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Electronic supplementary information (ESI) of

Organic photovoltaic cells – promising indoor light harvesters for self-sustainable electronics

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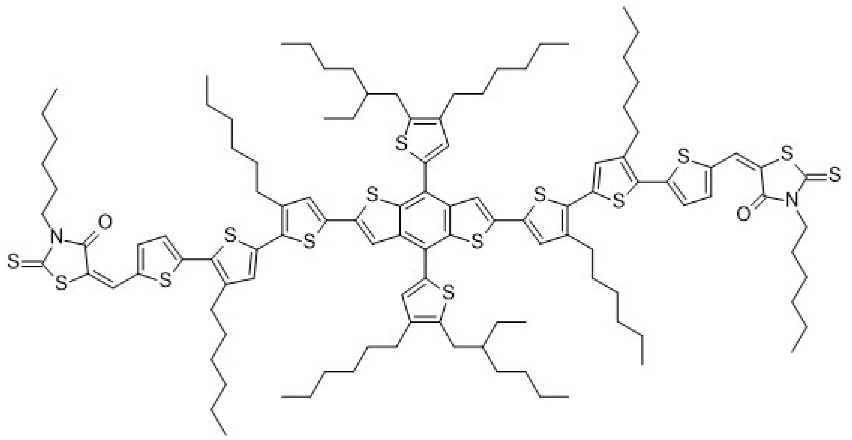

Fig. S1 Molecular structure of BTR molecule.

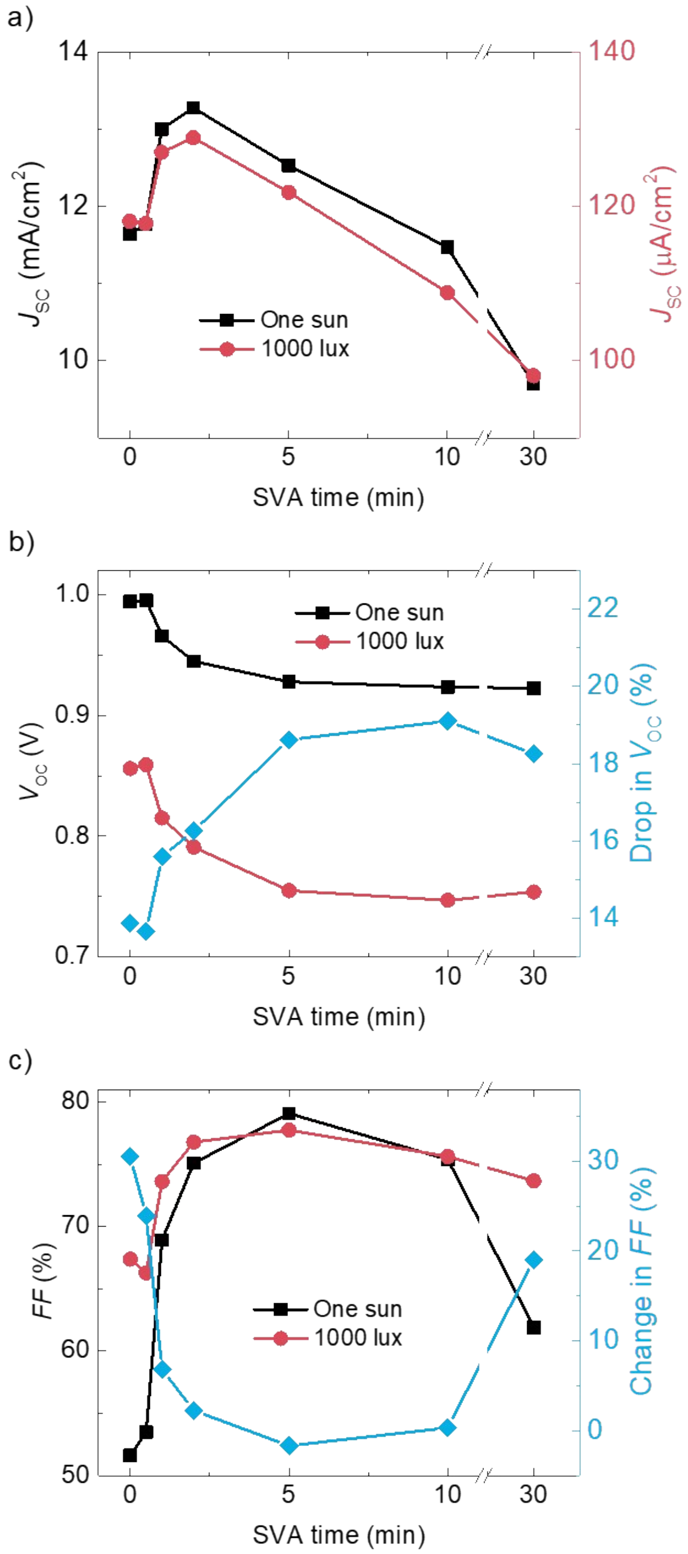

Fig. S2 Evolutions of (a) J_{SC}, (b) V_{OC}, and (c) *FF* with SVA time under AM1.5G and 1000 lux fluorescent lamps, respectively. Blue diamond data in (b) and (c) are the difference in the parameters between the two lighting conditions.

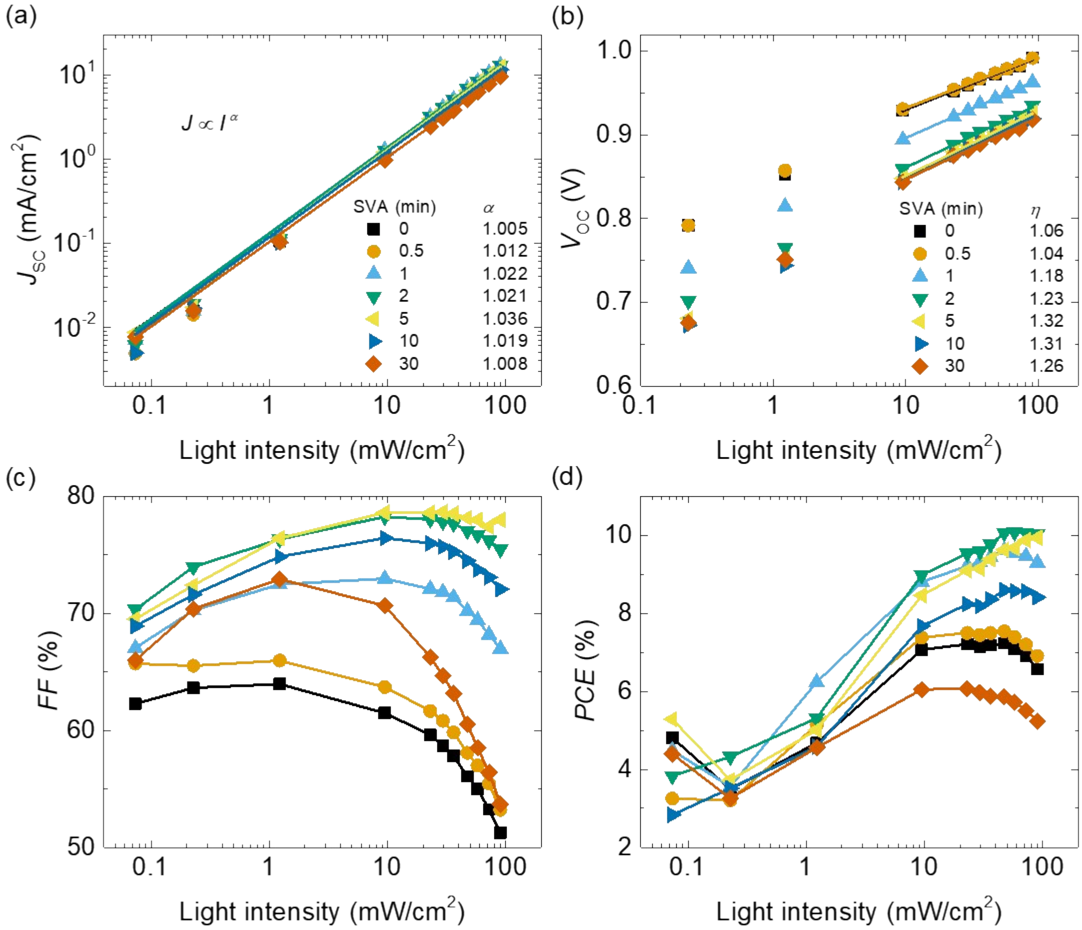

Fig. S3 Device parameters, (a) J_{SC}, (b) V_{OC}, (c) *FF*, (d) *PCE* of different SVA times against light intensity. Lines in (a) and (b) represent the best linear fits to the data (symbols), and the index of the power law (α) and the diode ideality factors (η) are listed in the plots, respectively.

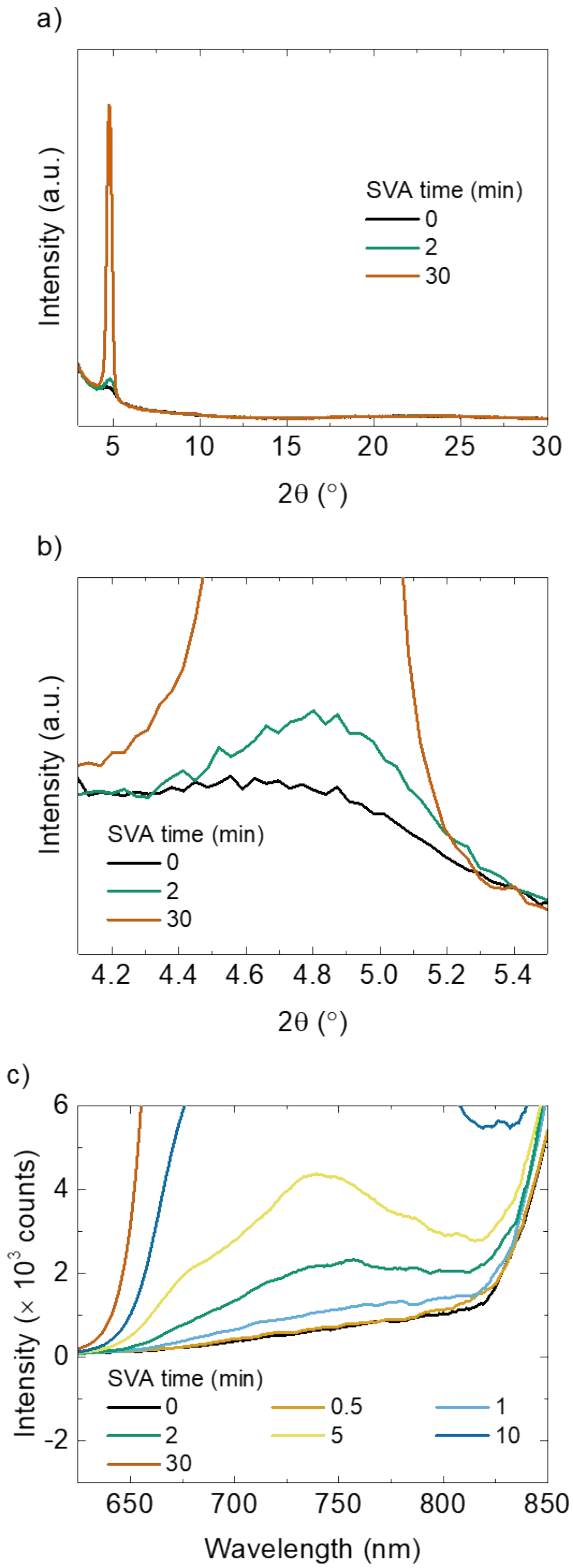

Fig. S4 (a) Full range plot of GIXRD data; (b) zoomed-in plot of GIXRD data; and (c) zoomed-in plot of PL spectra, of the BTR:$PC_{71}BM$ blend film with increasing SVA time.

Table S1 PL quenching efficiency with the maximum PL intensity of BTR neat films and BTR:$PC_{71}BM$ blend films.

SVA time (min)	Maximum PL intensity of BTR neat films, PL_{neat} (Counts)	Maximum PL intensity of BTR:$PC_{71}BM$ blend films, PL_{blend} (Counts)	PL quenching efficiency (%)
0	125000	693	99.4
2	180000	2300	99.8
30	147000	81000	44.9

Table S2 Maximum generation rate G_{max} calculated from saturation photocurrent at far reverse bias, $G_{max} = J_{sat}/qd$, where *q* is the electron charge and *d* is the thickness of the active layer.

SVA time (min)	G_{max} ($cm^{-3}s^{-1}$)
0	4.659×10^{21}
2	4.063×10^{21}
30	2.983×10^{21}

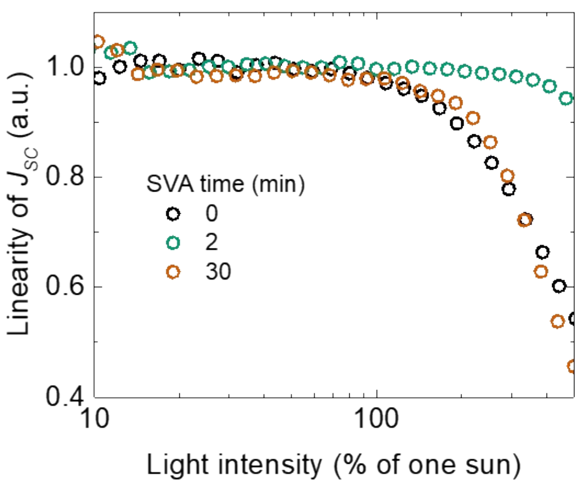

Fig. S5 Linearity of J_{SC} of devices with different SVA times.

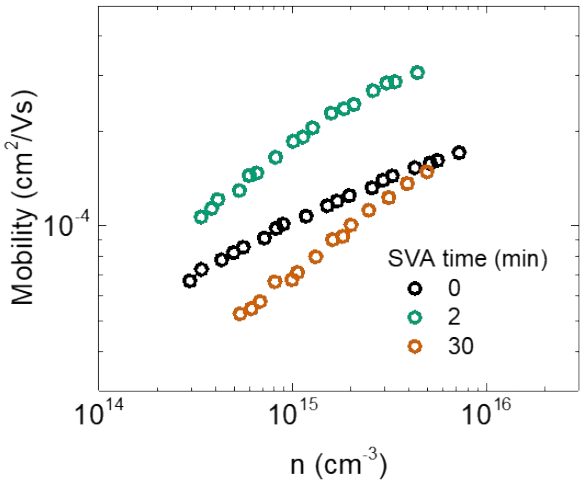

Fig. S6 Average drift mobility of devices with different SVA times. The average drift mobilities were calculated from charge extraction at short circuit condition: $\mu_{drift} = -(\frac{J_{sc}d}{qn_{sc}})(\frac{1}{f(\delta)V_{BI}})$, J_{SC} is the short circuit current, n_{SC} is the excess carrier density at short circuit under different illumination levels, d is the active layer thickness, $f(\delta)$ is the correction factor and V_{BI} is the build in voltage.[1]

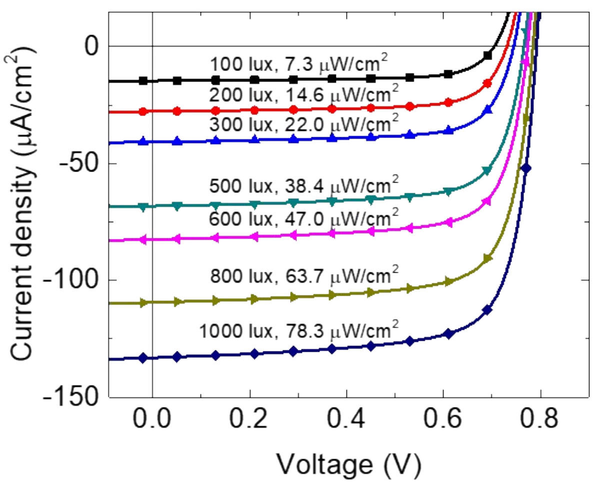

Fig. S7 *J-V* characterization of BTR:$PC_{71}BM$ with 2 minutes SVA at different illuminance. P_{max} at different illuminance are also available in the plot.

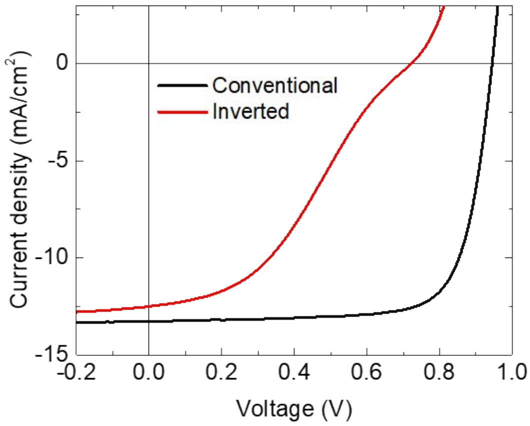

Fig. S8 *J-V* characterization of BTR:$PC_{71}BM$ with 2 minutes SVA prepared in normal and inverted device structures, ITO/PEDOT:PSS/BTR:$PC_{71}BM$/Ca/Al for normal device structure while ITO/ZnO/BTR:$PC_{71}BM$/MoO_3/Ag for inverted device structure.

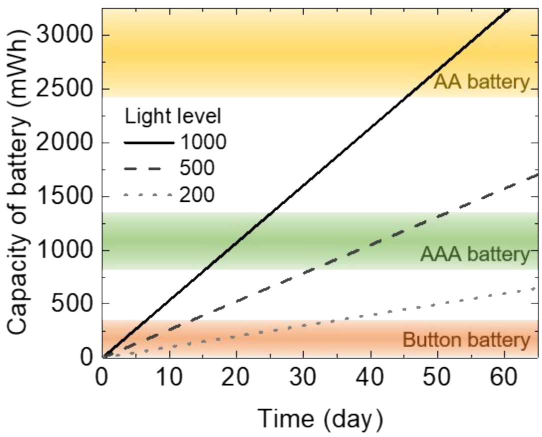

Fig. S9 Simulated time (*t*) required for charging different sizes (button, AAA, and AA) of rechargeable batteries under different light levels of indoor lighting. Capacity of the batteries are calculated by multiplying the number of total charge (*Q* with unit mAh) and the operational voltage (*V*). Calculation are based on the BTR:$PC_{71}BM$ data with 2 minutes SVA treatment under 1000, 500, and 200 lux operating in a business card size module (area, *A* = 8.5 cm × 5.5 cm) with geometric FF (*GFF*) of 80 %, a scaling factor accounting for efficiency drop after upscaling (η_{SF}) of 80 %, and a charging efficiency (η_{CE}) of 95 %. The simulation can be summarised in the following equation:

$$Capacity\ of\ battery = Q \times V = P_{max} \times t \times A \times GFF \times \eta_{SF} \times \eta_{CE}$$

References

[1] C. G. Shuttle, R. Hamilton, J. Nelson, B. C. O'Regan, J. R. Durrant, *Adv. Funct. Mater.* **2010**, *20*, 698.