

158 HESTPV: High-Efficiency and Stable Tin-Based Perovskite Solar Cells

Project duration: from 01.2016 to 07.2019

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Publishable Summary

The power conversion efficiency (PCE) of the best, small lab-scale perovskite solar cells exceeds now 24%. A key challenge for commercialization of Hybrid Organic Inorganic Perovskites (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). HESTPV aims to develop such Pb free or Pb poor perovskites and integrate them into solar cells. Hence, the primary objective of HESTPV is to identify the prospect of lead free, tin based perovskite based solar cells and to develop efficient and stable solar cells with more benign components.

Secondary objectives are the following:

- Improve perovskite charge extracting interfaces.
- Identify fundamental processes limiting performance.
- Develop a lifetime testing system for commercial cell evaluation.

Main results

- Pure tin and mixed tin-lead perovskite based solar cells were developed reaching power conversion efficiency as high as 14 %.
- The role of SnF₂ in the preparation of these cells has been identified.
- Alternative tin and lead-free “double” perovskite materials were prepared and integrated into solar cells providing more than 1 % efficiency.
- Charge-extracting materials for perovskite solar cells were identified and their relation with the device stability was established.
- The link between time-resolved optical characterization and the, for devices important, electrical charge carrier diffusion length was clarified.
- A novel measurement platform for lifetime evaluation of perovskite solar cells was developed.

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
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>	6	<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
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