

HIPER XL

High-Efficiency Si PERovskite Tandem Solar Cells eXtra Large

Project duration: from 02.2021 to 02.2023

Report submitted: 08.2022

Publishable Summary

The IEA has reported in its “Renewables 2019” report that a solar PV capacity growth of 700-880 GW is expected until 2024. Current Si PV technology has a mainstream efficiency of ~22%, which would increase up to an economically feasible efficiency of 24-25%. A proven method to improve the power output is to create tandem devices. In this context, perovskite/c-Si tandem technology can make an impact: the high-power output, results in a lower footprint for PV systems, and offers a route to lower the levelized cost of electricity.

Within HIPER XL, the consortium will demonstrate environmentally benign, stable, efficient and cost effective, four terminal (4T) bifacial hybrid tandem solar cells with unprecedented power output, manufactured with scalable process routes. The concept of bifacial perovskite/c-Si tandem modules was published for the first time by HIPER XL consortium members in April 2020. Our preliminary investigations resulted in a device with a power output of 30.5 mW/cm² for lab-scale cells under BiFi200 conditions.

By building on our joint background the consortium will deliver in 24 months, four terminal bifacial hybrid tandem cells with a power output of 32 mW/cm² on 3x3 cm² area substrates, an analogous 6x6 inch² device delivering 28 mW/cm² under BiFi200 conditions and a demonstrator on 35 x 35 cm². We aim to pass damp-heat light soaking tests for 3000 hours, and thermal cycle between -40 °C to 85 °C for 200 cycles, with at least 90% of the initial power output. The stability and annual yield of these modules will be investigated in outdoor tests in two different climate zones (Turkey and The Netherlands). HIPER XL conducts an ecological footprint study (with a focus on the perovskite elements) and a cost assessment survey to evaluate the potential to further reduce the levelized cost of solar electricity.

Project consortium

Coordinator and all contact details:

Full name of organisation	Nederlandse Organisatie voor Toegepast Natuurwetenschappelijk onderzoek
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Participating countries and financing:

Country	Number of organisations involved	Project costs in EUR	Public funding in EUR
The Netherlands	2	527 793	359 000
Spain	1	86 000	79 500
Turkey	2	113 520	92 815
United Kingdom	1	25 000	-
<i>Total</i>	6	752 313	531 315

Funding agencies involved and contracts

Funding Agency	Contract N° and Title
RVO / TKI toeslag	1921292
Tubitak	Contract No: 120N519 (220N050) Contract Title: 1071-Uluslararası Araştırma Fonlarından Yararlanma Kapasitesinin ve Uluslararası Ar-Ge İşbirliklerine Katılımın Arttırılmasına Yönelik Destek Programı Proje Destekleme Sözleşmesi
AEI	PCI2020-112084