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Institute of Energy Materials and Devices (IMD),
Photovoltaik (IMD-3)

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Solar Cell Diagnostics: Fast & Scalable Analysis of Multi-Junction Cells Without Complex Optics

Fast, precise analysis of multi-junction solar cells - without a camera, calibration effort or expensive lab technology.

Technology Description

This novel method makes it possible to determine the electrical properties of individual subcells in multi-junction solar cells easily, accurately and cost-effectively - directly in production.

This technology isolates each sub-cell of a multi-junction solar cell by shining a tailored light spectrum and measuring its open-circuit voltage. It replaces bulky optics with compact LEDs and simple voltage meters, making it ideal for industrial quality assurance.

Problem

Manufacturers of multi-junction solar cells (e.g. perovskite-silicon tandem solar cells) face a dilemma: analysing individual subcells has been extremely complex, expensive and slow – and therefore unsuitable for use in series production. However, precise diagnostics are crucial to avoid failures, increase efficiency and ensure product quality.

Solution

Our solution replaces complex camera technology with intelligent light control: each subcell is activated with a specific light spectrum – the electrical effect can be measured directly and separately.

- No calibration required
- Compact, cost-efficient hardware (e.g. LED instead of laser)
- Significantly faster measurement process → ideal for inline measurements
- Scalable for different cell types and production environments

Potential Use

- Photovoltaic industry (especially tandem manufacturers)
- Quality assurance in cell production
- Research and development of new solar cell technologies
- Test systems for automated cell classification

Development Status and Next Steps

The technology is at TRL 3-4: The core concept has been validated experimentally; proof-of-concept demonstrations are possible. The basic hardware setup exists, but software for automated control and analysis still needs to be developed for industrial use.

We are looking for industry partners for:

- Exclusive or non-exclusive licensing
- Pilot projects for integration into production lines

Interesting for the following sectors
» Photovoltaics

TRL
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Contact
Inventor
Sercan Aslan

Innovation Manager
Dr. Ann-Katrin Beuel

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More Information
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