

## 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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### Initial contacts at Palestinian university/universities (if available)

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### Thesis candidate(s) (if available)

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### Project description\*

<p>Proposal for Master Thesis on 3D optoelectronic simulation of silicon heterojunction solar cells</p> <p>The silicon heterojunction solar cell concept represents one of the main candidates for the future industrial standard in silicon-based photovoltaics and holds the current efficiency record in this field. The architecture combines thin film silicon or silicon alloy contact and passivation layers with a high-quality crystalline silicon absorber. While the front side exhibits a large size texture for efficient light incoupling, the back side may be modified with an interdigitated contact scheme to avoid optical and recombination losses at the front.</p> <p>Numerical device simulations are a valuable tool to support the optimization of the various components of the device structure. Due to the presence of both sub-wavelength features and optically thick absorber regions, the coupling of coherent wave optics with ray optics is necessary. On the other hand, the complex architecture of the interdigitated back contact requires three-dimensional electronic simulations on the drift-diffusion level, which have to be coupled to the optical simulations.</p> <p>The full 3D optoelectronic device simulation will be developed on the basis of existing work on different aspects and integrated in a comprehensive TCAD approach. Material parameters for the macroscopic device simulations will be obtained from dedicated characterization experiments, and the full simulation will be verified by comparison with experimental device characteristics. The work will be performed in close collaboration with the silicon heterojunction group at IEK-5.</p> <p><b>Requirements</b></p> <ul style="list-style-type: none"> <li>• Excellent knowledge of semiconductor physics</li> <li>• Good knowledge of numerics</li> <li>• Experience with simulation of advantage</li> </ul>
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