

MasterPV

Innovative manufacturing solutions for cost-efficient semitransparent BIPV

Project duration: from 09.2018 to 07.2021

Report submitted: 05.2020

Publishable Summary

MasterPV addresses the **development of innovative transparent back contacts in Cu (In,Ga)Se₂ (CIGS) solar cells for cost efficient semi-transparent modules**. CIGS semi-transparent modules can be achieved with transparency levels up to 30%-40% by selectively removal of part of the absorbers in the devices. However, the optical quality of state of the art devices is strongly compromised by the presence of a Mo back contact that is currently used in the CIGS device architecture.

The project involves the **replacement of the Mo back contact in the traditional CIGS device architecture by chemical vacuum-free based TCO (Transparent Conductive Oxide) electrodes**. This will allow achieving a significant improvement in the aesthetic quality of the semi-transparent devices, with the elimination of the back mirror effect that is determined by the remaining Mo regions in the semi-transparent modules. Use of chemical based processes for the fabrication of the back contacts will also allow to a reduction of the manufacturing costs, because of the replacement of the expensive vacuum-based Mo sputtering deposition processes by lower cost approaches that are based in vacuum-free chemical processes.

The main scientific challenge of the project is related to the development of optimal transparent contacts allowing for solar cell efficiencies comparable to the high efficiency values that have already been achieved in CIGS technologies with the standard Mo based back contacts. This will imply a special effort in the optimization of TCO based contacts suitable for high efficiency devices, which will be based in the development of surface contact configurations including nanometric transition metal oxides (TMO) that have already been demonstrated as efficient hole transport layers in organic based technologies. The main technological challenge is related to the implementation of low cost vacuum-free processes for the growth of the optimal transparent back contact configurations and to the adaptation of these processes for the fabrication of efficient semi-transparent CIGS modules. At commercial level, the improvement of the aesthetic quality of the semi-transparent modules and the decrease of their cost will contribute to the consolidation of CIGS as one of the main commercial technologies able to answer to the increasing demand of cost-efficient and reliable semi-transparent products in the BIPV market. This will allow the development of semi-transparent modules with higher optical quality and combining the high efficiency and high stability characteristic of CIGS 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
Spain	2	394'172	290'836
Germany	1	217'598	217'598
<i>Total</i>	3	611'770	508'434

Funding agencies involved and contracts

Funding Agency	Contract N° and Title
Agencia Estatal de Investigación	PCI2018-092945, Innovative manufacturing solutions for cost-efficient semitransparent BIPV
CDTI	EXP-00108913/SERA-20181028
BMW/PTJ	0324230