LASER PATTERNING OF PEROVSKITE SOLAR CELLS

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Perovskite solar cells have been rapidly improved over the last years. At small lab-scales efficiencies comparable to crystalline silicon solar cells were achieved. Successful up-scaling to large modules requires monolithical interconnection processes. Here we report on laser scribing processes of the P1, P2 and P3 patterning steps to interconnect perovskite ($CH_3NH_3PbI_3$) solar cells. Particular emphasis is put on the P2 laser patterning step as it is known to induce detrimental material modifications of the absorber layer mostly at the bottom and in the vicinity of the scribed lines. Suitable process windows were established and optimized by systematic variation of the pulse length (ns, ps), the wavelength (1024 / 532 / 355 nm) and the processing side (glass-/ layer-side). Systematic analysis of the laser-matter interaction, i.e. the selective layer removal, the proper morphology and the electrical functionality, resulted in conditions for successful monolithic serial integration with minimal dead areas.

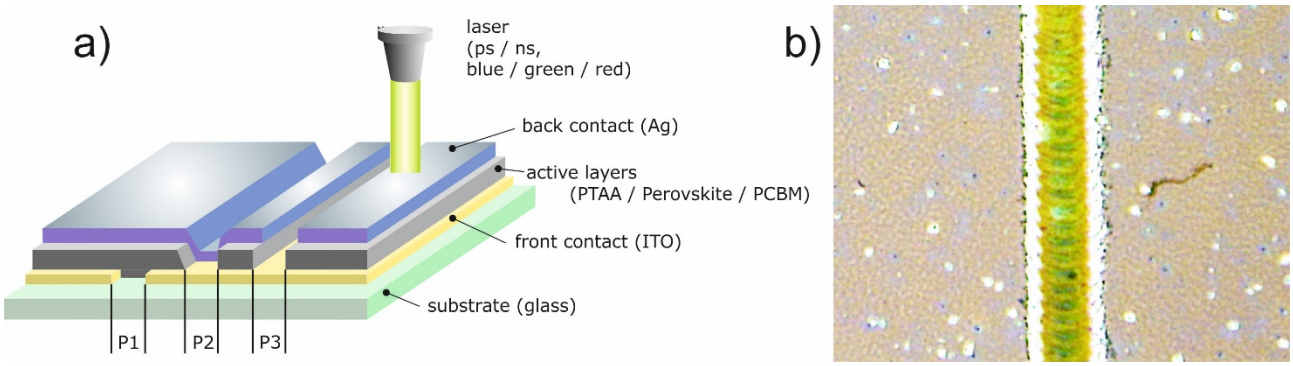

Fig.: (a) Schematic illustration of the laser scribing configuration, (b) optical micrograph of a P2 scribe in perovskite ($CH_3NH_3PbI_3$) obtained by ns laser ablation at 532 nm.