Emerging Solar PV: Designing a Self-Powered Outdoor Testing Platform

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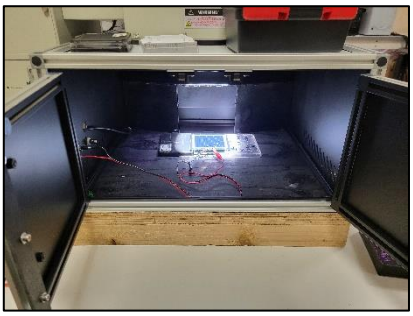
In recent years, a growing interest in emerging photovoltaic solutions, such as organic (OSC) or perovskite (PSC) solar cells has emerged based on several successful breakthroughs on top of their distinctive advantages: light weight, printability, semi-transparency, low environmental impact and the use of non-strategic materials. These emerging solar technologies have recently reached impressive power conversion efficiencies (lab cell certified record efficiencies of 19.2% for OSC and 27.1% for PSC [1]). However, their industrial transfer is still facing important challenges mainly due to the poor stability of the active layer [2]. Our project consists in designing and building an outdoor platform in Bordeaux where various solar modules will be characterized in real time, under relatively harsh conditions all year long, from the well-known hot and sunny days to hail episodes among the rainy and oceanic climate. A variety of solar panels (from mature c-Si and III-V to emerging perovskite and organic modules), together with numerous environmental sensors have been implemented on the platform to be monitored over time and compared with each other. Besides the power conversion efficiency (PCE) consideration we will focus on the energy yield of each technology in order to gain a broader sense of production capabilities the device can deliver under real solar illumination [3]. The various samples are provided by international industrial and academic partners from all over the world. In this communication we will share the development of our platform as well as preliminary results from a twin testing campaign of organic and perovskite modules during autumn season in Bordeaux and Paris.



[1] NREL Best Research-Cell PV Efficiency Chart
[2] Eva M. Herzig, Feng Gao, Jonas Bergqvist, Maria A. Loi, Sebastian B. Meier. Harmonizing organic photovoltaics research and development among academia and industry, Joule, Volume 8, Issue 8, 2024, 2171-2178. https://doi.org/10.1016/j.joule.2024.07.015.
[3] Sarmad Feroze, Andreas Distler, Karen Forberich, Iftikhar Ahmed Channa, Bernd Doll, Christoph J. Brabec, Hans-Joachim Egelhaaf. Comparative analysis of outdoor energy harvest of organic and silicon solar modules for applications in BIPV systems, Solar Energy, Volume 263, 2023, 111894. https://doi.org/10.1016/j.solener.2023.111894.