MIKRO Project: 03SF0419A
Micro crack formation in PV-modules

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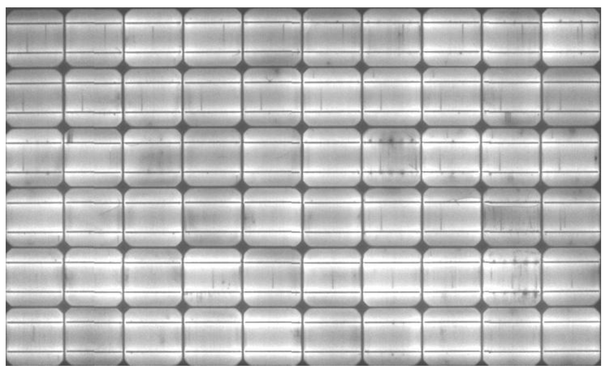
Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit

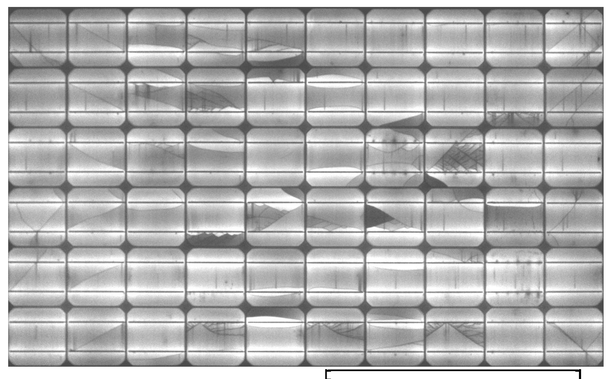
Motivation

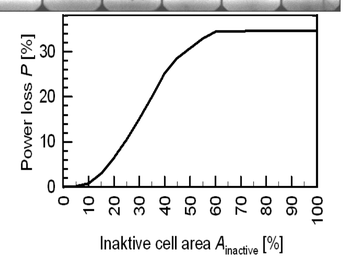
Micro cracks from production + **Mechanical stress** → **Crack propagation and Power loss**



- Micro cracks can be initiated e.g. during soldering of cell interconnectors

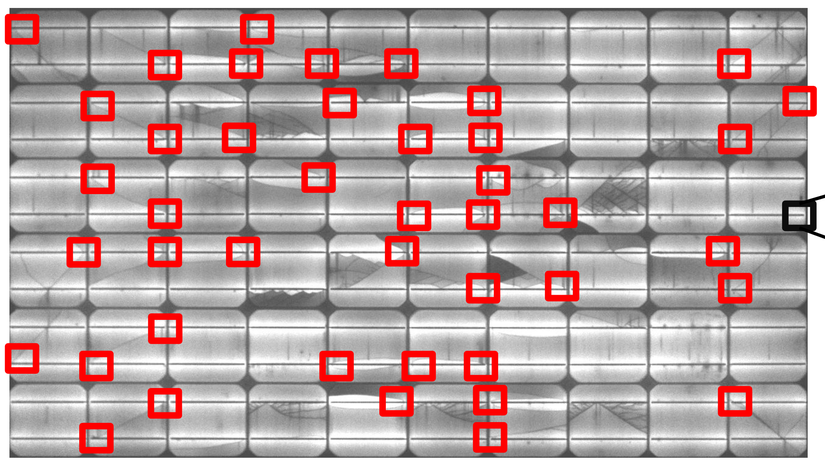
- Mechanical loads, e.g. wind, snow, transport and installation
- Changing environmental conditions, e.g. winter / summer, day / night



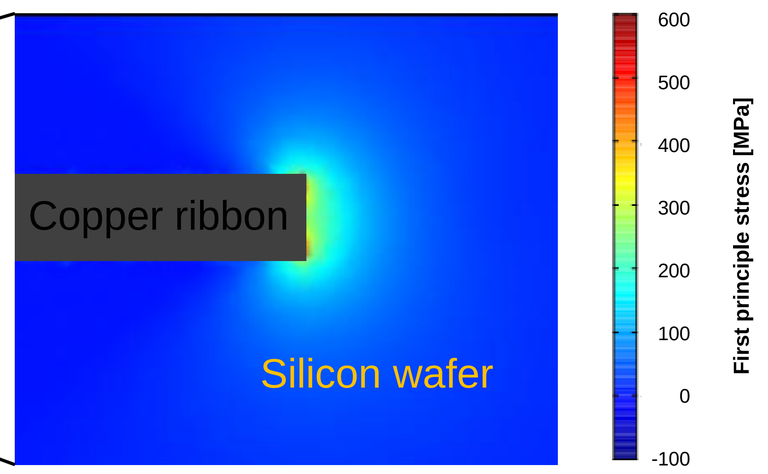


Experimental challenge: Measuring internal stress (e.g.: by Raman spectroscopy)

End of busbars frequently origin of micro cracks



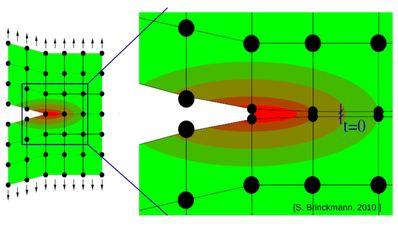
Soldering simulation of stress in silicon: 250 K cool down of copper ribbon



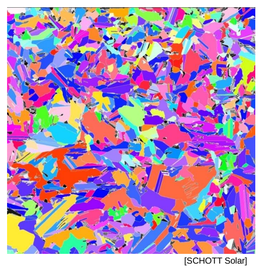
Aim of project

Simulations

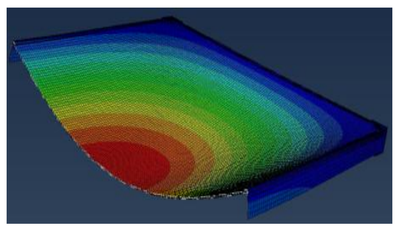
Thermo-mechanical multiscale simulation of crack initiation and propagation



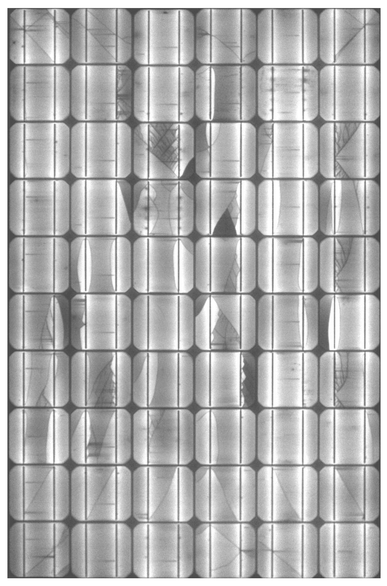
Micromechanical level



Wafer level



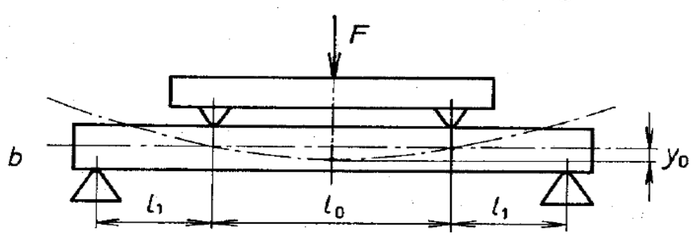
Module level



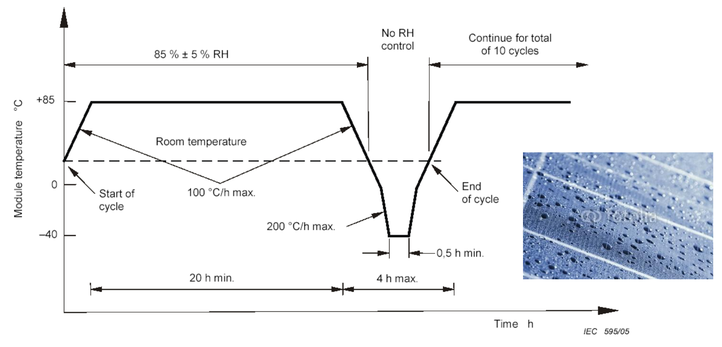
Reliable prediction of:
- **Micro cracks**
- **Crack propagation**
- **Power loss**

Experiments

Validation of simulations by e.g.



4 line bending of PV modules



Humidity freeze tests

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