

2020 Helmholtz – OCPC – Program for the involvement of postdocs in bilateral collaboration projects

PART A

Title of the project:

Development of Novel Transparent Conductive Oxide / p-Type Rear Contact for High Efficiency Silicon Heterojunction Solar Cells

Helmholtz Centre and institute:

Forschungszentrum Jülich, Institute of Energy and Climate Research, Photovoltaics (IEK-5)

Project leader: Dr.-Ing. Kaining Ding

Web-address: www.fz-juelich.de/iek/iek-5/EN/

Description of the project:

The IEK-5 operates one of the most modern industrial size silicon heterojunction (SHJ) solar cell pilot lines reaching efficiencies up to 24%. Even though the efficiency record for two-side contacted SHJ solar cell on full industrial wafer size is 25.1% (Hanergy), the best efficiencies of SHJ solar cells using mass production compatible processes are around 24%. Further boost of the SHJ solar cell efficiency using mass production compatible processes lies in the development of novel thin-film materials with superior optical and electrical properties as compared to the state-of-the-art material choices. In particular, achieving fill factors up to ~85% at the IEK-5 pilot line requires the advancement in p-layer material, the rear TCO material and their interface, which has been identified as the current limiting factor. Currently materials like Indium-Titanium-Oxide (ITiO), Aluminum-doped Zinkoxide (AZO), and Indium-Tungsten-Oxide (IWO) as well as microcrystalline silicon ($\mu\text{c-Si}$) and nanocrystalline silicon oxide (nc-SiOx) were investigated at the IEK-5 and show very promising results. The underlying project will deal with the investigation and optimization of various TCO/p combinations of these materials. The aim is (1) to understand the working principle of TCO/p contact and its impact on the solar cell performance and (2) to fabricate SHJ solar cell using optimized TCO/p contact targeting efficiency >25.1%.

Description of existing or sought Chinese collaboration partner institute:

A strategic partnership already exists with the Research Center for New Energy Technology (RCNET) at the Shanghai Institute of Microsystem and Information Technology (SIMIT) under the framework of the Virtual Joint Research Institute on Functional Materials and Electronics. Further collaborations with Institute for Solar Energy System, Sun Yat-sen University (SYSU-ISES) and Institute of Electrical Engineering, the Chinese Academy of Sciences (IEE-CAS) exist. Chinese research institutes with state-of-the-art c-Si solar cell technology platform can be considered as collaboration partner institutes.

Required qualification of the post-doc:

- PhD in physics, chemistry, material sciences, electrical engineering or a comparable discipline
- Fabrication of crystalline silicon solar cell, in particular silicon heterojunction or passivated contact
- Additional skills in scientific English writing and presentation and evaluation tools e.g. Originlab

PART B

Documents to be provided by the post-doc, necessary for an application to OCPC via a postdoc-station in China, which is affiliated to a research institution like a university:

- Detailed description of the interest in joining the project (motivation letter)
- Curriculum vitae, copies of degrees
- List of publications
- 2 letters of recommendation
- Proof of command of English language

PART C

Additional requirements to be fulfilled by the post-doc:

- Max. age of 35 years
- PhD degree not older than 5 years
- Very good command of the English language
- Strong ability to work independently and in a team