Supporting Information

Monolithic CIGS-Perovskite Tandem Cell for an Optimal Light Harvesting Without Current Matching

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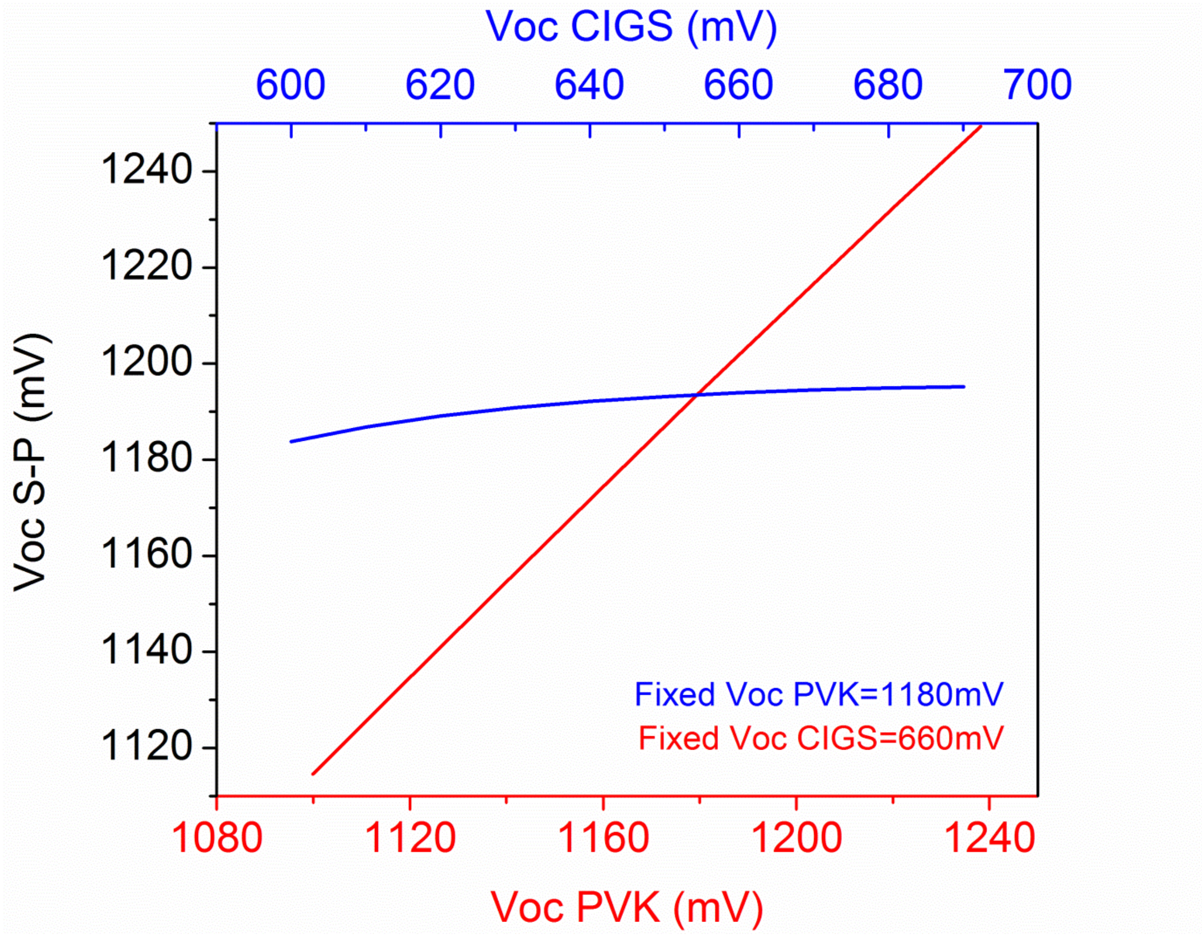

Figure S1. Equivalent V_{oc} for the S-P configuration when varying the V_{oc} of the PVK subcell with a fixed V_{oc} for the CIGS of 660 mV (red) and for variations of the CIGS V_{oc} with a fixed PVK V_{oc} of 1180 mV.

Fitting of IV curves

The single diode model used for the fitting of the IV curves is the following:

$$I = I_{sc} - I_0\left[exp\left\{\frac{q*(V+IR_S)}{nkT}\right\} - 1\right] \qquad \text{(eq S.1)}$$

For the case of the PVK, we took an experimental curve of V_{oc} 1180 mV, 22.8mA/cm^2 and FF 81% from reference [3] and fitted it using the diode parameters shown in Table S1.

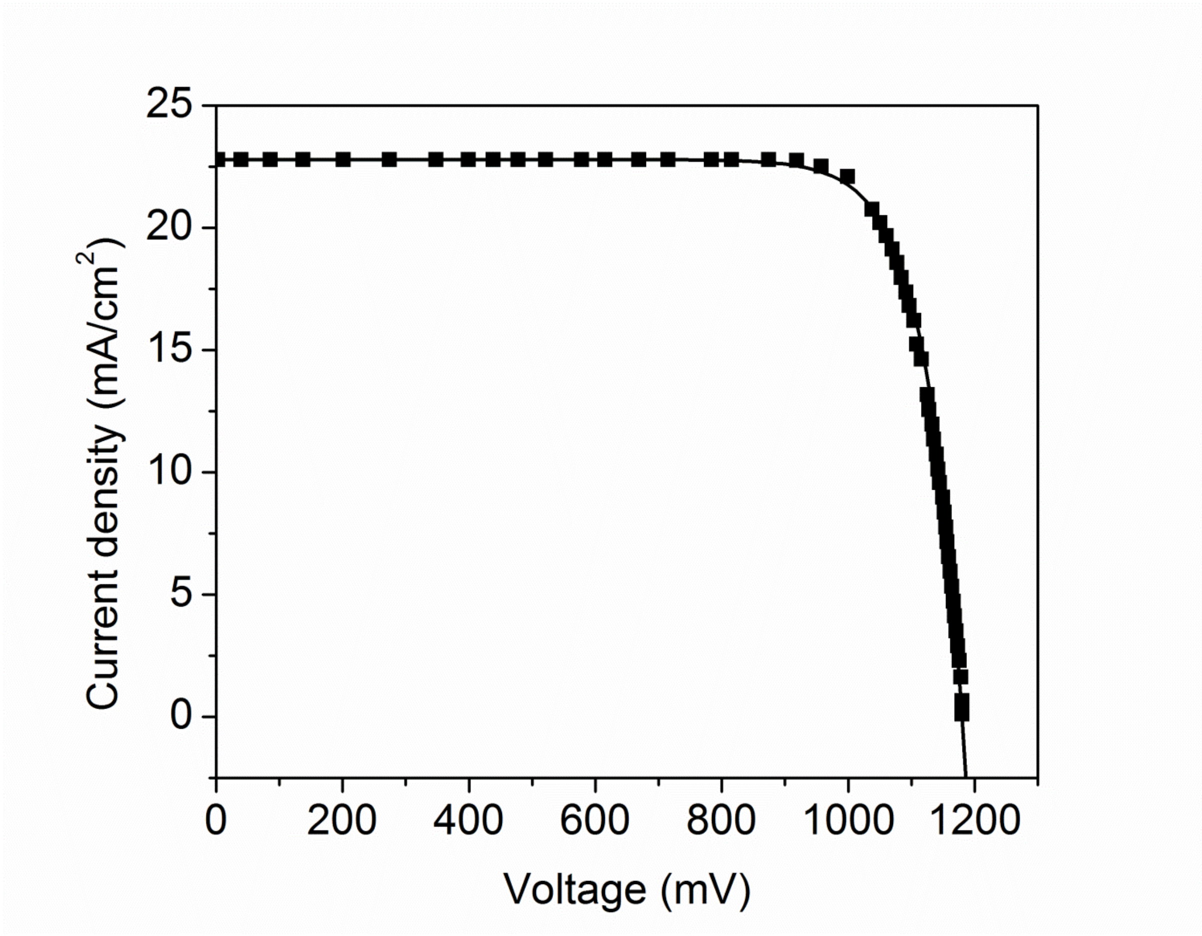

Figure S2. Fitting of experimental IV curve of a Perovskite cell (squares) with model using parameters in Table S1 (line).

Table S1. Diode parameters for the fitting of an experimental curve in Ref [3].

Saturation current density (mA/cm^2)	4e-8
Diode ideality factor	2.34097
Resistance (ohm cm^2)	3.91e-5
Short-circuit current density (mA/cm^2)	22.8

This data was taken as a starting point for the computer calculation of several IV curves for the PVK sub-cells exhibiting different V_{oc} while maintaining a high FF of 81%.

For the serially connected CIGS, we chose values that could represent IV curves with variable V_{oc} and high FF of around 80% as demonstrated experimentally in Ref [20]. For a fixed photocurrent, we varied the saturation current density in the range between 3.5 and 3.9e-8 mA/cm^2, the ideality factor between 1.21 and 1.39, and kept the series resistance at 3.2e-1 ohm cm^2.

Module interconnection schemes for the S-P configuration

Different strategies can be followed to interconnect the S-P solar cells into modules.

Option 1

Figure S3. Interconnection scheme with independently connected sub-cells branches.

An array of a large number of series connected CIGS cells is only connected at the ends to an array of series connected PVK cells (the number should be half the number of the CIGS cells).

Option 2

The S-P unit cell is connected to an adjacent S-P unit cell with a sequence of 7 cuts as shown in Figure S4. The current flow is indicated with the black arrows.

Note that this option requires an additional cut per S-P unit cell but it has the advantage that no selective layer cutting is required.

When comparing to a standard 4-T module, the S-P configuration would require three additional cuts in option 1) and four if option 2) is being considered.

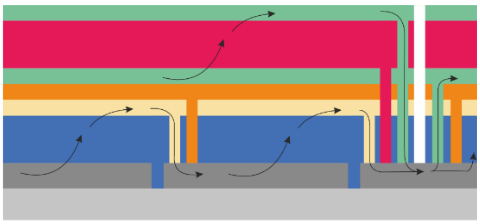

Figure S4. Scheme of laser scribes for the S-P configuration.