

**Supporting Information for:**

**Study on graphene oxide as a hole extraction layer for stable organic solar cells**

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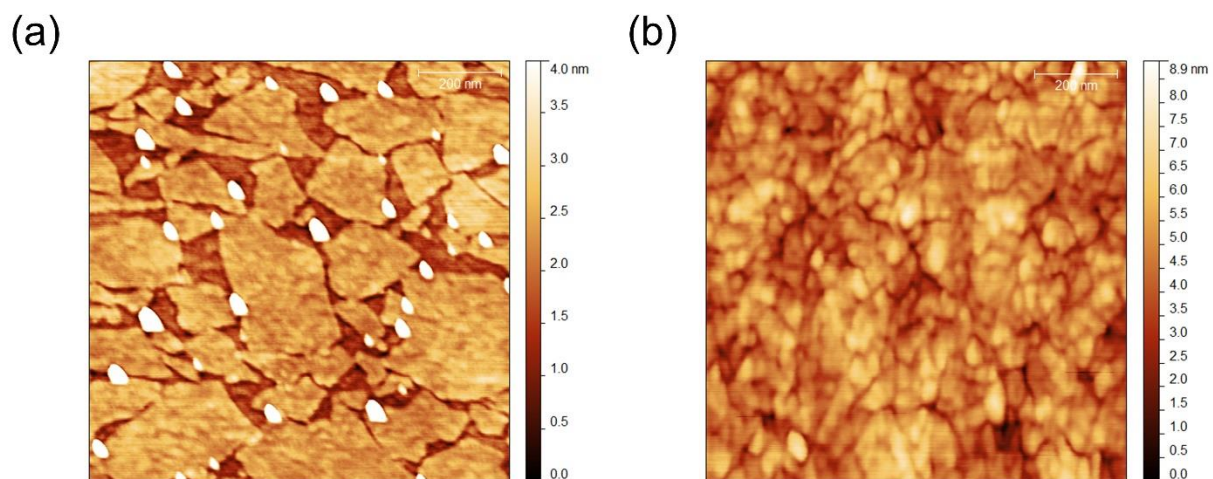
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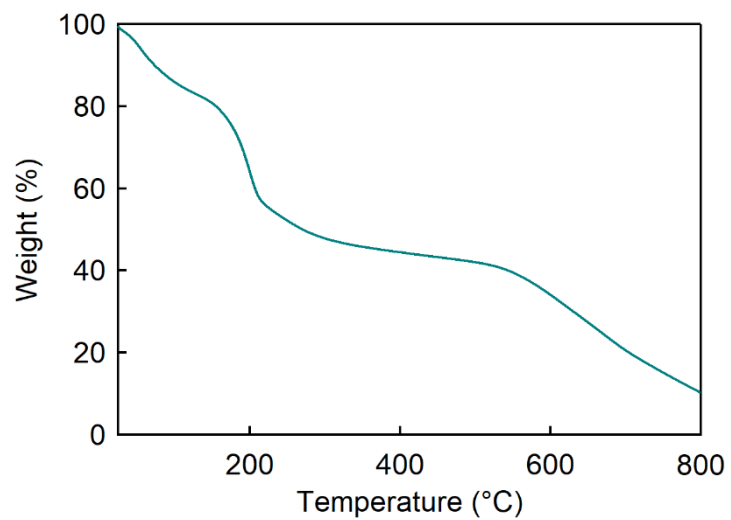
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**Table S1** Raman peak positions and full widths at half-maximum (FWHM) of graphene and GO.

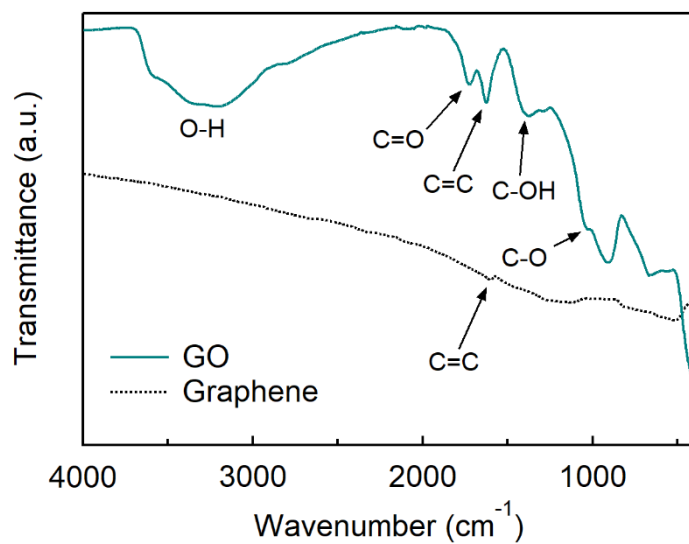
	Peak (cm <sup>-1</sup> )		FWHM (cm <sup>-1</sup> )		Relative intensity (I <sub>D</sub> /I <sub>G</sub> )
	D band	G band	D band	G band	
GO	1350	1600	140	110	1.037
Graphene	1350	1590	100	100	0.985



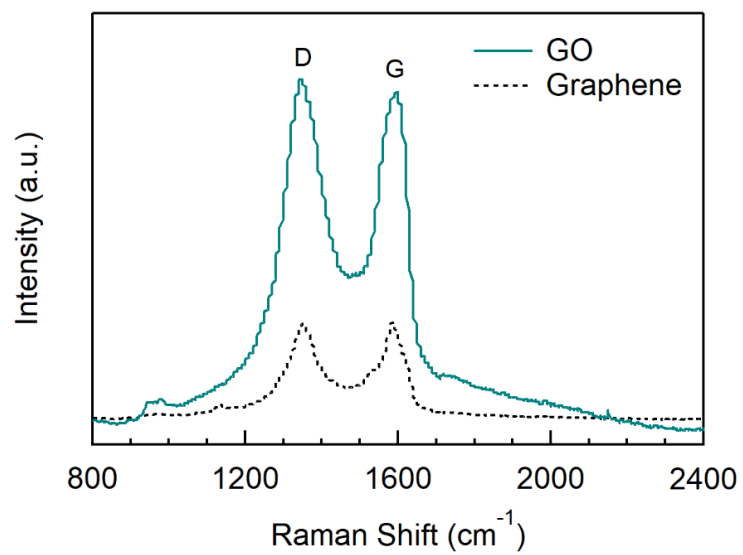
**Fig. S1** Topography images of GO flakes within a GO film spin coated from (a) 1 mg·mL<sup>-1</sup> and (b) 5 mg·mL<sup>-1</sup> by atomic force microscopy (AFM).



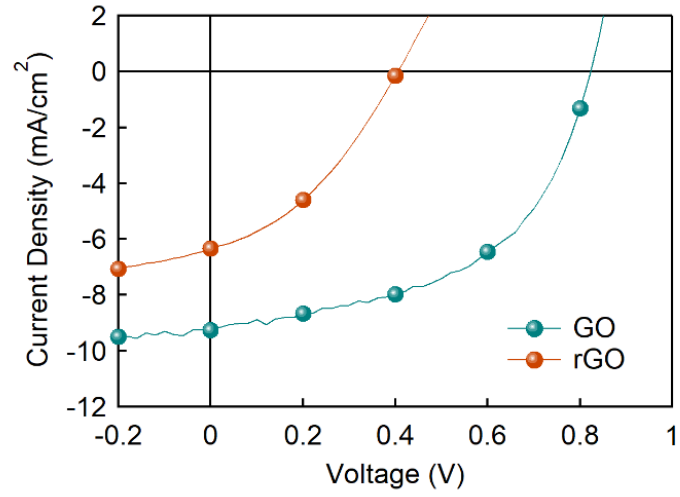
**Fig. S2** Thermogravimetric analysis (TGA) of graphene oxide (GO).



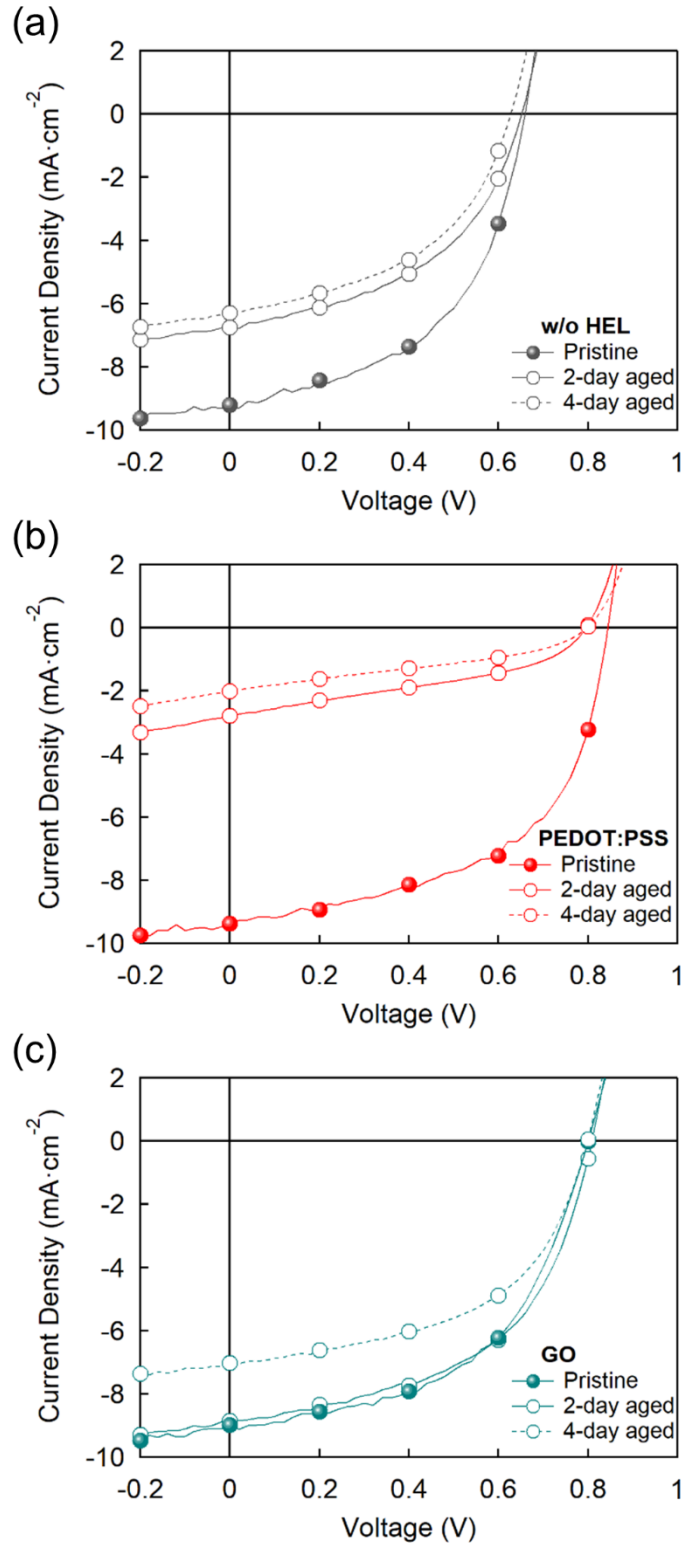
**Fig. S3** Fourier-transform infrared spectroscopy (FTIR) of graphene oxide (GO).



**Fig. S4** Raman spectroscopy analysis of graphene and graphene oxide (GO).

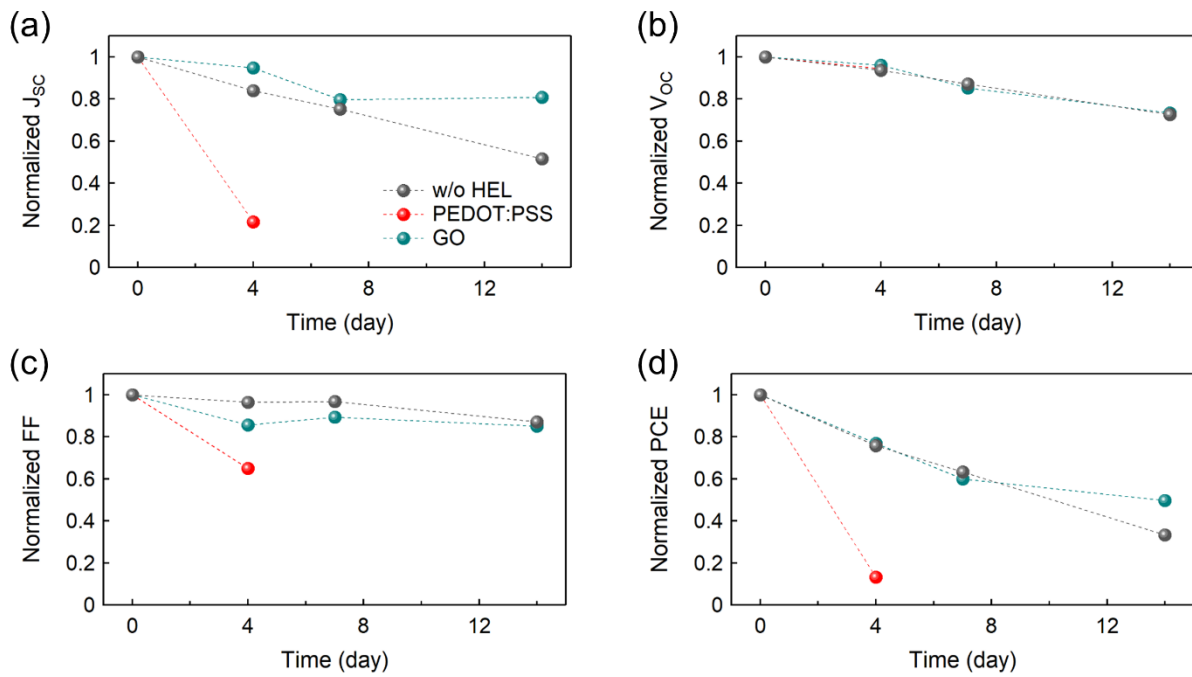


**Fig. S5** Current density-voltage ( $J$ - $V$ ) characteristics of OSCs with GO and reduced GO (rGO), where rGO is obtained through thermal annealing the GO film at 500°C.

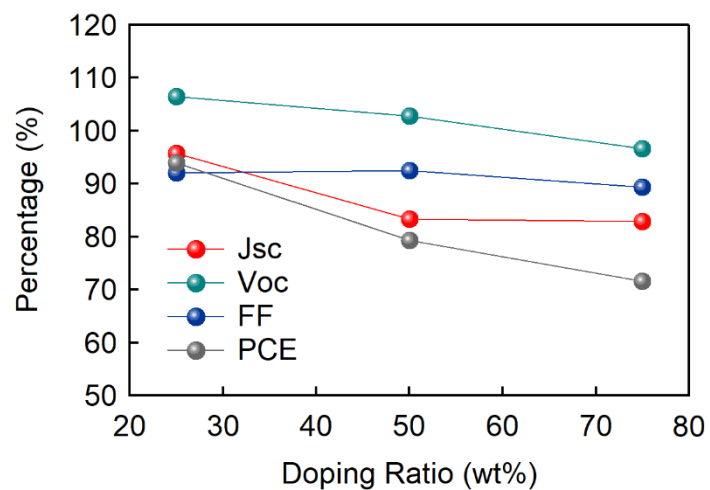


**Fig. S6** Variation of  $J$ - $V$  characteristics of devices upon 4-day aging.





**Fig. S7** Variation of photovoltaic parameters ( $J_{sc}$ ,  $V_{oc}$ , FF, PCE) of devices upon 2-week aging.



**Fig. S8** Normalized values of photovoltaic parameters of devices with composite HIL as a function of the GO doping ratio from 25 wt% to 75 wt% compared to pristine PEDOT:PSS.