blocking ability of graphene oxide (GO), the GO layer was composited with vanadium oxide and molybdenum oxide layers to form the anodic buffer layer for polymer solar cells. Composite anodic buffer layers composed of solution-processed graphene oxide and vanadium oxide(GO/VOx) exhibit a significant enhancement in their electron-blocking properties and sol–gel-precursor blocking abilities, compared to buffer layers of only the d^0 transition metal oxide. Such composites enable inverted polymer solar cells to have high open-circuit voltage and fill factor values, as well as the highest power conversion efficiency to date of 6.7%, shedding light on how stable and cost-effective whole-solution-processed polymer solar cells may be achieved.

References

[1] Y. H. Chao, J. S. Wu, C. E. Wu, J. F. Jheng, C. L. Wang and C. S. Hsu, Adv. Energy. Mater., 3, (2013) 1279
[2] M. K. Chuang, S. W. Lin, F. C. Chen, C. W. Chu and C. S. Hsu, Nanoscale, 6 (2014) 1573

Figures

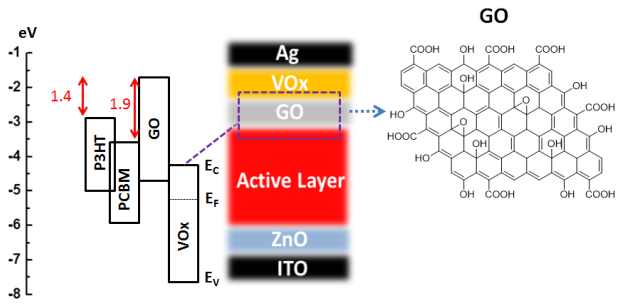
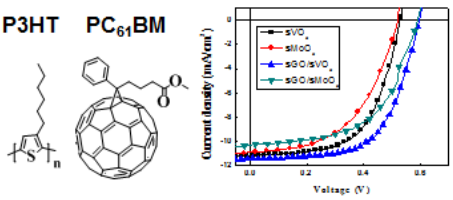


Figure 1: Device structure of a polymer solar cell



Anodic Buffer Layer	V_{oc} (V)	J_{sc} (mA cm^{-2})	*FF* (%)	PCE (%)	R_{sh} (Ω cm^2)	R_s (Ω cm^2)
sVO_x	0.53	11.3	60	3.6	971	12.4
$sMoO_x$	0.52	10.9	52	2.9	394	14.3
sGO/VO_x	0.60	11.1	63	4.1	3086	5.6
sGO/MoO_x	0.58	10.3	57	3.4	606	8.1

Figure 2: Performance of polymer solar cells using graphene oxide as a buffer layer