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NextBase - Deliverable report

D7.3 Optimized AR-coating and encapsulation integrated in a 60-cell module meeting the reliability requirements of KPI 7.2

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Publishable summary

In this deliverable we evaluate in reliability testing the combinations of different interconnection, encapsulation and anti-reflective (AR) glass technologies using high efficiency cells from WP6 or black silicon wafers from WP3. The interconnections technologies evaluated are the Smart Wire Connection Technology (SWCT) by Meyer Burger and a hybrid multi-wire fabric technology by imec, while liquid encapsulation process has been developed by CEA-INES in collaboration with Arkema. The AR coated glass is provided by DSM with the coating based on an improved version of the current commercial product. The aim of this work is to determine which combination of materials and processes is the most suitable for manufacturing of demonstration modules at the end of the project in deliverable D7.4 and D7.5.

The results show that the AR coating gives a performance gain of approximately 3% compared to similar modules manufactured with uncoated glass. This has been validated both in full-size 60-cell and single cell modules, and is in agreement with transmission measurements on the coated glass. The liquid encapsulation process was demonstrated successfully in four-cell laminates with standard cells and ribbon interconnection showing similar cell-to-module losses in terms of current and power, despite a higher thickness of the liquid encapsulant compared to reference EVA. Damp-heat testing of these modules also showed similarly limited power degradation. Combination of the liquid encapsulation and SWCT or the hybrid multi-wire fabric technologies have shown limited compatibility: firstly, interconnection developed both by imec and Meyer Burger require heat/pressure to connect the copper wires to the cell, whereas the advantage of the liquid encapsulation is to avoid these processes. Another compatibility limitation is the complex 3D geometry of the interconnection layers/fabric asking for an adapted filling procedure (beyond the scope of the project). Liquid encapsulation could be a relevant technology for the next generation of these multi-wire interconnection approaches using stand-alone copper wires, however their assessment is beyond the scope and timeline of this project.

Based on the above results and in collaboration with WP6, we determined that the combination of SWCT with state-of-the art polyolefin encapsulants and w an AR-coating on the front glass will be optimal for the final demonstrators in the project considering manufacturability, performance and reliability. Development of the liquid encapsulation and hybrid woven fabric within the frame of this project will be stopped (further details are in D7.2 report) and their exploration will be continued for other module types and/or applications by the partners beyond the scope of this project.