

THESEUS

Tandem High Efficiency Solar Cells Utilizing III-V Semiconductors on Silicon

Project Duration: 06.2015 to 11.2017.

Initial report submitted: 12.2015

Summary

This proposal seeks to develop novel, very high efficiency tandem flat plate solar cells utilising III-V semiconductors grown onto Silicon substrates, using advanced epitaxial techniques to grow SiGe and SiGeSn structures, and to integrate them into high efficiency modules and test them on sun. As such, this work meets the scope as set out in the SOLAR-ERA.NET Transnational Call PV2.4 'High-efficiency PV modules based on next generation c-Si solar cells'. By utilising tandem solar cell architectures that better match the device bandgaps to the solar spectrum it is possible to significantly enhance the efficiencies compared with conventional c-Si devices. The intention is to develop these high efficiency cells to demonstrate cell conversion efficiencies well in excess of 25%. This aim will be achieved by the combination of the extensive expertise of IQE in the field of SiGe and III-V epitaxy and the solid background of UPM in the areas of multijunction solar cell design and manufacturing. In this respect, novel epitaxial wafers of InGaAsP/SiGe(Sn) on Si solar cells grown by IQE, will be processed into solar cells at UPM facilities to be eventually incorporated into prototype modules, assembled by DHV, which will be tested on-sun by UPM in Madrid. It is anticipated that the module efficiencies utilising these novel cell architectures will be well in excess of 22%, making them significantly ahead of the current state of the art. Finally, acceleration ageing test by using climatic chambers will be carried out on these novel solar cells.

Project consortium

Coordinator and all contact details:

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Participating countries and financing:

Country	Number of organisations involved	Project costs in EUR	Public funding in EUR
United Kingdom	1	497'000	248'500
Spain	2	175'000	25'000
<i>Total</i>	3	672'000	273'500

Funding agencies involved and contracts

Funding Agency	Contract N° and Title
Innovate UK	620114 THESEUS
Ministerio de Economía Y Competitividad (Spanish Ministry of Economy and Competitiveness)	PCIN-2014-009-C02-01
Ministerio de Economía Y Competitividad (Spanish Ministry of Economy and Competitiveness)	PCIN-2014-009-C02-02