The 13th Dvořák Lecture

by Professor **Marko Topič**

University of Ljubljana, Faculty of Electrical Engineering, LPVO; Slovenian Academy of Sciences and Arts

Photovoltaics at Terawatt Scale – Science, Engineering and Technology in Energy Transition

Tuesday, **June 13, 2023** at 10:00, Lecture hall, SOLID21 building

Institute of Physics of the Czech Academy of Sciences, *Na Slovance 2, 182 00 Praha 8, Czech Republic*

The lecture and the discussion will be in English only, the translation to Czech will not be provided.

The admission to the lecture is free, however it is necessary to reserve a seat using the registration form at: https://rezervace.fzu.cz

Annotation

At global and European scales, electricity is the cornerstone of decarbonized modern energy systems. Solar, hydro and wind rank among key renewable energy sources to deliver electricity in sufficient quantities, at affordable cost, in a sustainable manner and reduce energy dependency on fossil fuel imports. They offer a world with a 100% renewable electricity supply where electricity is accessible to all and where electricity makes major inroads into satisfying final energy demand for living, including communications, transport, efficient heating, and even synthetic fuels.

Solar Photovoltaics (PV) thus play a prominent role to achieve the EU's clean energy targets and climate change mitigation, as well as the global sustainability goals. Last year it exceeded one terawatt (1 TW = 1000 GW) of installed power globally and is entering the multi-terawatt era. Are we getting ready for the multi-TW scale PV and TW scale production per year?

We will review the ubiquitous availability of sunlight, the fascinating PV technology's modularity and the continuous cost reductions that path a way solar PV to become the largest source of electricity worldwide. Although with already proven economical and environmental competitiveness on its journey to become a major player in the clean energy system, it must successfully address further challenges in science, engineering and technology, topics broadly encompassed under themes of performance enhancement and cost reduction, manufacturing processes, quality and circularity, integration and double use along with public support and socio-economic transition.

The latest R&D activities in silicon and perovskite photovoltaics globally will be presented with a contribution from the Laboratory of Photovoltaics and Optoelectronics (LPVO), which is the largest PV research group in Slovenia. An interplay of the whole optimization loop, from modeling and optoelectronic analysis to fabrication and advanced characterization of high-efficiency perovskite solar cells (PSC), will be explained. We will shed light on the stability of PSC under real conditions, development of measuring systems for monitoring the stability of perovskite single-junction and tandem solar cells, optical optimization of perovskite-silicon tandem solar cells and energy yield analysis of single junction and tandem PSCs.

Marko Topič

Marko Topič has been a Full Professor and the head of the Laboratory of Photovoltaics and Optoelectronics since 2006 and the Chair of the Department of Electronics at the University of Ljubljana since 2017. In 2011 he became an Affiliate Professor at Colorado State University. He has co-authored more than 170 papers in peer-reviewed international journals with over 9000 citations, 3 patents and more than 250 papers in international conference proceedings, and has been a Principal Investigator in many national, bilateral and European projects.

His research interest focuses on photovoltaics, but also includes thin-film semiconductor materials, electron devices, optoelectronics, electronic circuits, and reliability engineering. From 2014 till 2022, Prof. Topič acted as the Chairman of the European Technology and Innovation Platform Photovoltaics.

He was a recipient of the research fellowship from the Alexander von Humboldt Foundation in 2000 and the Zoisova Nagrada (the highest Award in the Republic of Slovenia for Scientific and Research Achievements) in 2008. He is a Fellow of the Slovenian Academy of Engineering and Slovenian Academy of Sciences and Arts as well as an Associate Member of the International Academy of Engineering. In 2022 he was announced as the winner of the Alexander Edmond Becquerel Prize for his outstanding contributions to the field of photovoltaics.

Vladimír Dvořák

(1934–2007)

Vladimír Dvořák was a solid state physicist and the most prominent Czech scientist in the theory of ferroelectricity and structural phase transitions. He was affiliated with the Institute of Physics of the Czech Academy of Sciences in Prague for the whole productive life. He served as its director in 1993–2001 and was the main protagonist of the revolutionary reforms of the Institute after 1989. He was a member of the Learned Society of the Czech Republic since 1995. His personality has strongly influenced the scientific program and development in the Department of Dielectrics of the Institute since the late sixties up to the present. He was a brilliant lecturer and is considered as one of the most respected directors of the Institute.

To commemorate his work and personality, the Institute Physics of the Czech Academy of Sciences decided to organize an annual festive Dvořák lecture, given by prominent internationally renowned scientists in the field related to the research pursued at the Institute.

FZU Institute of Physics of the Czech Academy of Sciences