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# TNO and TU/e develop thermal stable perovskite solar cell

**Eindhoven (Netherlands), 25 September 2018** – On September 27th, 2018, at the EU PVSEC conference, in Brussels, Belgium, Solliance Solar Research announces a major accomplishment in thermal stability of perovskite technology. The thermal stability was tested over a period of 3.000 hours. After this thermal stress test, the cell performance showed still 93% of the initial performance.

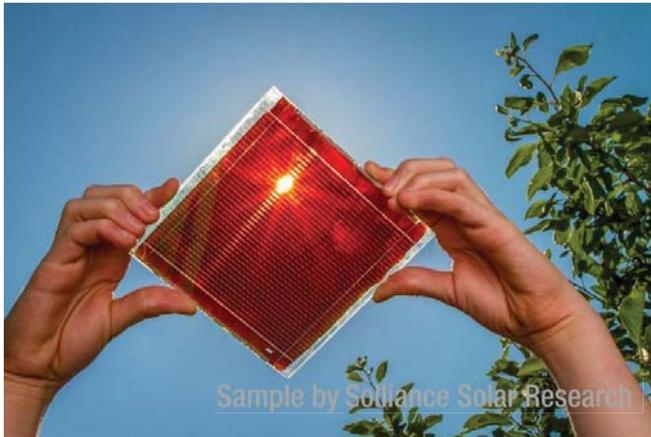
Mehrdad Najafi, researcher at Solliance Solar Research, who will present the work at the EU PVSEC, states: 'Perovskite solar cells have attracted great attention due to their high power conversion efficiency. Demonstrated stability and scale-ability, two very important topics within the Solliance collaboration, are the next steps towards successful commercialization of this technology. Our recent results show that it is possible to achieve stable perovskite solar cells upon prolonged exposure to thermal stress. After a further full-stack optimization and the introduction of a metal oxide layer by means of Atomic Layer Deposition (ALD), the thermal stability improved drastically compared with our previous reference: instead of losing over 50% of its performance after 100 hours at 85oC, we now demonstrate only 7% of performance loss after 3.000 hours at 85oC. This is an important stepping stone towards full IEC compliance.'

Adriana Creatore, Associate Professor at the Applied Physics department of the Eindhoven University of Technology (TU/e), partner in Solliance Solar Research, comments on this accomplishment, 'In the past 3 years we have been working with TNO towards the improvement in efficiency and stability of the hybrid perovskite PV technology. We are very happy to see that our fundamental research on interface engineering between atomic layer deposited (ALD) metal oxide-base charge transport layers and perovskite absorber, contributes to advancements in this extraordinary PV technology.'

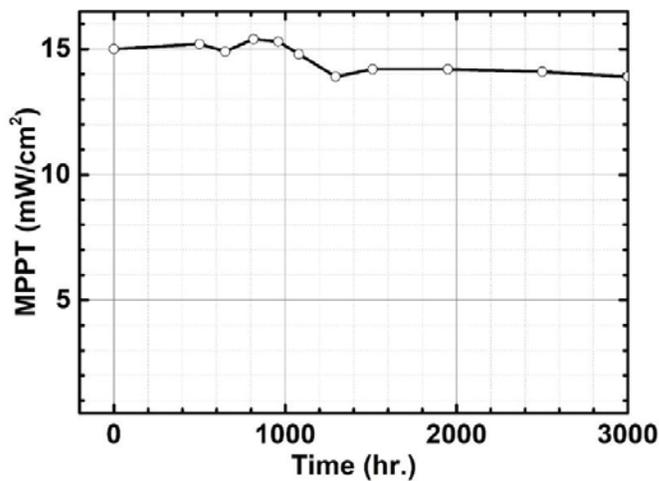
'Note that the perovskite solar cell used in this test, recalls the structure of the semi-transparent perovskite solar cell Solliance used for its 26.3% hybrid perovskite / crystalline silicon tandem solar cell which Solliance, ECN part of TNO and Choshu Industry Co, Ltd announced earlier this year together. Therefore, this stability accomplishment also adds weight to this hybrid tandem result. Since this small perovskite solar cell (0.09 cm<sup>2</sup>) combines good performance with good thermal stability, we are now working to apply pilot scale process equipment provided by our industrial partners to bring this perovskite solar cell to a viable industrial production process for perovskite solar modules,' adds Sjoerd Veenstra, program manager Perovskite Solar Cells at Solliance. 'Also, the expertise of industrial partners of Solliance Solar Research in sheet-to-sheet spatial ALD and laser interconnection of thin film cells is used to scale-up the technology to demonstration modules.'

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Example of a 6 inch semi-transparent perovskite module processed with scalable methods (sputter deposition, slot die deposition and spatial atomic layer deposition). Photo: nielsvanloon.com



Performance of the perovskite solar cell measured by determining its maximum power point (MPPT) during the accelerated lifetime test at 85°C.

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### About Solliance

Solliance is a partnership of R&D organizations from the Netherlands, Belgium and Germany working in thin film photovoltaic solar energy (TFPV). In order to strengthen the region's position as a world player in PV, Solliance

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is creating the required synergy by consolidating and coordinating the activities of 250 researchers in industry, at research institutes and universities.

Various state-of-the-art laboratories and pilot production lines are jointly used for dedicated research programs which are executed in close cooperation with the solar business community.

Solliance partners are: imec, TNO, Holst Centre, Forschungszentrum Jülich, University of Hasselt, University of Twente, Delft University of Technology and Eindhoven University of Technology.

Solliance offers participation in its research programs and opens up its lab facilities to new entrants, either from industry or in research. On the basis of clear Intellectual Property (IP) agreements, each industrial partner can participate in this research effort, or alternatively, hire equipment and experts to further develop its own technology.

### About TNO

TNO is an independent research organization of the Netherlands and connects people and knowledge to create innovations that boost the competitive strength of industry and the well-being of society in a sustainable way. This is our mission and it is what drives us, the over 3,200 professionals at TNO, in our work every day. We believe in the joint creation of economic and social value and we work in collaboration with partners and focus on nine domains:

- Buildings, Infrastructure & Maritime : 'Robust constructions, sustainable use'
- The Circular Economy and the Environment: 'Directing and accelerating sustainability'
- Defence, Safety and Security: 'We're putting our knowledge and technology to work for safety and security'
- Energy: 'Faster towards a sustainable energy supply'
- Healthy living: 'Focussing on participation, not on the disease'
- Industry: 'Innovating for employment, welfare and well-being'
- Information & Communication Technology: 'Interpreting and accelerating digital transformation'
- Strategic Analysis & Policy: 'Turning complex issues into concrete innovations'
- Traffic and Transport: 'Helping to create liveable, sustainable cities'
- Innovation with purpose is what TNO stands for. We develop knowledge not for its own sake, but for practical application.

### About TU/e

The Eindhoven University of Technology (TU/e) is a research university specializing in engineering science & technology. Our education, research and knowledge valorization contribute to:

- science for society: solving the major societal issues and boosting prosperity and welfare by focusing on the Strategic Areas of Energy, Health and Smart Mobility
- science for industry: the development of technological innovation in cooperation with industry
- science for science: progress in engineering sciences through excellence in key research cores and innovation in education

### About imec

Imec is the world-leading research and innovation hub in nano-electronics, energy and digital technologies. The combination of our widely acclaimed leadership in microchip technology and profound software and ICT expertise is what makes us unique. By leveraging our world-class infrastructure and local and global ecosystem of partners

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