2018 Helmholtz – OCPC – Programme

for the involvement of postdocs in bilateral collaboration projects

PART A

Title of the project: Development of highly transparent front-side passivated contact for high efficiency silicon solar cells

Helmholtz Centre and institute: Research Center Jülich, Institute for Energy and Climate Research 5 – Photovoltaics (IEK-5)

Project leader: Dr. Kaining Ding

Web-address: http://www.fz-juelich.de/iek/iek-5/DE/Home/home_node.html

Description of the project (max. 1 page)**:** The contacts in solar cells need to be passivated effectively to achieve very high energy conversion efficiencies. A prominent example for a successful passivation of contacts is the so called "TOPCon" concept where the contact between crystalline silicon wafer and poly-silicon is passivated by a tunnel oxide. Recently, TOPCon solar cells reached a very high efficiency of 25.7%. However, the poly-silicon layer leads to high parasitic absorption losses on the front side. In order to reduce parasitic absorption, the IEK-5 Photovoltaics is working on replacing the poly-silicon layer by the more transparent microcrystalline silicon carbide (µc-SiC:H). However, an additional transparent conductive oxide (TCO) layer is needed for lateral conductivity. The scientific goal of this project is the development of a µc-SiC:H/TCO layer stack that survives the final firing process of the screen-printed metal contacts for two-side contacted Si solar cell with passivated contacts on both sides. As the firing process leads to temperatures of up to 800 °C, it is known that TCO layers usually suffer from electrical or optical degradation. Beside the testing of different TCO materials and tuning their material parameters, it is also possible to introduce a capping layer that protects the TCO layer during the firing process. The development of the TCO layer with or without capping layer includes the minimization of optical and electrical losses in order to realize high solar cell efficiencies. The experimental optimization will be supported by optical and electrical simulations. The final solar cell device will be characterized by sun simulator, quantum efficiency, electroluminescence mapping and photoluminescence mapping.

Description of existing or sought Chinese collaboration partner institute (max. half page)**:** Chinese research institutes with state-of-the-art crystalline silicon 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 and optimization of silicon solar cell, in particular the passivated contact, power loss analysis and device performance predicting.
- Know how in silicon solar cell preferred and excellent knowledge in electrical and optical phenomena in semiconductors
- Additional skills in scientific English writing and presentation and 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