

Electronic Supplementary Information (ESI)

Flexible Organic Tandem Solar Modules with 6% efficiency: Combining Roll-to-Roll Compatible Processing with High Geometric Fill Factors

G. D. Spyropoulos,^a P. Kubis,^{ac} N. Li,^a D. Baran,^a L. Lucera,^c M. Salvador,^a T. Ameri,^a M. M.

Voigt,^{ab} F. C. Krebs^d and C. J. Brabec^{ab}

Table S1. Photovoltaic parameters of hero flexible tandem solar cells and the corresponding flexible single-junction solar cells.

	Thickness of active layer (nm)	V_{oc} (V)	J_{sc} (mA/cm ²)	FF (%)	PCE (%)
pDPP5T-2:[70]PCBM	80	0.54	11.82	61	3.89
OPV12:[60]PCBM	160	0.80	8.54	70	4.79
Tandem Cell	160/80	1.35	7.61	60	6.12

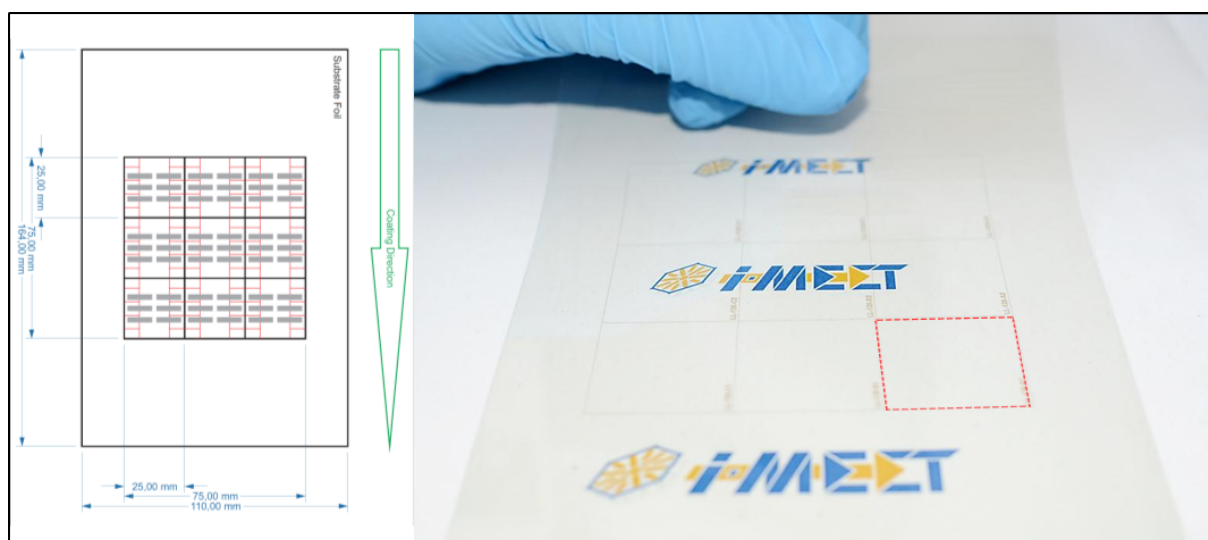


Figure S1. Top view illustration of the PET foil and the doctor blading direction (left). After deposition of top electrode, PET was divided into 9 substrates (area of $2.5 \times 2.5 \text{ cm}^2$) for characterization. Photograph of PET foil (one substrate was marked with red dotted line) (right).

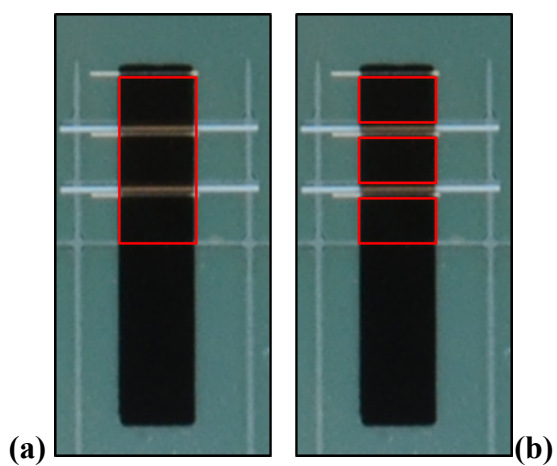
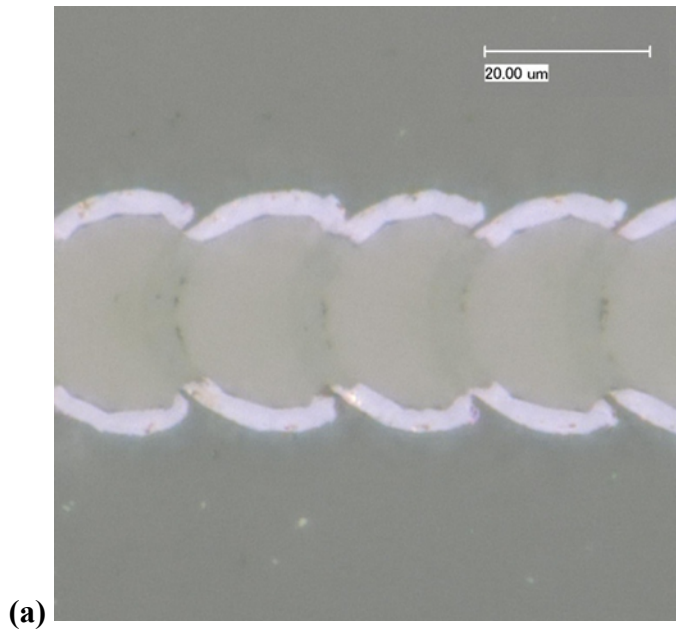


Figure S2. a) The assumed total area of flexible tandem modules is marked with a red line box. b) Active area is defined as the sum of 3 red line boxes. Dead area of the module was assumed to be the area that does not contribute to photocurrent between the active area boxes.



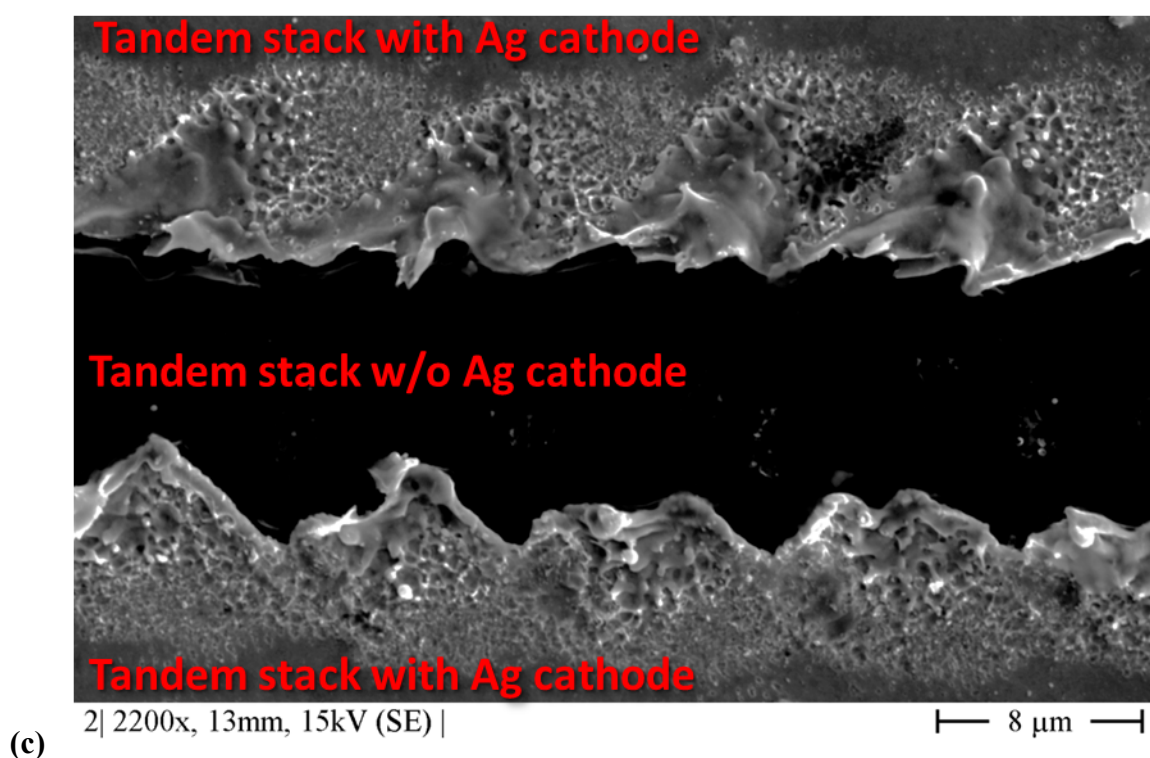
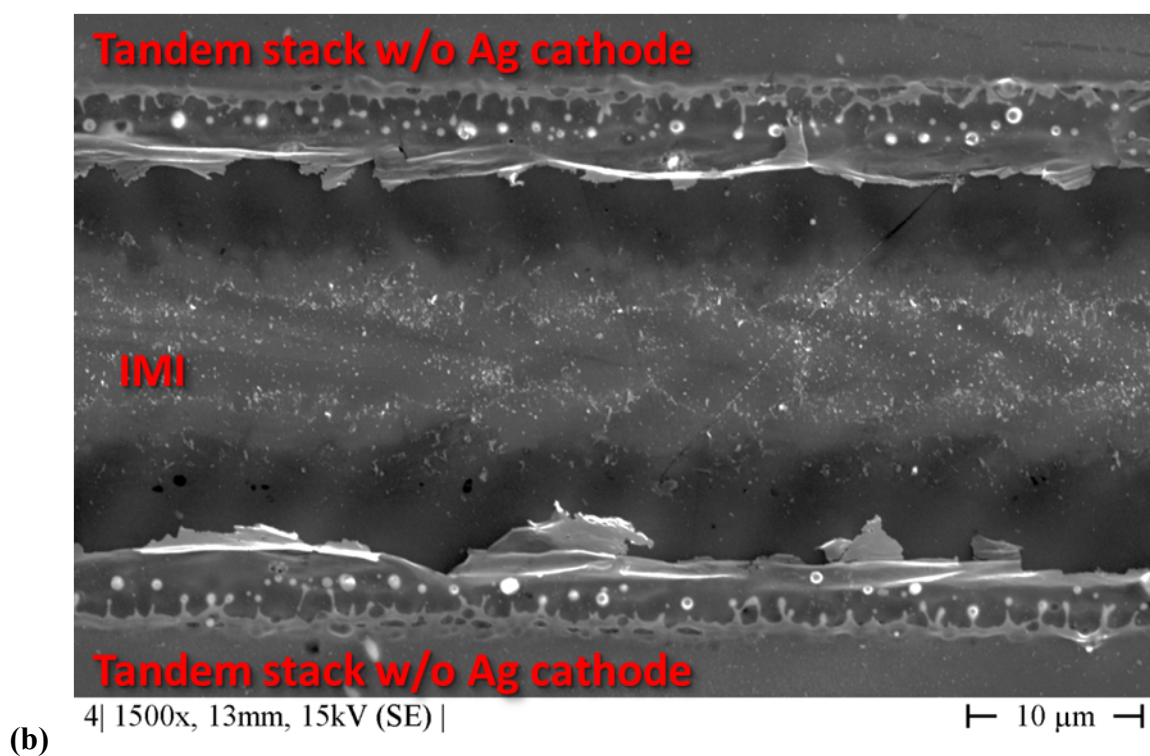


Figure S3. a) Top view microscope photograph of a P1 line on an IMI substrate. The high quality ablation ensures electrical separation without damaging the PET surface. b) SEM top view image of a $\approx 23\mu$ m P2 line. A stack of seven layers was successfully patterned without

destroying the IMI layer. This area is later filled with silver in order to succeed an electrical connection of the cells. c) SEM top view image of P3 line. The final silver layer is ablated in order to conclude the electrical separation of the sub-cells.

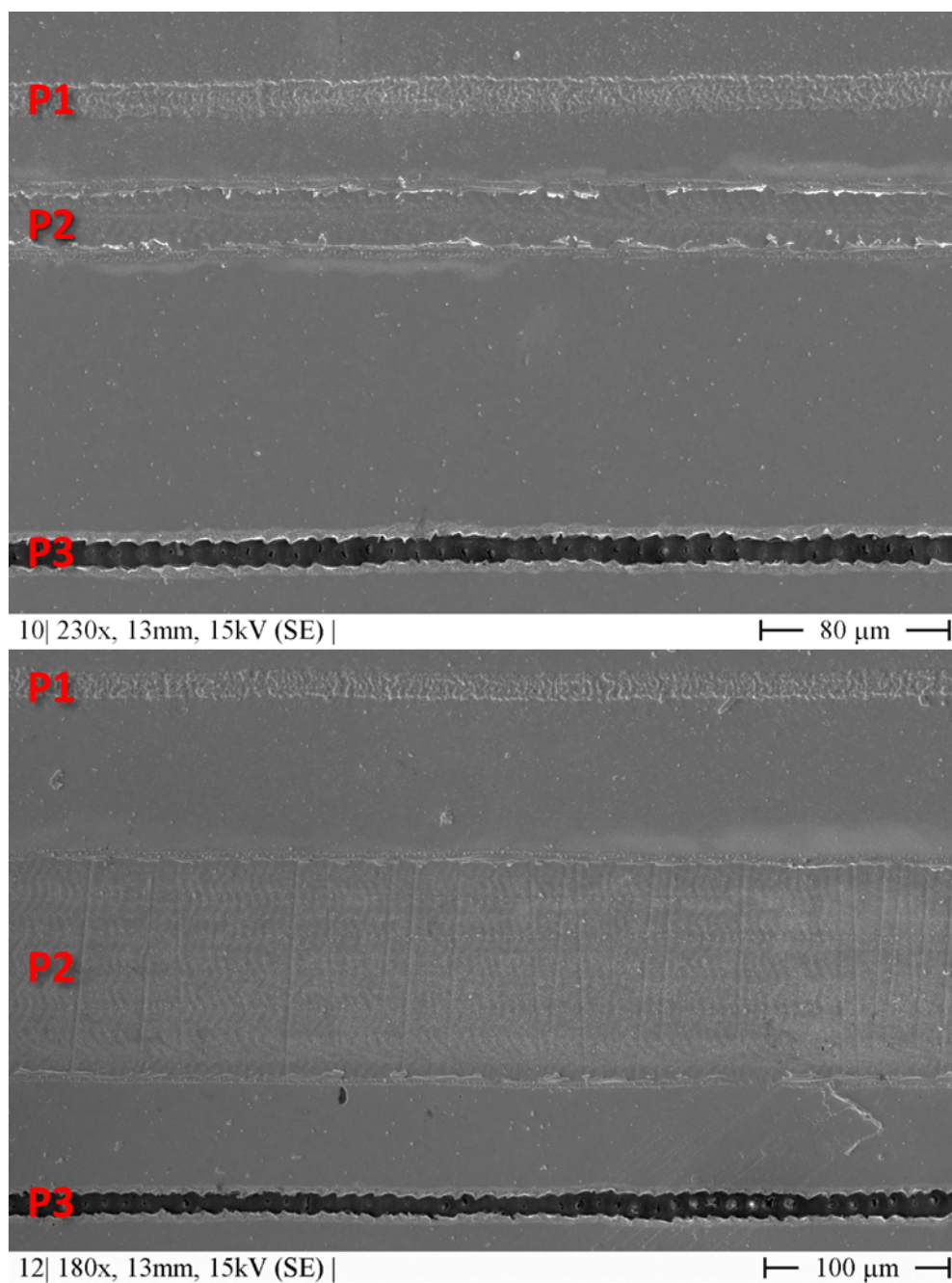
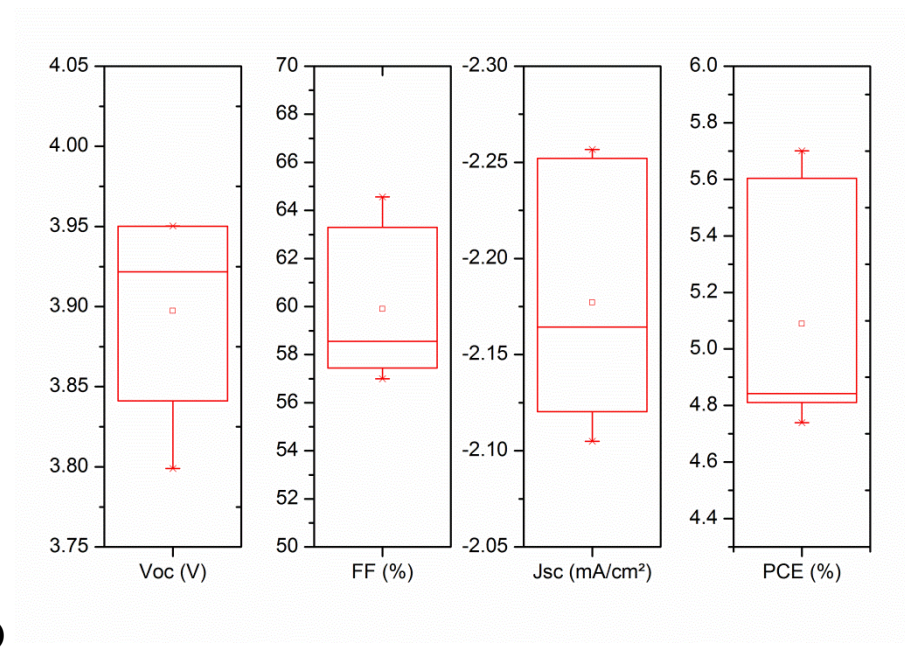
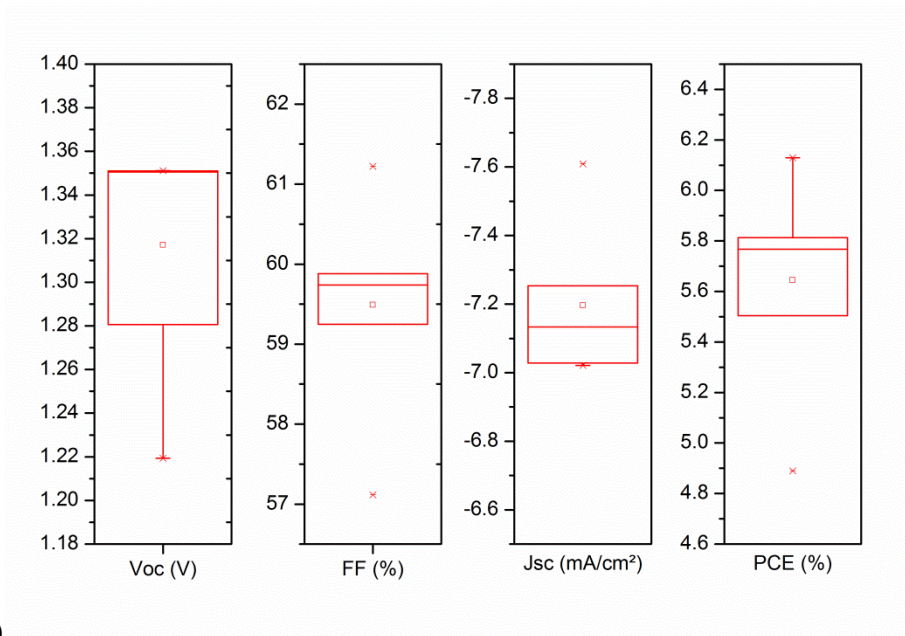
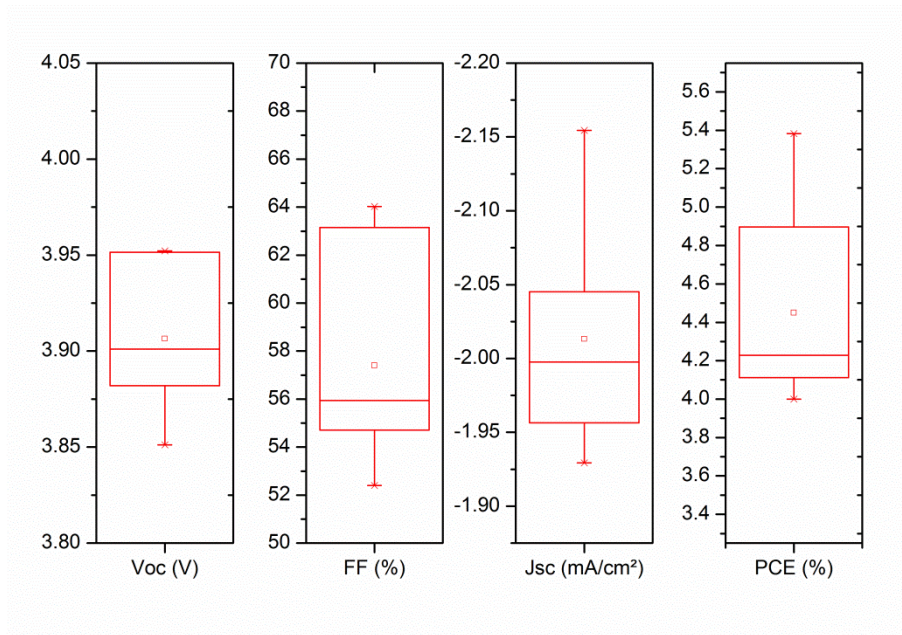


Figure S4. Top view SEM image comparison for the finished narrow P2 and wide P2 patterning.





(c)

Figure S5. Photovoltaic parameters distribution of 9 devices. a) Parameters distribution for reference tandem solar cells. b) Parameters distribution for narrow P2 line modules. c) Parameters distribution of wide P2 line modules