Fabrication Guide

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Day 1

Cleaning

→ Fit 20 ITO covered glass cells into a plastic cell holder in a clean beaker – ensure ITO side is facing the same direction.
→ Cover with acetone and sonicate in ultrasonic bath for 5 minutes at 60˚C, max power (this is the standard set-up of the ultrasonic bath).
→ Pour acetone into non-halogenated waste storage and cover samples in 2% Helmanex solution.
→ Sonicate for 5 minutes in Helmanex. Dispose of Helmanex waste into water waste container.
→ Rinse samples with DI water until bubbles have stopped (3-5 rinses).
→ Cover samples with clean DI water and sonicate for 5 minutes – repeat 3 times.
→ Cover samples with acetone and sonicate for 5 minutes – repeat 2 times.
→ Rinse samples with Isopropanol (IPA) – dispose of waste in non-halogenated waste storage.
→ Cover samples with IPA and sonicate for 5 minutes.
→ Remove IPA and dry on a hot plate overnight at 60˚C.

Solution preparation

→ Zinc Oxide
- Weigh 219.5 mg of Zinc acetate dehydrate into a vial
- Add 2 ml of 2-methoxyethanol
- Add 60.4 µl of ethanolamine
- Add a stir bar and either:
  - **o** Stir for 1hr at 50-60˚C
  - **o** Stir overnight at room temperature –We will use this one

→ PCE-10: $PC_{71}BM$
- Waiting on instructions.

Day 2

Final cleaning

→ Place samples in Pyrex dish ITO side up
→ Plasma clean for 2 minutes and 30 seconds with 50% power on generator
- Instructions found above plasma cleaner

Deposition of ZnO layer (Filter 0.45 um PTFE)

→ Place sample ITO side up on spin coater and vacuum seal

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→ Spray with N_2 to remove any dirt
→ Drop cast 180 µl of ZnO solution

→ Set up spin coater to 4000 rpm, 40 s, 10000 acceleration
→ Anneal in air for 10 minutes at 150 ˚C
→ Cool on metal/pyrex for a short while before transfer to plastic petri dish

Deposition of PCE-10: $PC_{71}BM$ layer

Transfer samples to OPV glove box
→ Place sample on spin coater and vacuum seal
→ Spray with N_2 to remove any dirt
→ Drop cast 100-120 µl of solution onto the substrate and spread using pipette tip – ensure no bubbles in solution
→ Set up spin coater to 90 s, 800 rpm, 2000 acc
→ Anneal all samples overnight in glovebox environ – cover with cleanroom paper to prevent dust/dirt.

Day 3

Electrode evaporation:

Transfer samples across to evaporator side of glove box
Evaporation of MoO_3 and Ag electrodes:
→ Insert crucibles for MoO_3 and Ag
→ Input 1 level spoon of MoO_3 and 4-8 pellets of Ag
→ Insert samples into the top of the evaporator making sure that they are active layer down and all flat inside the mask
→ Turn on evaporator and pump down to 1 x 10^{-3} mbar
→ Turn on sigma at the back of the device
→ Hit the manual/auto button such that manual is above auto
→ Process menu – Process 6 (MoO_3) or process 13 (Ag) – click select which then becomes edit {may have changed number, check sheet next to evaporator}
→ On the Glovebox screen press layout – MoO_3 is at the back = shutter 2 and Ag is front right in position = shutter 1.
→ Check the program is correct by pressing quick edit on the sigma
→ Click start layer
→ Adjust power to obtain correct rate – this is found on the front of the glovebox for each material
→ Open shutter 2 on the glovebox screen
→ Once 10 nm of material has been evaporated, open substrate shutter and set layers to zero
→ Once desired thickness has been achieved, close substrate shutter and abort
→ Switch sigma device off and on again
→ Repeat process for Ag deposition
→ MoO_3 – 10 nm thick
→ Ag – deposit 130 nm of material, close substrate shutter when layer thickness reads 186 nm. (again, check device sheet for specifics)
→ Cool for 15-30mins then refill chamber and remove samples.

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