Printing polymer tandem solar modules

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At CSEM Muttenz, we aim to demonstrate the feasibility of printing tandem modules using low cost mass production compatible printing techniques to fabricate fully printed tandem OPV modules. In the current work we have focused on deposition of the charge injection layers, the photoactive layers and the recombination layer by additive doctor blade coating.

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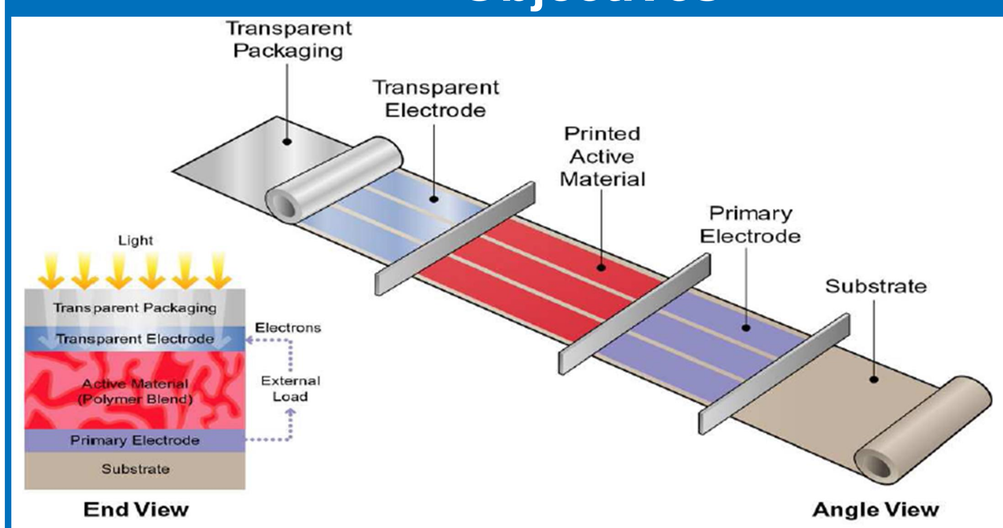
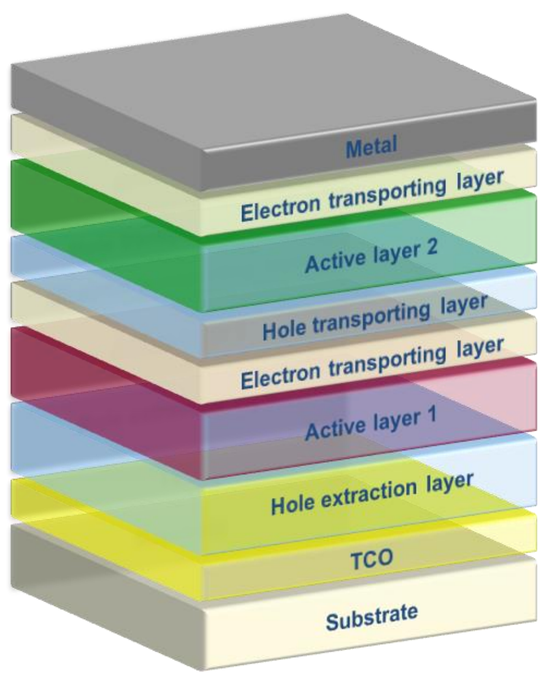
More details on the Sunflower project and partners can be found at the CSEM booth.

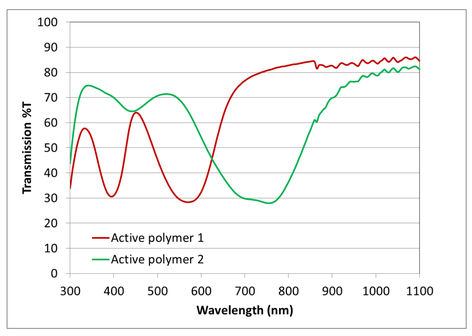
Objectives

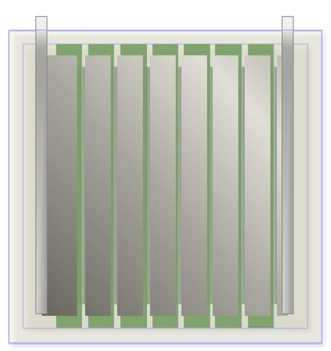


Aim: To address the challenges that arise as materials and processes are transferred from the small laboratory scale to a larger production scale for all the individual components that are needed to manufacture tandem OPV modules at a high efficiency and low cost.

Design of the tandem stack





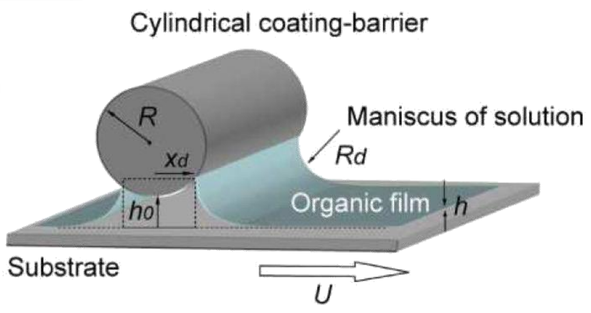


Fabrication methods

Using printing methods that are compatible to industrial, low cost, large scale production.

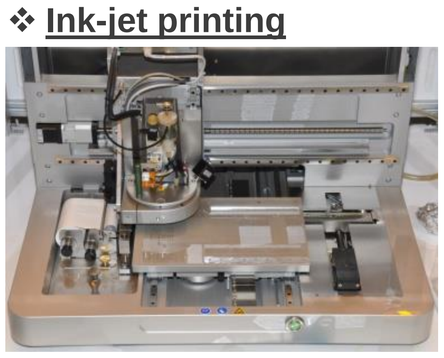
❖ **Method of choice: blade coating**

Doctor blade coater

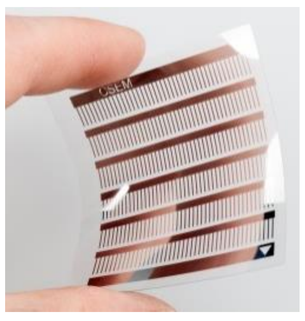


Blade coating principle

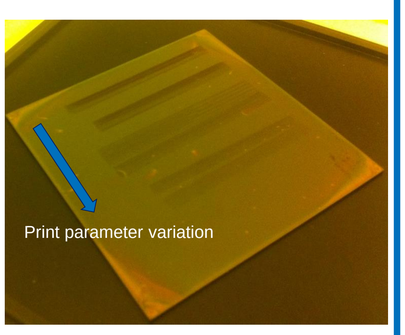
❖ **Ink-jet printing**



Pixdro multi nozzle ink-jet printer

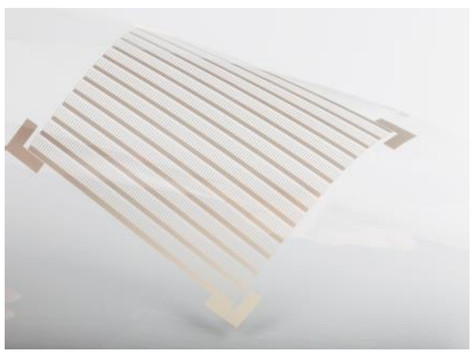


Bottom or top silver grid electrode



ZnO interlayer for tandem module

❖ **Screen printing & slot-die coating**

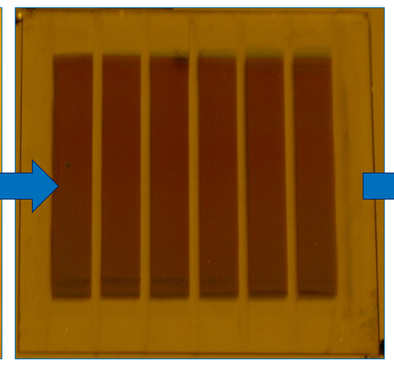


Screen printed silver grid top electrode

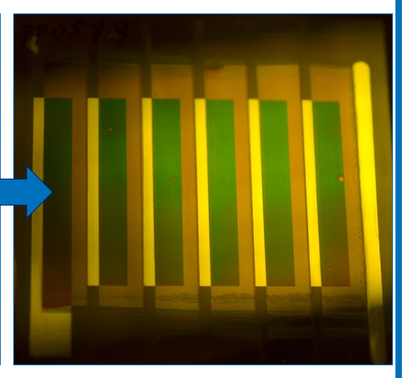
Sheet-to-sheet slot-die coating of organic layers

Fabrication & Result

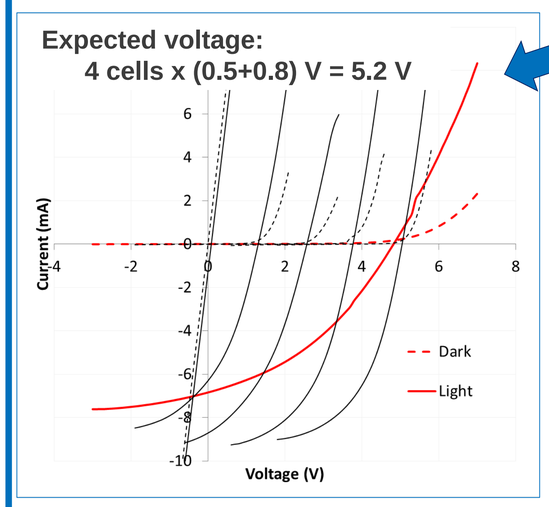
Step 1: Additive blade coating



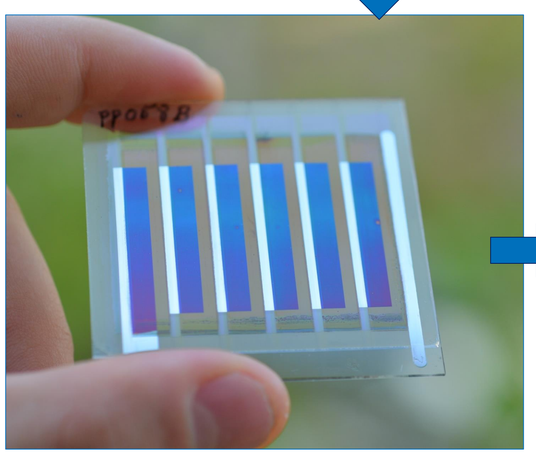
Step 2: Layer patterning



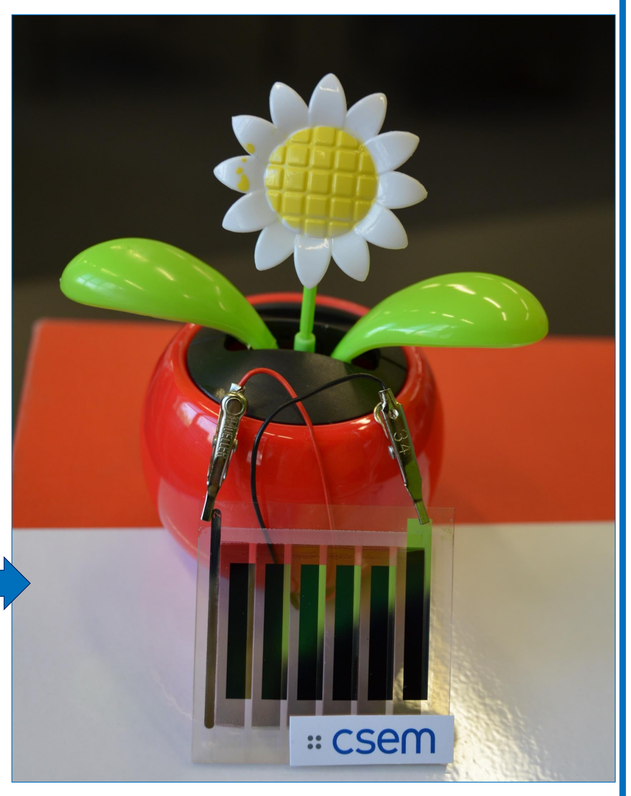
Step 3: Deposition of top electrode by thermal evaporation or screen printing



Step 4: JV- characterization



Step 5: Encapsulation



Step 6: Demonstration