Ribbons affect movement of cracked solar cells

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Project description

Background

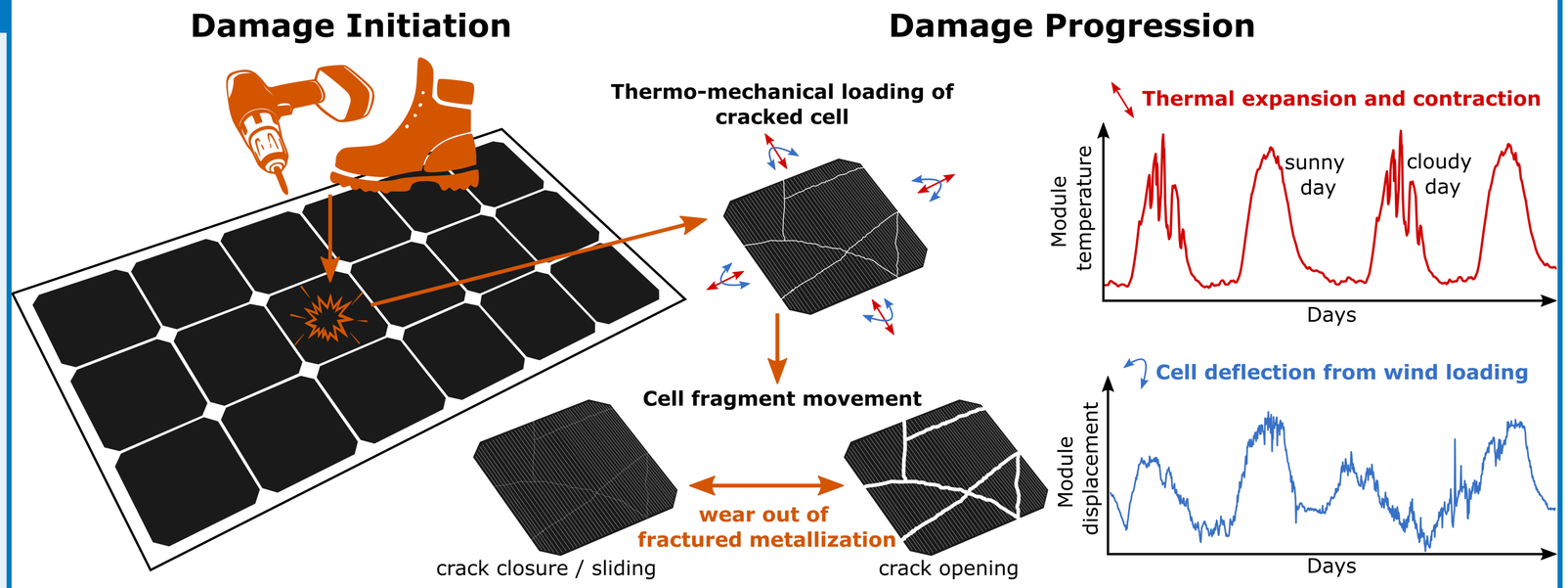
- Crystalline Silicon cells can be damaged during manufacturing, transportation, installation, or operation.
- Initially, the metallization can bridge the gap of fractured cells and keep individual cell fragments electrically connected.
- Thermo-mechanical stresses during operation from temperature changes and wind loading can wear out the metallization and lead to a safety hazard and/or power loss.
- The rate at which the metallization wears out is currently unknown.

Goal

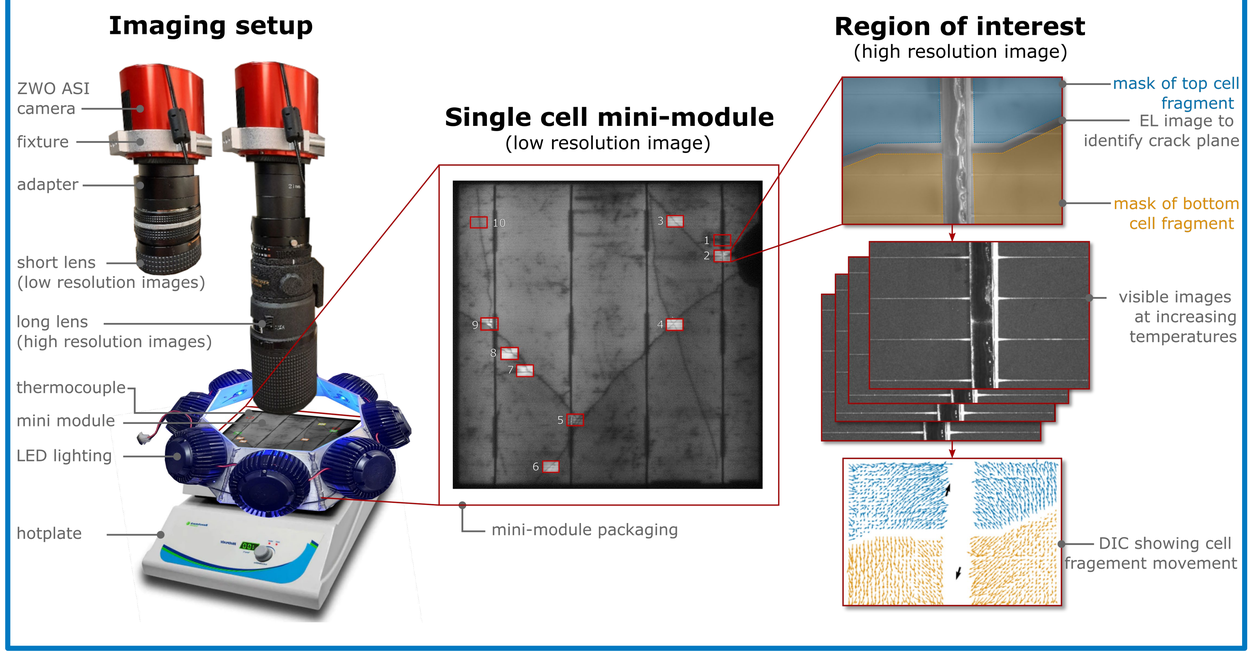
- Predict metallization wear out of cracked cells during operation to allow for the reliability and lifetime assessment of damaged PV modules.

How?

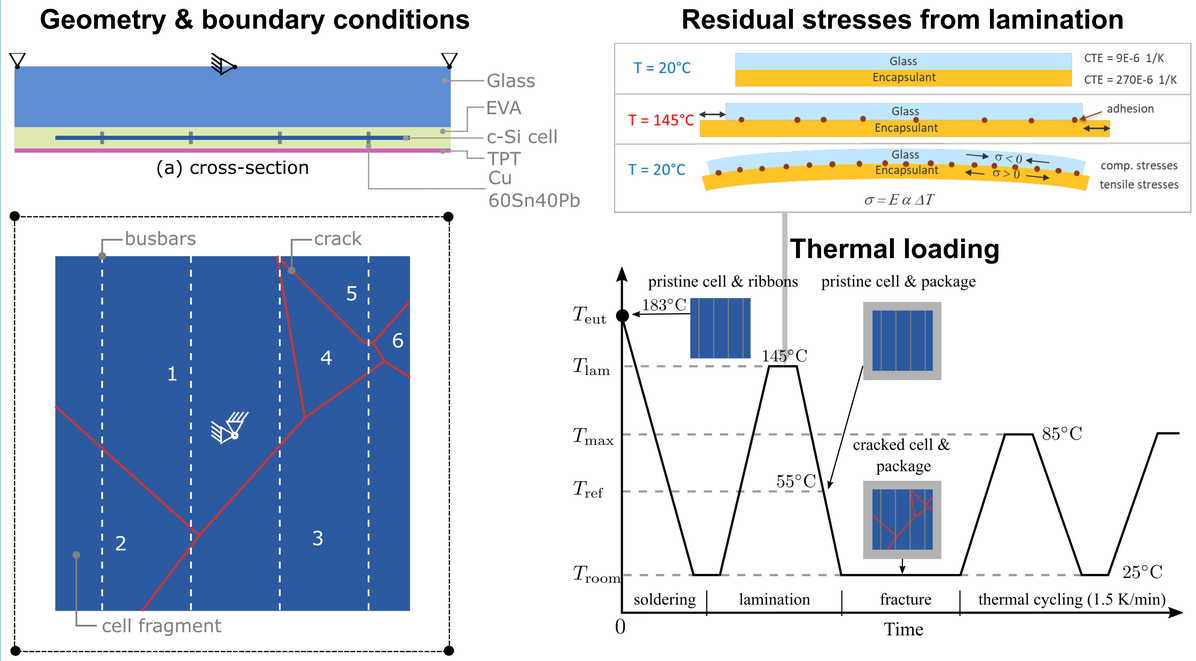
- We use digital image correlation and finite element analysis to quantify the crack opening and sliding distances of cracked cells.
- This information is essential for the development of wear models that will allow for the subsequent reliability and lifetime assessments.



Digital Image Correlation (DIC)



Finite Element Method (FEM)



Results

I) Ribbons affect the direction and quantity of cell fragment movement

II) Quantified crack opening distances will be used in wear models for lifetime predictions

III) Verified FEM model allows for quicker application towards new technologies

preliminary results

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