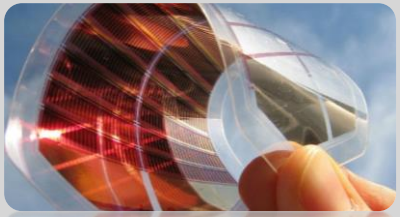
School of Engineering Seminar Series



Wednesday, 11 May 2022, 12:30-13:30

To attend the seminar, click here.

Maria Hadjipanayi

PV Lab

DegradationLab – Experiences and learning curves in outdoor monitoring of perovskite PV

Abstract

Since solar cells tend to degrade after a specific time of operation, characterization methods are more than necessary for the failure analysis of PV cells. New and emerging technologies such as perovskites and perovskite tandems, particularly demand advanced and systematic characterization work for understanding degradation mechanisms occurring therein and subsequently contributing to improvement of their properties which can lead to their commercialization. For this purpose, we have developed a dedicated laboratory and forged key collaborations for addressing performance degradation, stability issues, and long-term reliability in perovskites-based PV in a full top-down, holistic approach. In this seminar, we focus on one aspect of our work, namely the outdoor evaluation of such novel PV technologies.

It is widely accepted that the determining factor for any PV technology to 'succeed' in penetrating the solar PV market is 'proving' its long-term stability under real operating conditions. Market leaders such as crystalline silicon, a-Si, etc. have underwent (and still undergo) extensive, continuous, and systematic studies following international measurement standards to establish a good understanding of their long-term performance in the field. On the contrary, for emerging PV technologies until now there exists only limited experience in long-term field monitoring under real operating conditions (with a handful of laboratories globally focusing on outdoor perovskite studies) with no international standards yet in place for accurate and reliable test procedures for this technology.

Here we will present work performed on outdoor monitoring of perovskite-based mini-modules highlighting the overall difficulties in measuring and assessing the outdoor performance of such devices compared to monitoring more robust and stable PV technologies. Some of the challenges faced were the hysteretic I-V behavior, diurnal performance variation, and reversible degradation which make the development of perovskite-appropriate' test protocols quite challenging. Overall, the measurement campaigns outdoors yielded useful insights regarding outdoor lifetime assessment of perovskite modules and appropriate outdoor measurement tactics and test parameters for perovskite PV monitoring.

Biography

Dr. Hadjipanayi is a research scientist at the Photovoltaic Technology group in the Department of Electrical and Computer Engineering of the University of Cyprus since 2012. She is the principal investigator in an ongoing strategic infrastructure development project at the University of Cyprus (http://www.foss.ucy.ac.cy/degradationlab/) through which she was able to develop an advanced laboratory (the DegradationLab) for accurate characterization of new generation solar cells such as perovskites and tandems. Before her current appointment, she was an Associate Research Scientist at the Energy, Environment and Water Research Centre of the Cyprus Institute (2009-2012) and a Post-Doctoral Research Associate at the Department of Physics, University of Oxford (2006-2009). She holds a DPhil (PhD) in Condensed Matter Physics from the University of Oxford and a BSc in Physics from the University of Cyprus.

Dr. Hadjipanayi's research interests lie at the interface between fundamental and applied physics of novel materials and devices which are promising for future energy-efficient technological applications, especially in the field of solar energy. She is currently working on the investigation of perovskite-based PV in terms of performance, degradation mechanisms, and long-term stability in real conditions as well as on the development of accurate standardized and non-standardised testing protocols for new solar cell technologies.

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