Fabrication of Perovskite PV devices using Ossila I201 Ink

Process summary

1. Substrate clean (in air)
Sonicate ITO substrates for 5 minutes in hot (~70°C) 1% Hellmanex (Ossila C141)
Dump-rinse substrates twice in boiling, deionised (DI) water
Sonicate for 5 mins in IPA
Dump-rinse twice in boiling DI water
Dry the substrates with a nitrogen gun
Bake the substrates on a hotplate at ~120˚C

2. PEDOT:PSS anode preparation (in air)
Filter AI 4083 PEDOT:PSS (Ossila M121) using a 0.45µm PVDF filter (Ossila C105)
Dispense 35 µl of the filtered PEDOT:PSS solution onto the heated ITO substrate spinning at 6000 rpm for 30s
Place substrate onto a hotplate at ~120°C
After all ITO substrates have been coated, transfer all to a nitrogen-filled glovebox and place onto a hotplate at 120°C for ~20-30 mins
Remove the substrates from the hotplate and allow to cool at room temperature

3. Perovskite deposition (in nitrogen glovebox)
Heat I201 perovskite ink for 2 hours at ~70°C and then cool to room temperature
Place the ITO coated substrate (at room temperature) onto the spin-coater and spin the substrate at 4000 rpm (for 30s)
Dynamically dispense 30µl of I201 ink
Place substrate back onto the hotplate (in the glovebox) at ~80°C.
Once all substrates have been coated, anneal for ~90 mins
After 90 mins, use a cleaning swab dipped in DMF solvent to wipe the cathode stripe clean
After cleaning, anneal for an addition 20-30 mins at 80°C to remove any residual DMF solvent. After this time, remove substrates from the hotplate and cool to room temperature.

4. $PC_{70}BM$ deposition (in nitrogen glovebox)
Prepare a solution of $PC_{70}BM$ (Ossila M113) at 50 mg / ml in chlorobenzene and stir for 3 to 5 hours
Place perovskite coated substrate onto the spin-coater and spin at 1000 rpm.
Dispense 20 µl of $PC_{70}BM$ solution onto the substrate (while spinning) and spin for a total time of 30s

5. Cathode deposition and encapsulation
Thermally evaporate a calcium/aluminium cathode (5 and 100 nm respectively) through a shadow-mask (Ossila E341)
Encapsulate devices using a glass coverslip (Ossila C181) and encapsulation epoxy (Ossila E131)
Expose to UV radiation (350 nm) for 30 mins to cure the epoxy

