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Aluminium-BSF Versus PERC Solar Cells: Study of Rear Side Passivation Quality and Diffusion Length

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The impact of (bulk) material and rear surface (contact) quality to the efficiency is found to be quite hard to measure on a processed solar cell. We will show with this paper that CELLO (solar cell local characterization) photo-impedance-spectroscopy measurements are capable of separating bulk from rear side effects on locally resolved maps. This study focuses on multicrystalline Aluminium-BSF solar cells which have been produced according to a co-firing parameter optimization process with a wide parameter space. It is found that the rear side recombination velocity on some locations of the Al-BSF cell is much better than compared to PERC cells. Thus, the full potential of Al-BSF solar cells is much higher than usually expected and anticipated. In the future paste and co-firing optimizations are required to transfer the excellent local values of Al-BSF cells to the full cell area for excellent global values that result in cell efficiencies higher than today PERC solar cells. Thus, the time of Al-BSF solar cells is for our opinion not over yet.