

PEROSOLAR

Development of Efficient, Stable and Pb-Free Perovskite Solar Modules

Project duration: from 04.2021 to 04.2024

Report submitted: 02.2023

Publishable Summary

The purpose of this project is to develop highly efficient, stable and ultimately lead (Pb)-free perovskite solar cells (PSCs) and upscaling the production technology with solution based low cost methods.

A computational screening study will be carried out to replace Pb-based perovskite materials with double perovskites (DPs) including Sn and Ge in the general form of $ABSn_yGe_{1-y}X_6$. Novel triarylamine based organic hole transport materials (HTMs) will be synthesized and ZnO based electron transport layer (ETL) will be improved. HTMs shall be synthesized by easier production methods, and their optical and electrical properties will be more stable as compared to Spiro-OMeTAD. In addition, ZnO:PEI (polyethyleneimine) blends will be applied as an electron transport material (ETM). By this way, the thin film quality, electron transport capability and the hole blocking ability of the layer will be increased. Thus, these materials will enhance both device efficiency and stability of the perovskite devices.

While lab-scale experiments are being optimized for Pb-free perovskites, mixed Pb-Sn perovskites will be utilized for developing low cost solution processing methods; printing and slot-die coating for the cell fabrication. After optimization of the printed lab-scale devices, they will be up-scaled for flexible substrates using roll-to-roll (R2R) systems. The efficiency and lifetime targets of the flexible modules are 15% and 10000 hours, respectively. Accelerated stability tests of encapsulated PSCs will be performed under monitored and controlled environmental conditions, following ISOS standards, to qualify the layer stack and sealing technology for the upscaling step.

Project consortium

Coordinator and all contact details:

Full name of organisation	TUBITAK MARMARA RESEARCH CENTER
First and family name of coordinator:	Emine Tekin
Full address:	TUBITAK MAM; Baris Mh. Dr. Zeki Acar Cad. 41470 Kocaeli / Gebze, Turkey
E-mail:	emine.tekin@tubitak.gov.tr

Participating countries and financing:

Country	Number of organisations involved	Project costs in EUR	Public funding in EUR
Turkey	3	368 677	368 677
Greece	2	216 770	199 600
<i>Total</i>	5	585 447	568 277

Funding agencies involved and contracts

Funding Agency	Contract N° and Title
TUBITAK	120N520 120N515
GSRT	5168514 - [T12EPA5-00074]