

HEAVENLY

High-efficiency PERT and IBC cell development focussing on paste and CVD optimization for long term stability

Project duration: from 01.2018 to 03.2021

Report submitted: 05.2021

Publishable Summary

The aim of the project was to move mature silicon based photovoltaic technology into the realms of low cost/high efficiency systems. Focussing on the development of silver pastes for screen printed contacts, atmospheric pressure chemical vapour deposited (APCVD) passivation layers for p+ or n+ doped regions, and long-term solar cell stability, the project facilitates the transfer of lab proven passivated emitter, rear totally diffused (PERT) solar cell technology to an industrial environment.

The research carried out in this project has led to a contact formation model for silver metallisation pastes on APCVD passivated silicon solar cells. The in-depth study of the etchant composition and its impact on the SiNx etching process has allowed us to tailor the paste composition to the n- and p-PERT cell architectures. APCVD processes were developed, enabling passivation qualities that allow for >22.5% solar cell efficiency with n-PERT architectures. Long-term stability was tested, ensuring the readiness level of the pastes and APCVD films.

UKN will continue to exploit the project results through follow-up projects with industrial partners. The use of APCVD technology will be further developed within the framework of ongoing research projects.

JM is currently involved in a new project with UKN exploring the use of these new silver metallisation pastes in new solar cell architectures, namely TOPCON. We are actively pursuing IP licencing opportunities and commercial partners. We are also exploring where it is appropriate to publish various findings in academic literature. The knowledge gained on tailoring the inorganic / organic component interactions with a high-solid content paste and the surface they were printed on is being applied across a variety of business units at JM, i.e. the production of hydrogen via green methods. Through analysing these samples, the Advanced Characterisation department at the JM technology centre is now able to apply this improved skill set to other research areas being carried out at the technology centre and across the business units.

Project consortium

Coordinator and all contact details:

Full name of organisation:	Johnson Matthey PLC
First and family name of coordinator:	Jonathan Booth
Full address:	Blount's Court, Sonning Common, Reading, RG4 9NH, United Kingdom
E-mail:	Jonathan.booth@matthey.com

Participating countries and financing:

Country	Number of organisations involved	Project costs in EUR	Public funding in EUR
United Kingdom	1	353'459	176'730
Germany	2	1'103'744	943'279
<i>Total</i>		<i>1'457'203</i>	<i>1'120'009</i>

Funding agencies involved and contracts

Funding Agency	Contract N° and Title
Innovate UK	File reference: 620139
BMW/PtJ	FKZ 0324226, HEAVENLY – Hocheffizienz PERT- und IBC-Prozess mit Langzeitstabilitätsstudie zum Einfluss von Pasten- und CVD-Schichten, Teilvorhaben: Entwicklung von simultan kontaktierenden Ag-Pasten auf multifunktionalen CVD-Schichten zur Untersuchung der Langzeitstabilität von hocheffizienten Solarzellen

Acknowledgement: The project "HEAVENLY" was supported under the umbrella of SOLAR-ERA.NET Cofund by InnovateUK and BMW/PtJ. SOLAR-ERA.NET Cofund was supported by the European Commission within the EU Framework Programme for Research and Innovation HORIZON 2020 (Cofund ERA-NET Action, N° 691664).