Electronic Supplementary Material (ESI) for Energy & Environmental Science.

Efficient planar heterojunction mixed-halide perovskite solar cells deposited via spray-deposition

Alex T. Barrows, Andrew J. Pearson, Chankyu Kwak, Alan D.F. Dunbar, Alastair R. Buckley and David G. Lidzey

Supporting Information

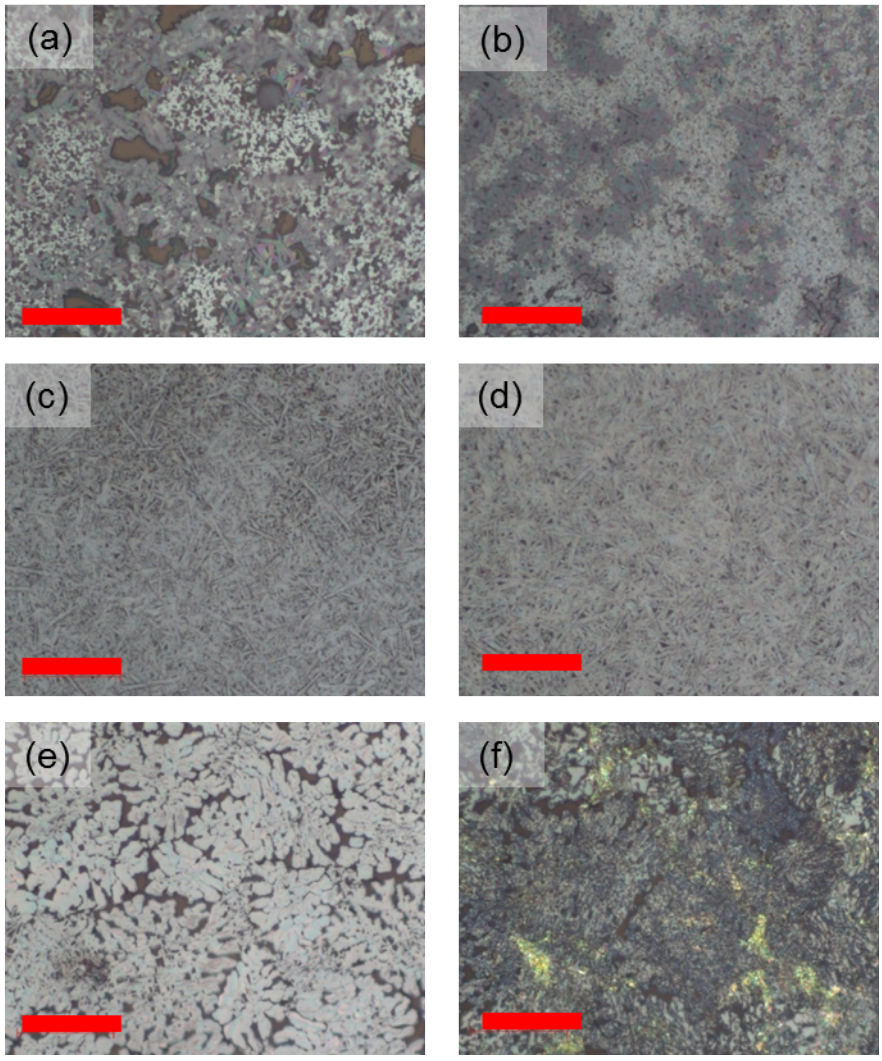

Figure S1: Optical microscopy images of spray-deposited thin-films of methylamine iodide and lead chloride cast from DMF onto substrates held at 90 °C and subsequently thermally annealed. (a) 70 °C / 90 minutes, (b) 90 °C / 30 minutes, (c) 90 °C / 60 minutes, (d) 90 °C / 90 minutes, (e) 110 °C / 30 minutes, (f) 130 °C / 60 minutes. The scale bar in each image corresponds to 20 μm.

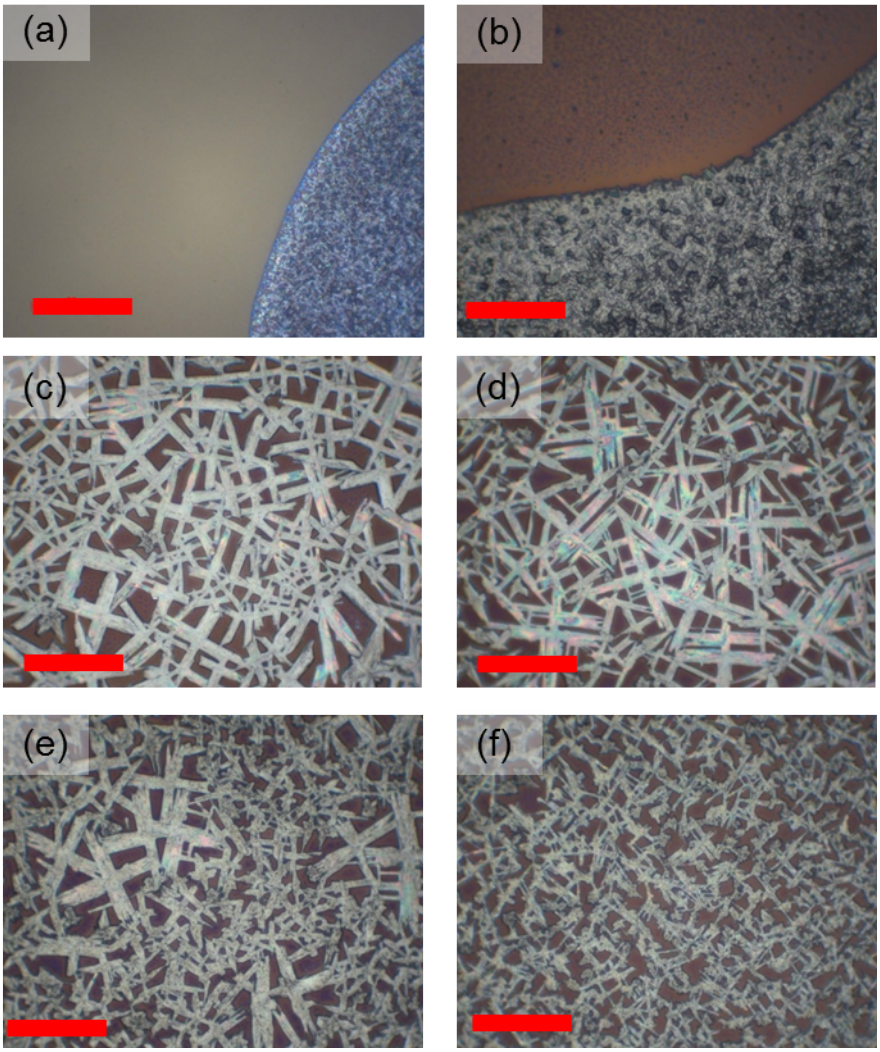

Figure S2: Optical microscopy images of spray-deposited thin-films of methylamine iodide and lead chloride cast from DMSO onto substrates held at a range of elevated temperatures. (a) 28 °C, (b) 38 °C, (c) 55 °C, d) 75 °C, e) 80 °C, f) 87 °C. All films were subsequently annealed at 90 °C for 90 minutes to crystallize the precursor film. The scale bar in each image corresponds to 20 µm.

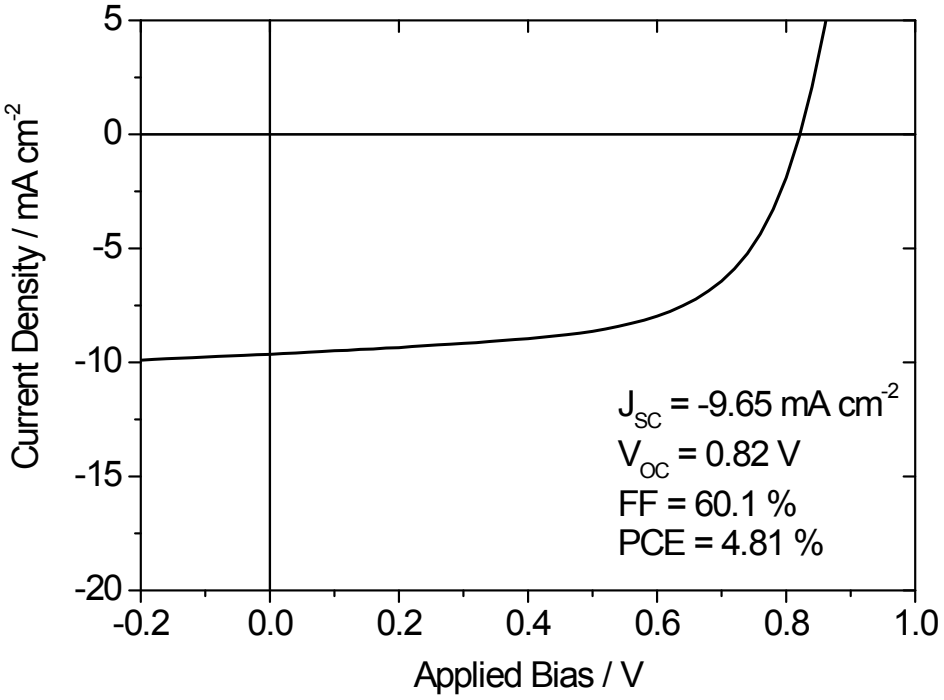

Figure S3: Current-density versus voltage characteristics for the champion spray-deposited $CH_3NH_3PbI_{3-x}Cl_x$ planar solar cell prepared using DMSO solvent.

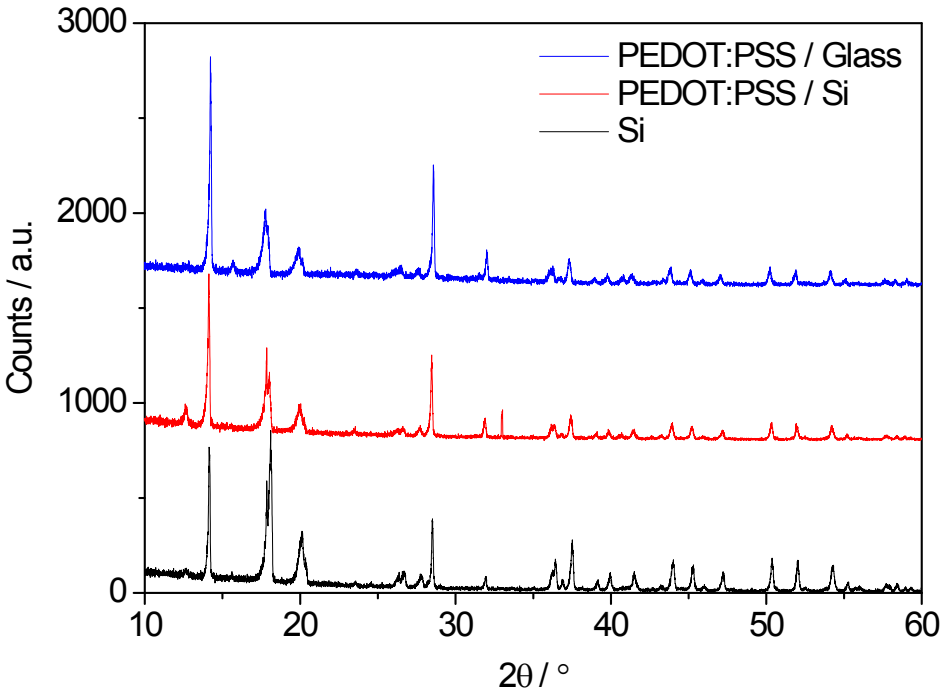

Figure S4: XRD spectra for $CH_3NH_3PbI_{3-x}Cl_x$ perovskite films deposited on different substrates. Data have been offset vertically for clarity.

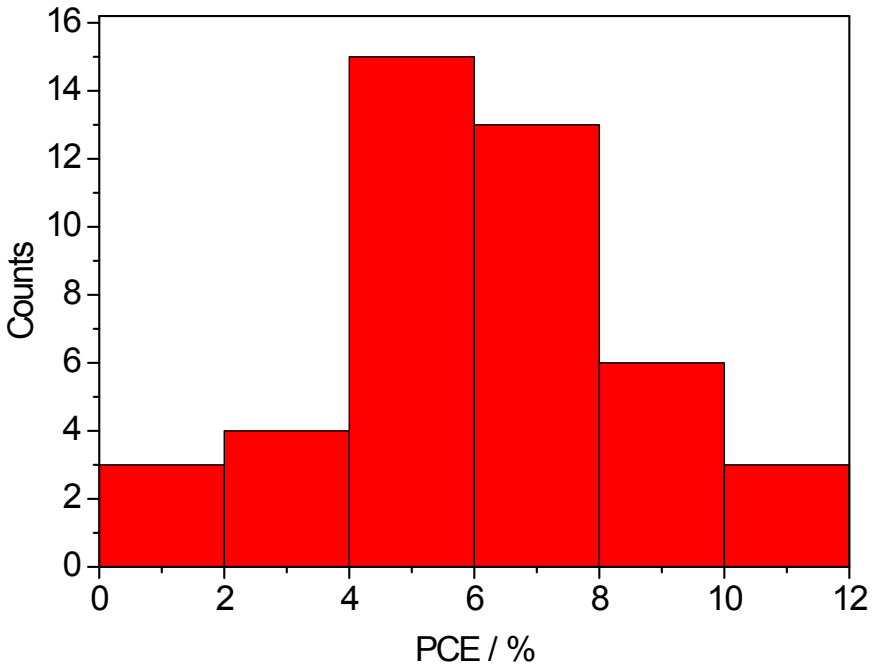

Figure S5: Distribution of device power conversion efficiencies for all solar cells within the optimised processing batch.

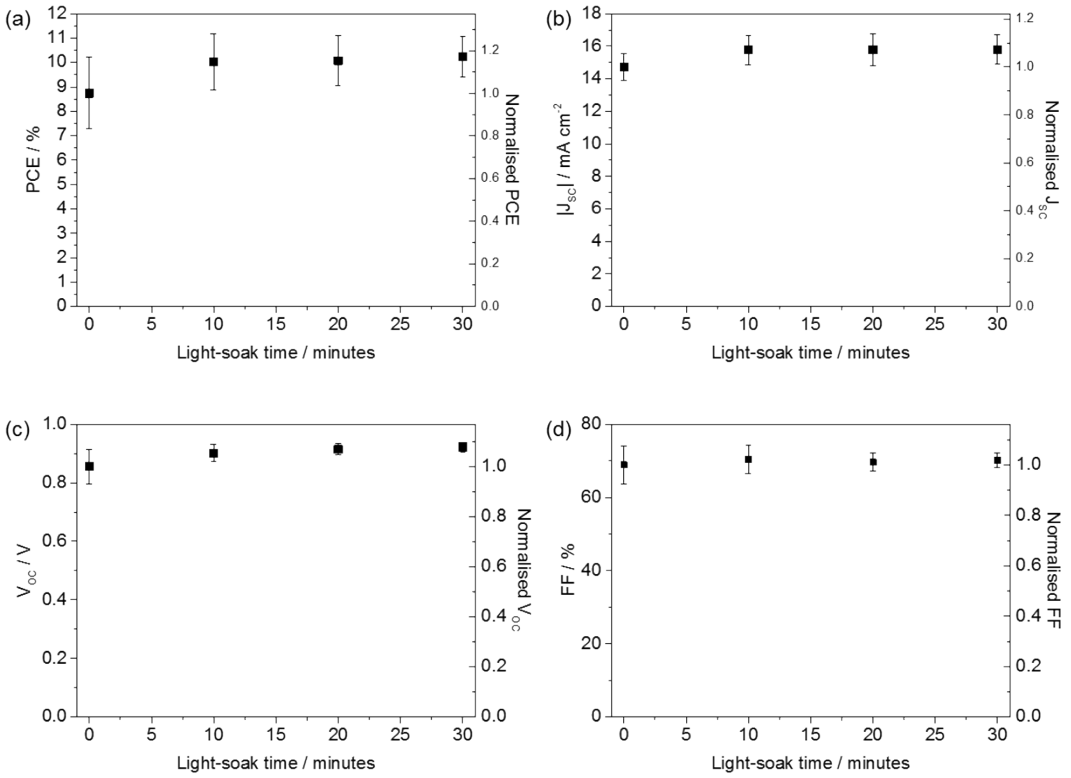

Figure S6: Evolution of device metrics during light-soaking of perovskite solar cells under simulated AM1.5G radiation. Data corresponds to the performance of the top 6 solar cells within the optimised processing batch and have been normalized (where applicable) to their initial values.

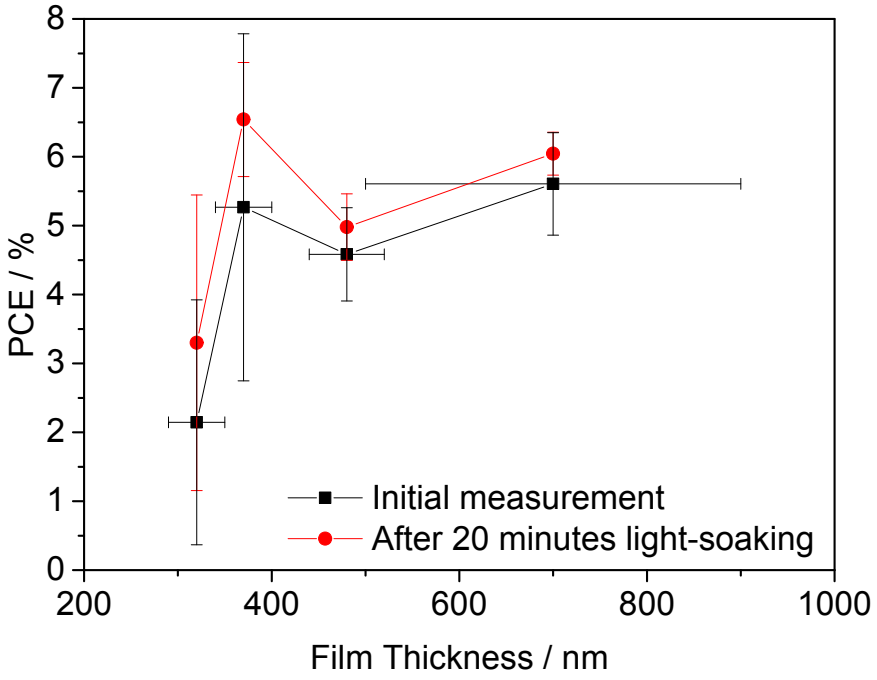

Figure S7: Impact of light-soaking on the PCE of perovskite solar cells having a range of active-layer thicknesses.