**Area:** Perovskite solar cells

# HIGH PERFORMANCE PEROVSKITE MODULES FOR BUILDING INTEGRATED PHOTOVOLTAICS

Lucija Rakocevic[1,2], Robert Gehlhaar[1], Tamara Merckx[1], Weiming Qiu[1], Tom Aernouts[1], Henri Fledderus[4], Jef Poortmans[1,2,3]

[1] imec, TFPV group – partner in Solliance, Leuven, 3001, Belgium, [2]ESAT, KUL, Leuven, 3000, Belgium, [3]University of Hasselt, 3590 Diepenbeek, Belgium, [4]TNO – partner in Solliance, Eindhoven, 5613, Netherlands.

Research of organo-metallic halide perovskites solar cells is resulting in constant improvements in their performance and stability. However most of the current research focuses on small area cells. Our efforts target the upscaling of deposition techniques and the optimization of module designs for future applications. We process modules of aperture area sizes from 4 cm2 up to 156 cm2 with maximum power conversion efficiencies of over 16% and 12.4 % (certified maximum power point tracking) (Fig 1a). In our presentation, we define potential loss mechanisms due to upscaling from lab cell size to large area modules and present design rules for optimized power conversion.

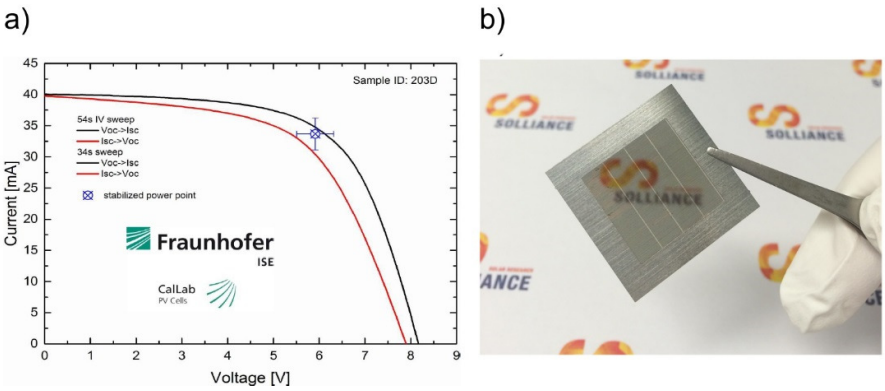


Figure 1. a) J-V scan of a certified 16 cm2 perovskite module demonstrating 12.4% power conversion efficiency under maximum power point tracking. b) Image of a 4 cm2 translucent perovskite module showing color-neutral transmission. The patterning of the active area is below the human eye resolution for most observer distances in applications.

The integration of solar cells into buildings requires cost-efficient devices combined with flexibility in transparency and color and freedom of size and shape. In the second part, we present a process to convert highly efficient perovskite modules into color-neutral semitransparent devices (Fig 2b). We outline the impact of the process on the power conversion efficiency. The final translucent modules consist of an alternation of opaque and transparent areas with a submillimeter pitch size. Due to the color-neutrality of the PV device, developers and architects have the freedom to select the color of the transmitted light by varying the tint of the substrate glass.

We finish our presentation with an outlook on backend interconnection processes. By decoupling the layer deposition from the interconnection fabrication a maximum flexibility in the design requested by the end-user can be achieved without increasing processing costs. This backend process gives the design flexibility that is necessary to pave the way for building integrated thin film photovoltaic modules. We are going to present perovskite modules using different backend process concepts demonstrating the potential and applicability of this fabrication sequence.