

## HESTPV

### High-Efficiency and Stable Tin-Based Perovskite Solar Cells

*Project Duration: 01.2016 to 07.2019*

*Initial report submitted: 02.2018*

#### Summary

The emerging solar cells based on hybrid organic-inorganic perovskites (HOIPs), specifically Pb halides as light harvesters, have stunned the photovoltaic community and captured intense attention of the academia and industry in renewable energy. The power conversion efficiency (PCE) of the best, small lab-scale perovskite solar cells exceed now 20%, a feat never achieved for other solution-processed materials before and suggests that HOIP-based cells may become comparable to crystalline solar cells in performance. However, the present reliance on Pb as a key element in the HOIP militates against the adoption of such products in consumer or building integrated applications. A key challenge for commercialization of HOIP solar cells is to replace the Pb with a less toxic metal, such as the chemically similar tin (Sn), with which reasonably efficient cells have been reported, or germanium (Ge). Completely lead-free Sn HOIP solar cells were reported. Unfortunately, the device efficiency is significantly less than that of lead-containing perovskites and the devices are very prone to oxidation, as (Sn(II) to Sn (IV) is more facile than the corresponding Pb process. Learning how to develop high performance and stable Sn-based perovskite solar cells is thus an important path forward for widespread applications of HOIP solar cells.

By introducing new material design concepts, novel deposition techniques and optimal device structures, this project aims to improve the efficiency and stability of Sn-based perovskite solar cells and thus to help push this novel photovoltaic technology into the marketplace.

## Project consortium

Coordinator and contact details:

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Participating countries and financing:

Country	Number of organisations involved	Project costs in EUR	Public funding in EUR
Spain	1	261'032	229'709
Sweden	2	605'180	402'419
Israel	1	300'000	120'000
Switzerland	1	371'000	148'400
<i>Total</i>		<i>1'537'212</i>	<i>900'528</i>

## Funding agencies involved and contracts

Funding Agency	Contract N° and Title
Ministerio de Economía y competitividad	PCIN-2015-255 Celdas solares estables y de alta eficiencia basadas en perovskitas de estaño
Swedish Energy Council (Energimyndigheten)	P42046-1 Effektiva och stabila tennbaserade perovskitsolceller
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Ministry of Energy	215-11-044 High-Efficiency and Stable Tin-Based Perovskite Solar Cells
Swiss Federal Office of Energy	SI/501417-01 Scalable High-throughput Characterization Platform for High-Efficiency and Stable Tin-Based Perovskite Solar Cells