## **Supplementary Information**

Improvement of Photovoltaic Parameters of Perovskite Solar Cells Using Reduced-

Graphene-Oxide-Modified Titania Layer and Soluble Copper Phthalocyanine as Hole

Transporter

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*Figure S1*. *XRD patterns of: (1) T/RGO nano-powders, (2) T/0.2 RGO mesoporous film on FTO substrate and (3) perovskite film on T/0.2 RGO mesoporous film and FTO glass.* 

## EDX Spectra of Perovskite film



## 1<sup>st</sup> measurement



## **Figure S2**. EDX spectra and elemental analysis of organo-lead halide perovskite film obtained by analyzing radiation at different positions. Sn comes from the FTO (Fluorine doped Tin Oxide) substrate.



**Figure S3**. The transmission line equivalent circuit used to fit the impedance data of mesoscopic PSCs.  $R_S$  represents the resistance of conductive substrate,  $C_{BL}$  the capacitance and  $R_{BL}$  the charge transfer resistance at TiO<sub>2</sub> compact blocking layer,  $R_t$  the transport resistance in the mesoporous/perovskite film,  $R_r$  the recombination resistance accounting for losses of electrons from perovskite absorber layer,  $C_{\mu}$  the chemical capacitance, the  $R_{CuBu}$  the resistance of CuBuPc as hole-transporting material.



*Figure S4.* FESEM images of: (a) graphene oxide sheets produced by Hummers and Offeman method and (b)  $TiO_2$ /reduced graphene oxide nanocomposite synthesized via an in-situ solvothermal process. The scale bar is 100 nm in (a) and 200 nm in (b).



*Figure S5.* (*a*) *HRTEM image, (b) interfringe spacing graph and (c) corresponding selected area electron diffraction pattern for T/RGO nanocomposite.* 



*Figure S6.* Normalized photovoltaic parameters (a)  $J_{SC}$ , (b)  $V_{OC}$  and (c) FF as a function of ageing time for mesoscopic PSC devices based on (1) pure TiO<sub>2</sub> and (2) T/0.2RGO mesoporous layers as electron transport mediator.