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High-performance low-cost modules with excellent environmental profiles for a competitive EU PV manufacturing industry

HighLite- Deliverable report

D3.5- Report on the most suitable cutting and edge passivation methods for SHJ and IBC cells.

confidential

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About HighLite

The HighLite project aims to substantially improve the competitiveness of the EU PV manufacturing industry by developing knowledge-based manufacturing solutions for high-performance low-cost modules with excellent environmental profiles (low CO_2 footprint, enhanced durability, improved recyclability). In HighLite, a unique consortium of experienced industrial actors and leading institutes will work collectively to develop, optimize, and bring to high technology readiness levels (TRL 6-7) innovative solutions at both cell and module levels.

HighLite consortium members

Document information

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Publishable summary

This confidential 3.5 deliverable intends to provide a general overview of the different cutting and edge passivation conducted within the Highlite project. This report is closely related to D7.4 which deals with characterization of the cut-edges, and where several experiments conducted are described in detail. Moreover, taking into account the different findings, and considering the industry compatibility of the developed processes, clear preferential paths have been identified for both integration steps.

Indeed, if several cut approaches have been evaluated, it appears that the Thermal Laser Separation (TLS) process proposed by 3D-Micromac, member of the Highlite consortium, simultaneously enables:

- Minimum edge losses after-cut
- Very smooth edge final morphology
- Limited/no edge crack apparition
- Already industry-compatible process

If alternative cut solutions are still under consideration, the TLS process is clearly identified as the most suitable cut process for all developments conducted. Some partners already have purchased such tool for their own needs, and most of the other project institutes/companies regularly ask for such cuts for their internal developments.

This is particularly true for edge passivation developments. All partners working on the topic have clearly converged on the same conclusion that very smooth edge is needed if such recovery process is to be considered for cut-cell integration. Indeed, the highly damaged edge resulting from usual Laser & cleave approach is not compatible with the high level of passivation needed for performance recovery after cut. Up to now, no clear passivation path has however been clearly identified despite the large amount of trials conducted. Nevertheless, one particular approach, developed by ISE and CEA shows promising first results, with up to 50% performance recovery possible, as proved by ISE trials on Shingle cell configuration. This approach relies on AlOx layer deposition over the whole wafer, at the very end of the cut-cell integration flow. This simple and cost-effective approach, even if not fully optimized yet would allow significant final module power gain, but many open questions still need to be fully tackled before considering large-scale industrialization. Indeed, long-term passivation stability, interconnection reliability and overall passivation uniformity needs to be further evaluated. This will be done in the final year of the project.