

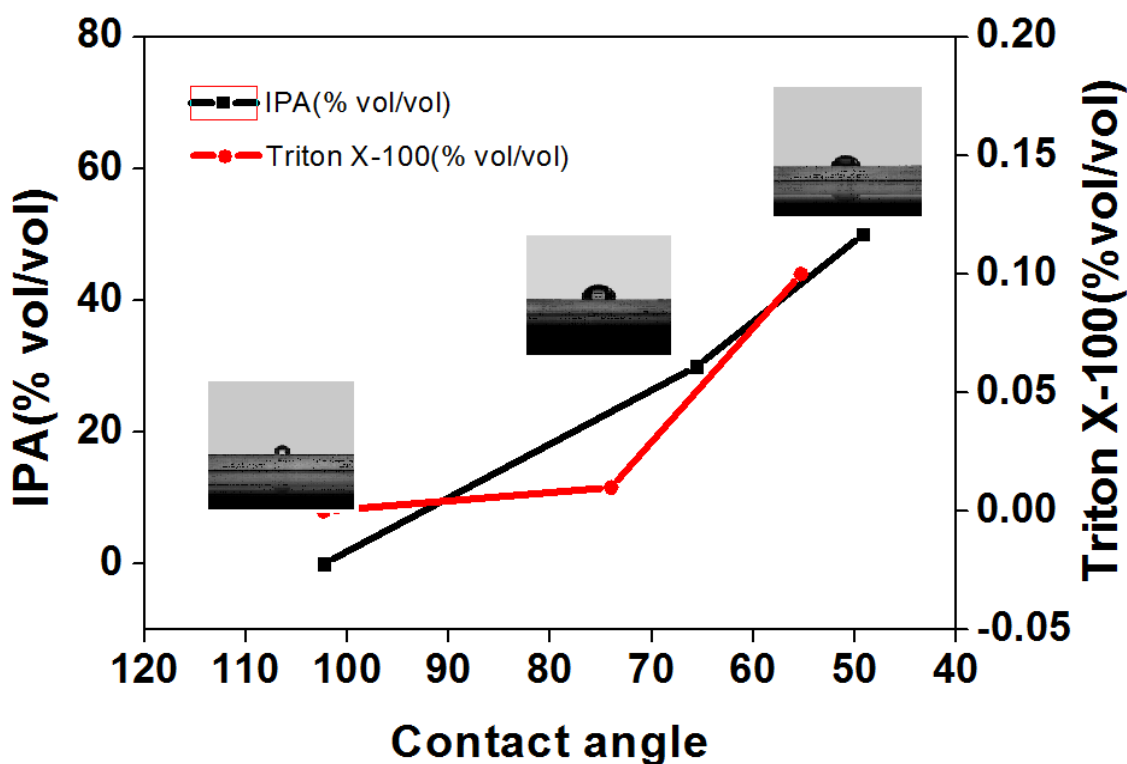
## Supporting Information

### Low-temperature, solution-processed, layered $V_2O_5$ hydrate as the hole-transport layer for stable organic solar cells

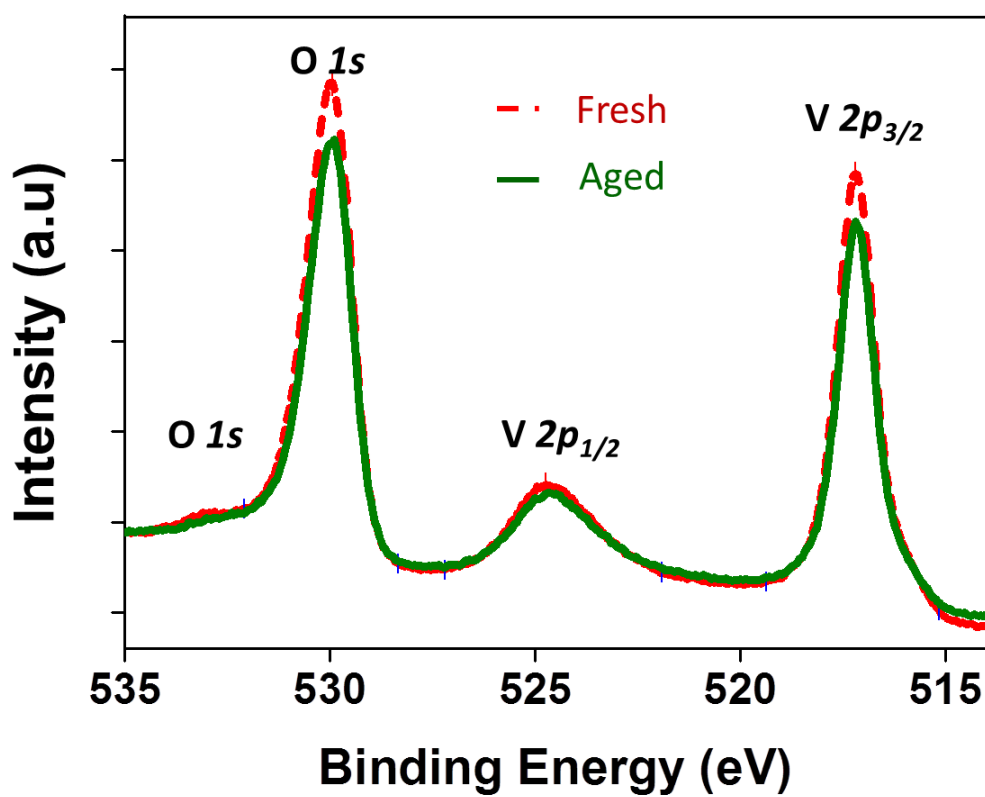
Gerardo Terán-Escobar, Jonas Pampel, José M. Caicedo and Mónica Lira-Cantú\*

Keywords: hole conductors, layered metal oxides, organic solar cells, solution processing,  $V_2O_5$

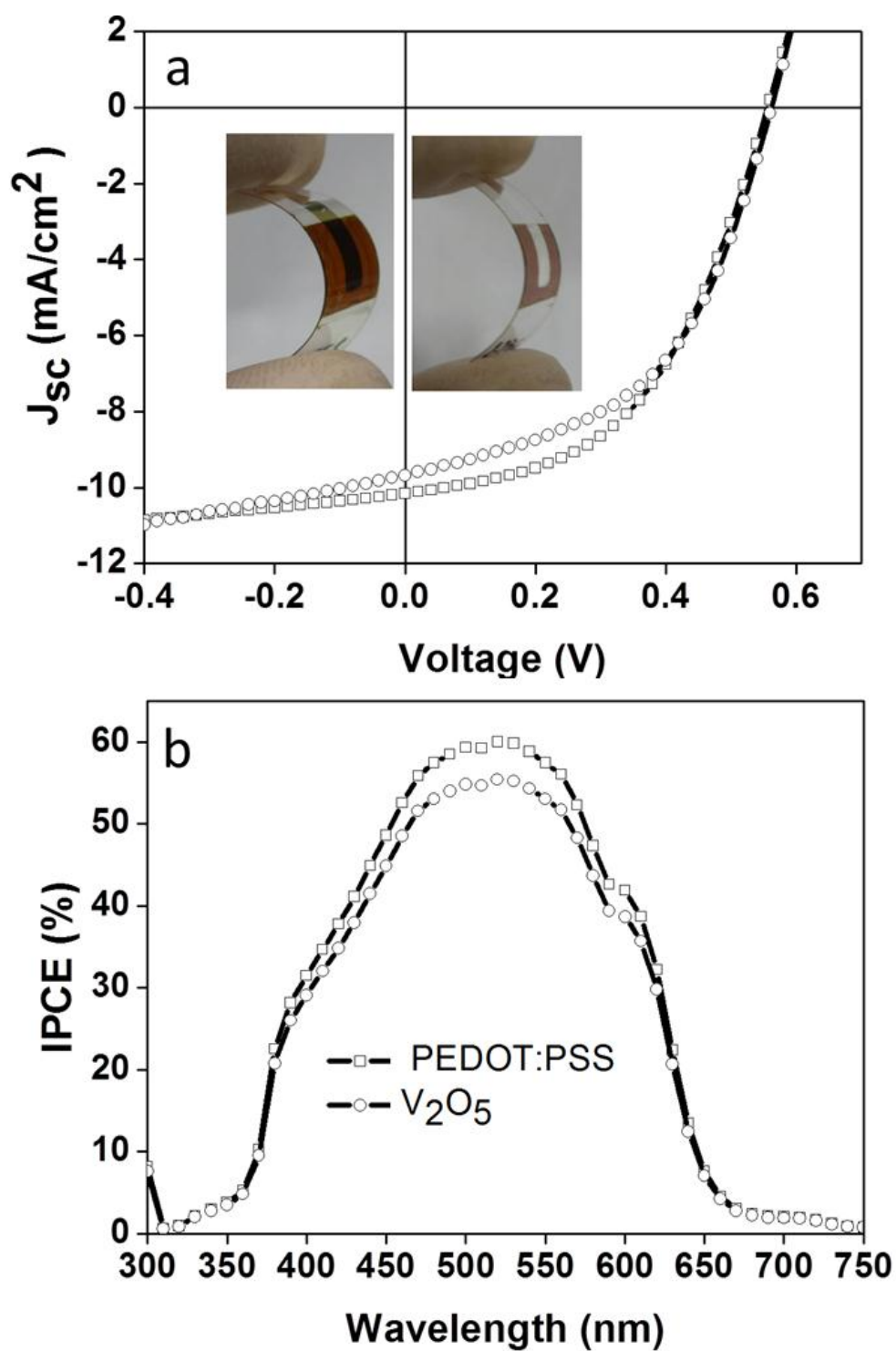
The effect of the concentration of the isopropanol within the  $V_2O_5$ /IPA mixture on the contact angle of the  $V_2O_5$  thin film is shown in **Figure S1**.



**Figure S1.** Effect of the contact angle of the  $V_2O_5$  versus the concentration of the IPA and Triton X-100 in solution.

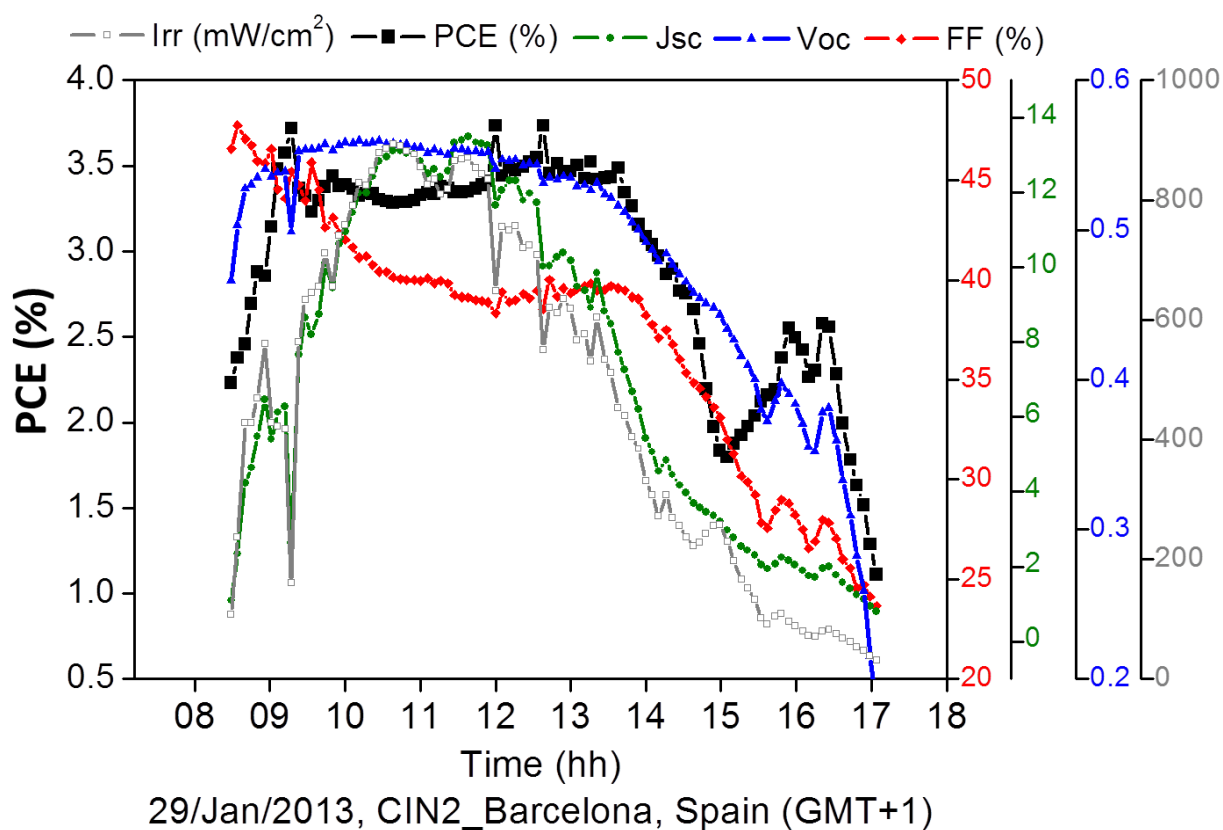


**Figure S2.** XPS spectra of the V<sub>2</sub>O<sub>5</sub> thin films obtained with the fresh (red) and aged (green) V<sub>2</sub>O<sub>5</sub>/IPA solutions.



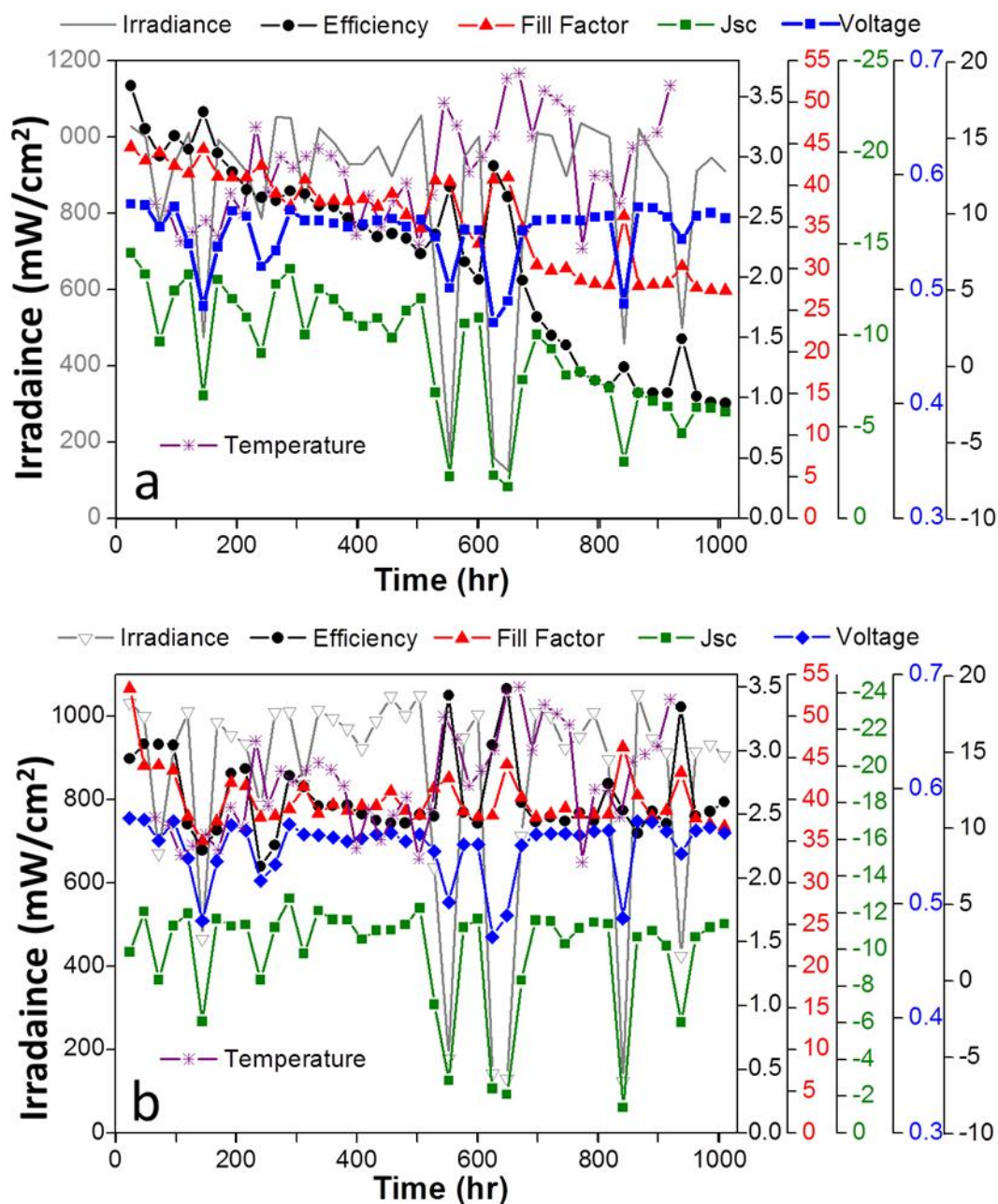
**Figure S3.** Inverted organic solar cells on flexible PET/ITO substrates applying the V<sub>2</sub>O<sub>5</sub> hydrate as the HTL and its comparison with PEDOT:PSS. a) IV-curves and b) IPCE spectra. Configuration: PET/ITO/ZnO/P3HT:PCBM/V<sub>2</sub>O<sub>5</sub>/Ag.

An example of the variation of the photovoltaic response of an inverted organic solar cell of the type Glass/FTO//ZnO/P3HT:PCBM/V<sub>2</sub>O<sub>5</sub>/Ag analyzed for one day under outdoor conditions (at Barcelona, Spain location 41.30° N 2.09° W, sun tracking system) is presented under supplementary information, Figure S3. Notice the variation of PCE (%) at maximum light irradiation.



**Figure S4.** One-day outdoor stability analyses of an inverted OSC under Barcelona weather location, 41.30° N 2.09° W. Sun tracker active.

Figure S4 shows the detailed photovoltaic parameters obtained for the outdoor testing of the inverted OSC of the type Glass/FTO/ZnO/P3HT:PCBM/V<sub>2</sub>O<sub>5</sub>/Ag analyzed without (a) and with (b) the application of an UV-filter.



**Figure S5.** Photovoltaic response, light irradiation (mW/cm<sup>2</sup>), temperature (°C) and relative humidity (RH%) effect on the long-term outdoor analyses of inverted OSCs with and without UV filter. Inverted solar cells with a) UV filter and b) no UV filter.