Project offers / Expressions of Interest from Jülich

Joint Research and Education Programme "Palestinian-German Science Bridge PGSB"
Forschungszentrum Jülich GmbH & Palestine Academy for Science and Technology

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Function*	Institute and homepage of institute*
Group leader: device development	Institute of Energy and Climate Research IEK-5 Photovoltaics; www.fz-juelich.de/iek/iek-5/EN/Home/

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Initial contacts at Palestinian university/universities (if available)

Thesis candidate(s) (if available)

Project description*

Proposal for Master Thesis on
Sustainable power solution from monolithic integrated PV-battery

This work will investigate the potentials of using monolithic integrated thin-film silicon solar module and solid state battery as a power source for low energy portable and self-sustaining electronic devices. In order to meet the requirements of solid state battery regarding voltages of 4 V a thin-film silicon solar module consisting of various cell stripes connected in series will be developed. The thin-film silicon solar modules will be based on single junction a-Si:H solar cells, tandem-junction of a-Si:H and µc-Si:H and triple-junction of a-Si:H, a-Si:H and µc-Si:H. The monolithic integration of PV solar module and battery with proper current-voltage matching is required without any control electronics. Potential to use more battery types and more efficient solar cells will be tested in the three-terminal configuration that will involve using charge control electronics.

Issues to solve:

1. Investigate contact/interface between PV and battery integration.
2. Actual monolithic integration of PV and battery without control electronics
3. Testing of integrated PV-battery with control electronics in the three-terminal configuration.

Working plan:

1. Development of PV solar modules with voltages of 4 V. Solar modules based on single junction a-Si:H, tandem-junction of a-Si:H and µc-Si:H and triple-junction of a-Si:H, a-Si:H and µc-Si:H will be fabricated in order to provide 4 V nominal.
2. Investigation of different contact materials that can be the monolithic integration possible.
3. Monolithic integration of PV module and battery. Current-Voltage matching of the both

devices. Effective charging and discharging of the battery trough the PV module.
4. Power outcome analysis (under various light sources and intensities) and microscopic analysis of the PV-battery interface.
5. Testing of the 3-terminal configuration concepts (various storage cells and PV types).

Date*	Signature*
27.1.2017	

* required field