Supplementary information for

Surface and subsurface morphology of operating nanowire:fullerene solar cells revealed by photoconductive-AFM

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Current and voltage offsets:

Since currents measured under short-circuit conditions are very low (pA range) it is extremely important to characterise the system such that offset current and/or voltage values are known. We use similar procedures as published (as supplemental material) by Reid et al. [S1].

We measured the voltage offset due to system electronics and the work-function difference between bottom electrode (ITO/PEDOT:PSS) and top electrode (AFM gold coated tip) to be 100 mV. This was obtained by measuring current voltage curves in the dark with the tip in contact with the surface and comparing it with a measurement while the tip is withdrawn from the surface (we typically used the average of 25 IV scans). The crossing point between these curves should be the real zero voltage x zero current point and therefore gives us a direct measure of the offset current and offset voltage. This value was used as an offset to define the zero bias voltage; therefore all measurements present in the manuscript are relative to this point. We repeated this measurement several times throughout the experiment time to check for any changes in voltage offset.
Although we found the voltage offset to be mostly constant, extreme care must be taken when quantifying current values. Current offset varies with measurement settings and we measured values as high as 40pA in some cases. Notice however that this is an effect of the changes

made to measurement parameters. When using the same parameters, the current offset values remain almost constant and therefore can be used to correct the measurement data.

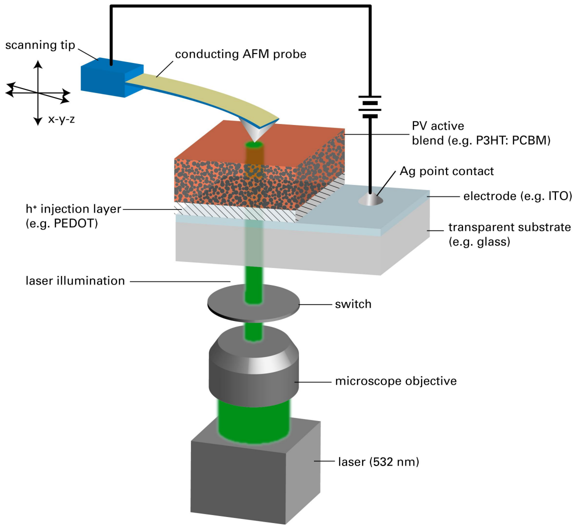

Figure S1 shows a schematic drawing of the setup used for photoconductive AFM measurements.

<u>Choice of sample system and development of technique:</u>

We have used similar equipment to that of other groups working on PC-AFM. PC-AFM is still a rather unexplored technique and we expect that it may provide even more information for OPV samples. But in order to understand how to extract information from PC-AFM data we suggest that model samples should be used. In this work we selected a system that allowed clear differentiation between the donor phase (nanowire) and the rest of the sample. This facilitated the interpretation of results and allowed us to draw conclusions that might have been masked by other factors in previous PC-AFM papers.

Obviously the quality of the images is critical and, as for any scanning probe experiment, care must be taken to minimise external noise and thermal drift. This is particularly important for PC-AFM where photocurrents are typically in the pico-Amperes range, close to the detection limit of the instruments.

<u>Charging effects excluded:</u>

We performed sequences of measurements alternating dark and light (immediately after each other) and observed very reproducible results indicating the lack of charging effects in our PC-AFM data.

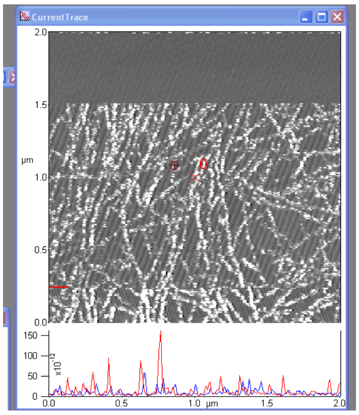

Figure S2 Screen shot image of a photocurrent measurement underway showing part of a previous measurement in the dark (top area) and the current measurement under light (bottom). The lack of any contrast when the sample is in the dark is very clear.

Reference S1: O.G. Reid, H. Xin, S.A. Jenekhe, D.S. Ginger, *J. Appl. Phys.* 2010, **108** 084320.