

2017 Helmholtz – OCPC – Programme for the involvement of postdocs in bilateral collaboration projects

PART A

Title of the project:

Development of advanced front- and back-end technology for high-efficiency silicon heterojunction solar cells

Helmholtz Centre and institute:

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

Project leader: Dr. Kaining Ding

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Description of the project:

The scientific goal of the project is the realization of high fill factor and high open circuit voltage on silicon heterojunction (SHJ) solar cells by minimizing the electrical losses and recombination losses, respectively. The SHJ solar cell consists of a crystalline silicon wafer, the surfaces of which are functionalized by thin-film stacks. The functional stacks in silicon heterojunction solar cell on each side of the wafer have a passivation layer, a contact layer, a transparent conductive oxide, and a metal coating in the order specified. Electrical losses occur in form of transport loss through the layers and across the interfaces. Recombination loss occurs mainly in form of defect recombination at the crystalline silicon surface.

The focus of this work lies on

- (i) the development of silver screen printing technology for cell metallization (back-end) as well as the optimization of the grid design in interplay the underlying transparent conductive oxide film and
- (ii) the development of silicon wafer wet chemistry for wafer cleaning (front-end) as well as the modification of the texture in interplay with the subsequent passivation layer growth.

These are considered to be crucial aspects that limit the fill factor and open circuit voltage of high efficiency SHJ solar cells, respectively. In particular the metallization process compatibility with transparent conductive oxide e.g. ITO and/or ZnO:Al as well as the cleaning process compatibility with passivation layers e.g. a-Si:H and/or a-SiO₂ will be analysed in detail.

This project will also deal with the development of advance processing of ultra-thin SHJ solar cell in the interdigitated back contacted (IBC) configuration bonded to glass, where extra considerations for cleaning and metallization have to be taken into account.

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. Also other Chinese research institutes with state-of-the-art SHJ 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 silicon heterojunction solar cell, in particular the front-end (Si-wet chemistry) and the back-end (metallization)
- Additional skills in scientific English writing and presentation and in evaluation tools e.g. Originlab

PART B

Documents to be provided by the post-doc:

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

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