First semi-transparent perovskite modules

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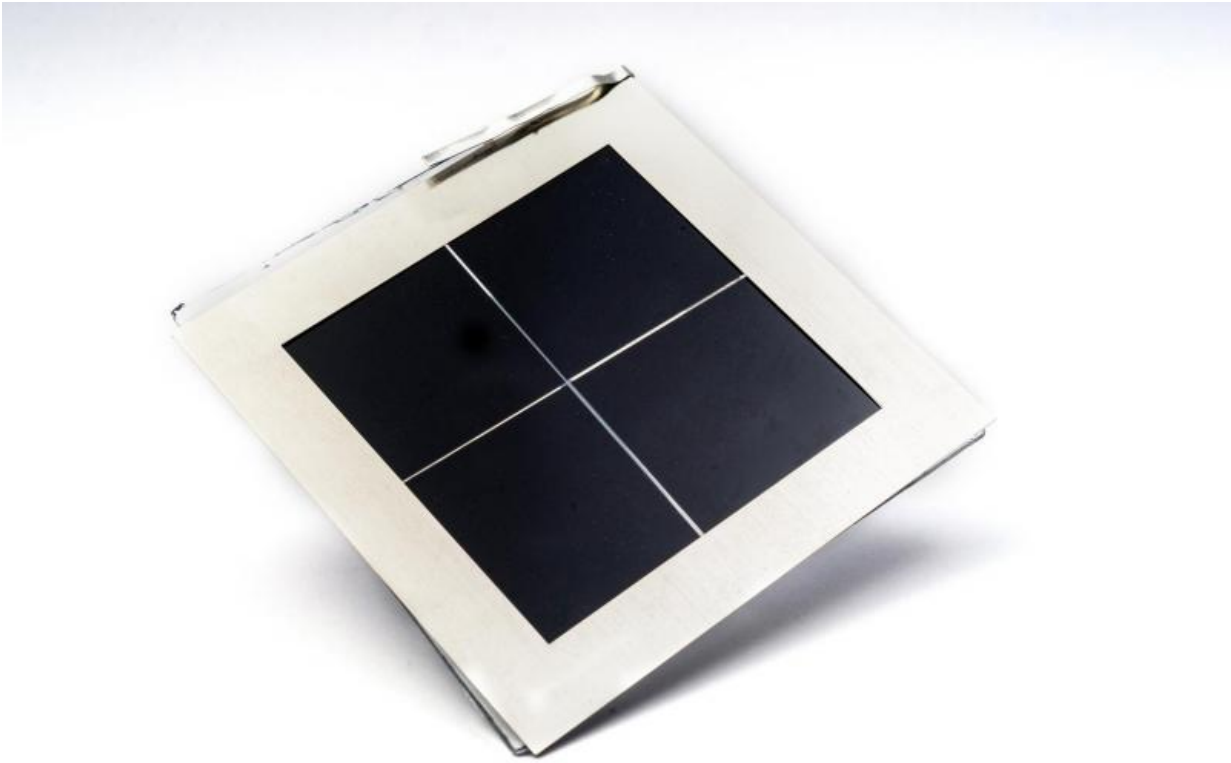

Nanoelectronics research center imec, partner in Solliance, presented today the first-ever semi-transparent perovskite PV-module, achieving power conversion efficiencies up to 12%. The technology enables for semi-transparent PV-windows which are a key towards Zero-Energy Buildings. Moreover, combining these semitransparent perovskite

modules with Si solar cells, an unprecedented 20.2% in power conversion efficiency for a perovskite/Si stacked solar module was achieved.

Stand-alone perovskite solar modules feature excellent power conversion efficiencies and can be manufactured with simple fabrication technologies, such as coating and printing. Perovskites can also be manipulated to be realized on flexible (plastic films or metal foils) as well as rigid (glass, metal) carriers. Optical and electrical properties of the perovskite solar cells can be varied by tuning the composition of the material components and thereby adjusting color and transparency. The semi-transparent perovskite modules of imec realized by scalable coating techniques showed efficiencies of 12% on sizes as large as 4 cm2 and 10 % on sizes as large as 16cm2, a world-best achievement in this domain.

The combination of perovskite solar modules on top of silicon solar modules bears the exciting potential of achieving power conversion efficiencies greater than 30 percent, thereby surpassing the efficiencies of the best single junction Si solar cells. Imec's novel stacked module concept features a highly transparent perovskite solar module stacked on top of interdigitated back contacted (IBC) silicon solar cells. All devices had the same area and the semi-transparent perovskite top module shows a 70 percent transmission of light towards the crystalline Si solar cell. An unprecedented power conversion efficiency of 20.2 percent was reached for the resulting stacked perovskite/Si solar module of relevant sizes of 4 cm2. Moreover, a power conversion efficiency of 17.2% was achieved for larger areas of up to 16cm2, employing a Si bottom solar module of 4 interconnected IBC cells, also representing a record result for this size.

Tom Aernouts, Thin Film PV Technology Manager at imec commented "We are proud about these results as they show we have excellent control over the performance as well as the upscaling capabilities of this technology. Our future work will continue in increasing module sizes

and optimizing the perovskite solar cell technology." Ulrich Paetzold, researcher at the Thin Film PV group at imec added: "With a mm-size perovskite solar cell stacked on our IBC solar cell even efficiency as high as 22% has been obtained. But advancement of the perovskite/Si stacked solar module technology relies on demonstrators of realistic sizes."

Provided by IMEC