SPRINTCELL
Sulfide-based Ink for Printable Earth-Abundant Solar Cell

Project duration: from 04.2016 to 03.2019
Final report submitted: 06.2019

Summary

The thin film photovoltaic (TFPV) industry is currently facing two critical challenges for its long-term expansion. One of the challenges is to increase the production capacity and the other concerns the use of abundant raw materials for sustainable TFPV production. TFPV production still operates far below the silicon photovoltaics production capacity level of 2.5-3.5 GWp/year, which gives rise to more expensive TFPV modules. One of the causes is that the production rate and scale of state-of-the-art, vacuum-processed thin films remain limited. Efforts to expand the vacuum-based TFPV fabrication facilities to larger area deposition systems require huge capital investment and maintenance costs. Another critical issue for the TFPV industry concerns the sustainable raw material supply when a terawatt-scale TFPV deployment is projected. Both established TFPV technology of CIGS and CdTe are believed will meet their yearly production limits due to the scarcity of critical In, Ga and Te elements.

In order to reduce investment and maintenance costs, non-vacuum, solution-based processing has attracted particular attention as a new thin film deposition technology for TFPV. It is an industrially relevant technology that is capable of high throughput film deposition over large areas, and is compatible with roll-to-roll (R2R) TFPV production. Meanwhile, photovoltaic materials containing more earth abundant elements have been regarded as the solution for sustainable, terawatt-scale TFPV production. One of the emerging abundant photovoltaic materials is the Cu2ZnSnS4 (CZTS) compound absorber (mineral name: kesterite) which contains abundant elements of Cu, Zn, Sn and S, both in terms of natural reserve and annual ore production. The use of CZTS as a photovoltaic material for envisioned large-scale TFPV deployment secures the long term production, being a perfect alternative for currently used CIGS and CdTe photovoltaic materials.

SPRINTCELL proposes an innovative TFPV fabrication route, which offers lower manufacturing costs as well as the use of earth abundant photovoltaic materials, through a combination of selected technologies for large-scale commercial powder synthesis, advanced powder milling, novel solar ink formulation as well as solution-based and non-vacuum film processing. SPRINTCELL has the primary objective to demonstrate an industry-oriented TFPV fabrication route, based on the development of the sulfide-based ink, containing earth abundant CZTS material and the high throughput production capacity of the non-vacuum solution-based processing technology. This newly proposed route takes advantage of the ample supply of CZTS that can be synthesized in large quantities on an industrial scale by the solid-state synthesis process from abundant elements or compounds and the capability of the solution-based film technologies to fabricate large area thin films.

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**
Austria	3	345’000	265’900
United Kingdom	1	108’759*	65’254*
Total	*4*	*453’759*	*331’154*

Note: Printed Electronics Ltd. project and funded costs are originally in British Pound. Project cost = GBP 86’768 and public funding = GBP 52’060. GBP 1 = EUR 1.25 as April 15th, 2016 (Source: Bank Austria).

Funding agencies involved and contracts

Funding Agency	**Contract N° and Title**
Österreichische Forschungsförderungsgesellschaft (FFG)	N°. 853374, SPRINTCELL . Sulfide-based Ink for Printable Earth-Abundant Solar Cell
Österreichische Forschungsförderungsgesellschaft (FFG)	
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