Electronic Supplementary Material (ESI) for RSC Advances.

Supporting Information

Controlling of the oxidation level of graphene oxide for High Efficient Polymer Solar Cells

Rui Wu[a](武锐) Lie Chen[a,b](谌烈) Liqiang Huang[a](黄立强) Yiwang Chen*[,a,b] (陈义旺)

[a] *College of Chemistry/Institute of Polymers, Nanchang University, 999 Xuefu Avenue, Nanchang 330031, China*
[b] *Jiangxi Provincial Key Laboratory of New Energy Chemistry, Nanchang University, 999 Xuefu Avenue, Nanchang 330031, China*

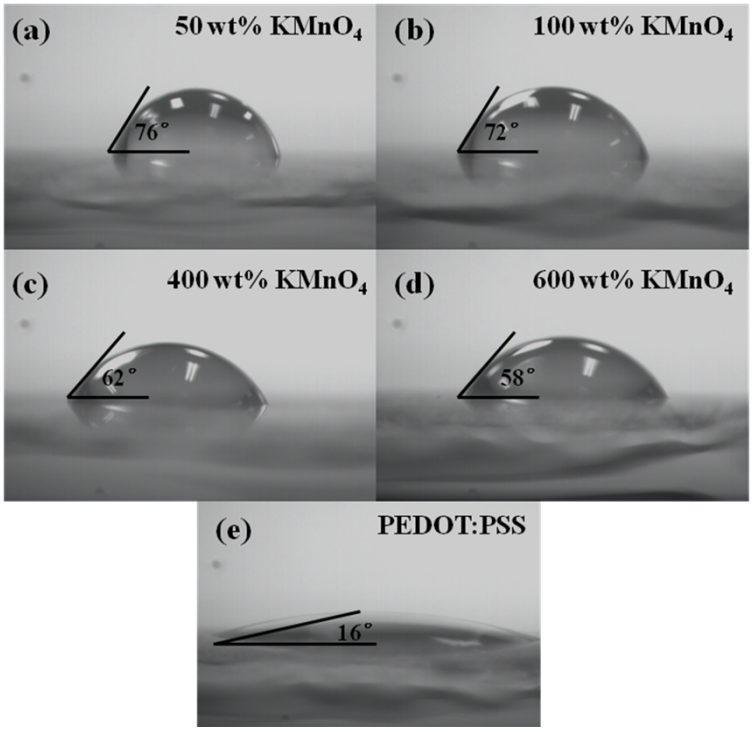

Figure S1. Surface contact angle of GOs with different degrees of oxidation and PEDOT:PSS. The substrate is ITO glass. (a) 50 wt% $KMnO_4$, (b) 100 wt% $KMnO_4$, (c) 400 wt% $KMnO_4$, (d) 600 wt% $KMnO_4$ and (e) PEDOT:PSS (percentage represents the input of oxidant ($KMnO_4$) corresponding to 1 g graphite).

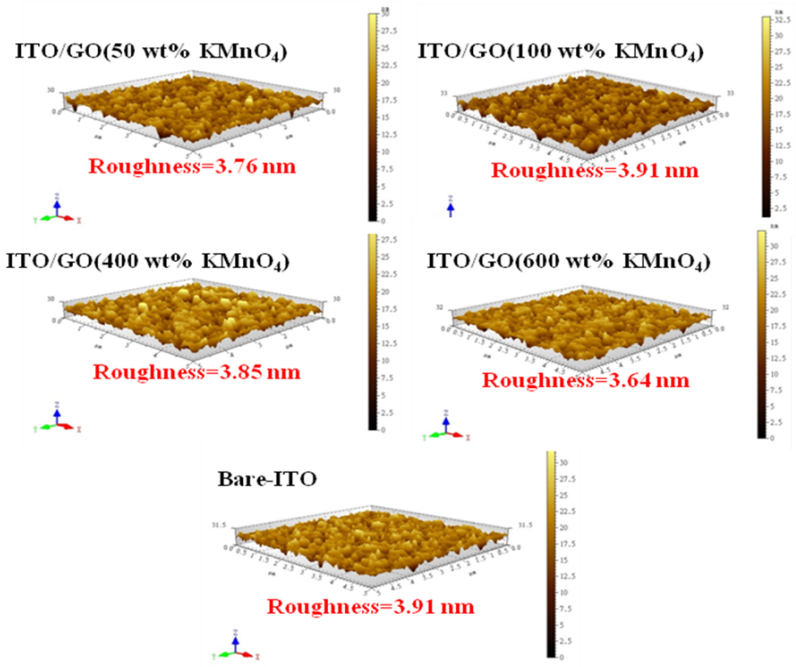

Figure S2. AFM micrographs and root-mean-square values of GO with different degrees of oxidation on ITO substrate.

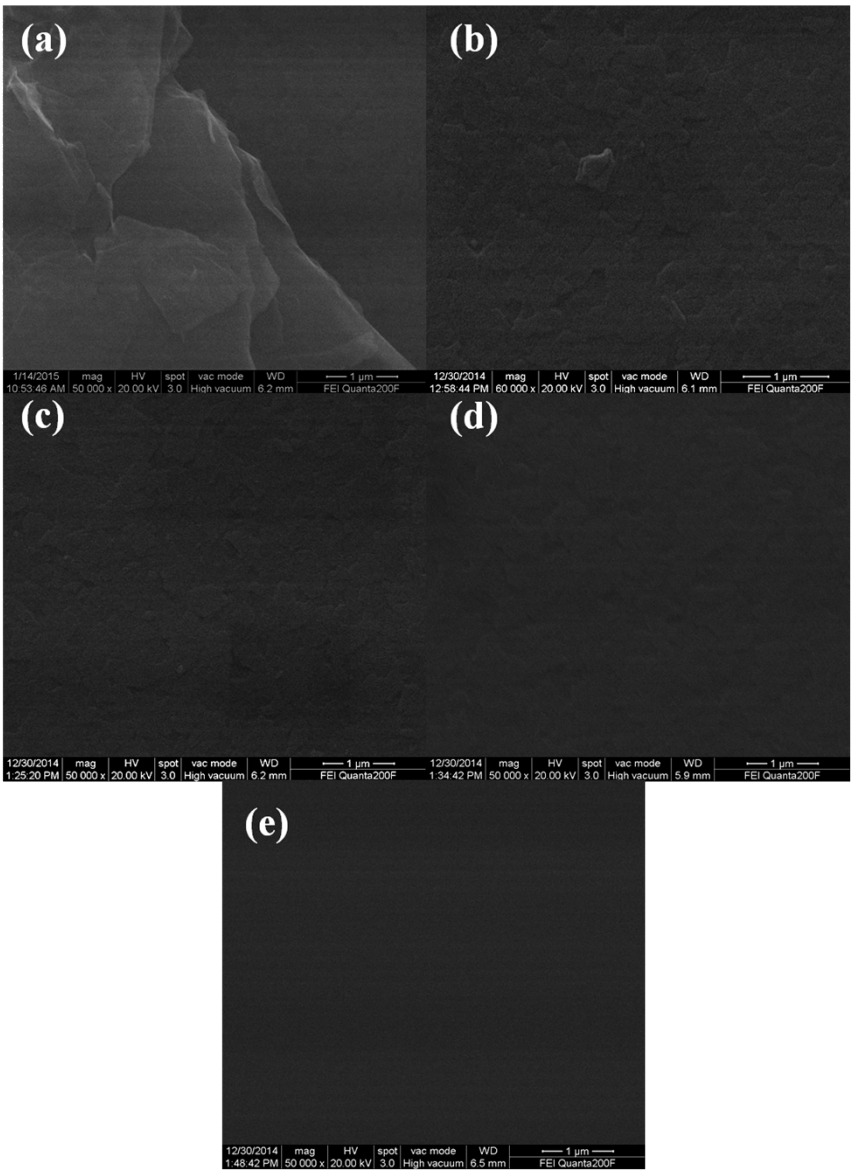

Figure S3. Scanning electron microscope images of GOs with different degrees of oxidation. (a) 50 wt% $KMnO_4$, (b) 100 wt% $KMnO_4$, (c) 400 wt% $KMnO_4$, (d) 600 wt% $KMnO_4$ and (e) blank substrate. The substrate is ITO glass.

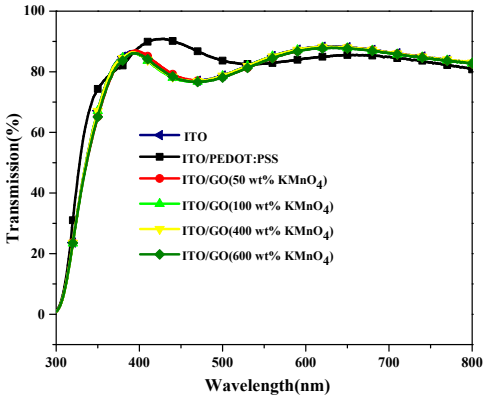

Figure S4. Transmittance spectra of GOs with different degrees of oxidation

Table S1. XRD parameters of GOs with different degrees of oxidation.

	Peak position (2θ/°)	'd' value (Å)
Graphite	26.5	3.36
GO (50 wt% $KMnO_4$)	13.0	6.81
GO (100 wt% $KMnO_4$)	12.8	6.92
GO (400 wt% $KMnO_4$)	11.8	7.50
GO (600 wt% $KMnO_4$)	11.2	7.90

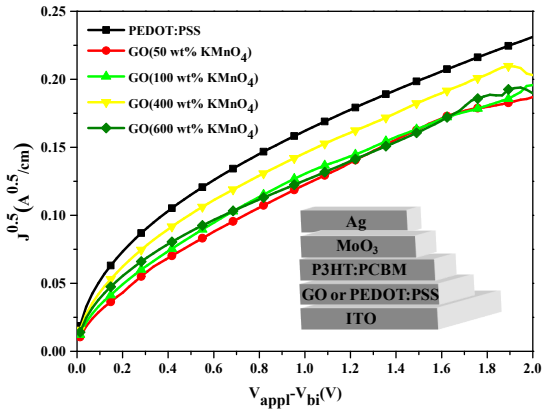

Figure S5. $J^{0.5}$–V characteristics of hole-only devices with PEDOT:PSS and GOs as HTLs based on device structure as ITO/HTL/P3HT:PCBM/MoO_3/Ag (The inset represents the structure of hole-only device). The oxidation degree of GOs doesn't have an obvious effect on the hole mobility of materials.

Table S2. Hole mobility of the devices based on PEDOT:PSS and GOs based on device structure as ITO/HTL/P3HT:PCBM/MoO_3/Ag.

Devices	PEDOT:PSS	GO(50 wt% $KMnO_4$)	GO(100 wt% $KMnO_4$)	GO(400 wt% $KMnO_4$)	GO(600 wt% $KMnO_4$)
Hole mobility [$cm^2v^{-1}s^{-1}$]	2.25×10^{-4}	1.90×10^{-4}	1.85×10^{-4}	2.05×10^{-4}	1.76×10^{-4}

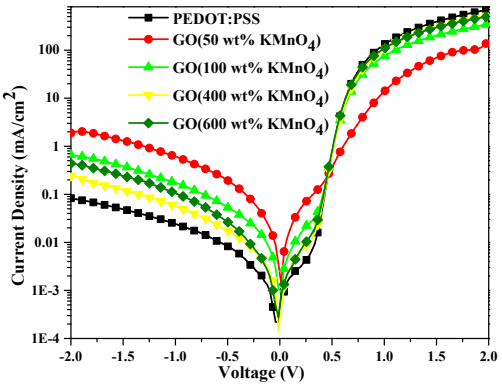

Figure S6. *J-V* curves in dark of P3HT:PCBM photovoltaic devices with different HTLs based on device structure as ITO/HTL/P3HT:PCBM/LiF/Al.